

# JCCP

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## JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS



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# JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

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# JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

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# Editorial

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We have been taught that the study of pediatrics encompasses conception to the late teen years. In this issue of the *JCCP*, we have attempted to broaden the reader's knowledge, comfort level and clinical expertise to care for the pregnant patient in his or her private practice.

Our care of this patient hopefully has begun before she has even considered having her first child. There is so much at stake for both mother and child that she needs to be at the peak of health when she conceives. Cellular division, migration and differentiation are carefully orchestrated by the folding and unfolding of paired genetic material revealing its secrets and molding a new human being from the materials at hand in maternal tissue. This new life will be nurtured and protected in the womb allowing it time to develop and prepare itself for egress into a sometimes hostile but often wonderful world.

Issues of clinical concern for the pregnant patient range from fertility and sustaining a pregnancy in the first trimester, to the patient's physical comfort and normal physiologic function during her second. In the third trimester, hypertension induced by issues of pregnancy, gestational diabetes, pre-eclampsia, fetal positions and the natural onset and progress of labor and delivery are of primary concern. All of the aforementioned are influenced by the integrity of her neurology (with an emphasis on the female endocrine system, the autonomic nervous system and her stress levels), biomechanics and nutrition. Issues unaddressed by a woman before conceiving are apt to manifest under the additional stress of pregnancy and issues unaddressed during pregnancy can appear in the postpartum period in the form of an inability to breastfeed, thyroid dysfunction and an alarming increase in the incidence of diagnosed postpartum depression.

Low back pain and pelvic instability are several of the most common complaints of pregnancy and both, as you will read in several papers published in this issue, have been responsive to chiropractic treatment protocols designed with a holistic approach including education, chiropractic adjustments, nutritional recommendations and rehabilitative exercise, and, when appropriate, ancillary supports like orthotics or braces. The restoration of balance to the lumbar spine and pelvis has demonstrated a decrease in uterine constraint and fetal malposition as well as potentially increasing the potential for a vaginal birth without intervention.

The correction of mechanical dysfunction has also resulted in the alleviation of pain. This alone must never be underestimated in its effect on the pregnant patient's stress level and therefore potentially, the outcome of her pregnancy. Pain results in altered chemistry, as the body produces hormones and other substances in response to nociceptive input. It also results in an alteration in biomechanics as the patient's posture is not only influenced by the expanding gravid uterus, but by the mechanical imbalances created by splinting or weakened muscles, misaligned joints or the destabilization of lax or injured ligaments. And lastly, emotionally, pain is frightening when acute and exhausting and debilitating when chronic. It takes a toll on an individual's health and longevity, the robust development of the fetus soon to be neonate, as well as interfering with the bonding process between mother and newborn.

Chiropractic appears to offer a non pharmacologic, non surgical approach to alleviating pain and dysfunction during pregnancy and improving desired pregnancy outcomes. It is with this understanding that we urge further research and encourage chiropractors to continue to compile clinical observations and accumulate data from larger populations as to the efficacy and safety, as well as the incidence of any adverse effects, of chiropractic treatment of the pregnant patient.



Sharon A. Vallone, D.C., F.I.C.C.P.  
Co-Editor



# Chiropractic Care during Pregnancy: Survey of 100 Patients Presenting to a Private Clinic in Oslo, Norway

Elisabeth Aas-Jakobsen, BS, DC, MSc and Joyce E. Miller, BS, DC, DABCO

## Introduction

Musculoskeletal (MSK) problems in pregnancy constitute a tremendous cost to society, both in regards to sick leave and chronic pain, and are a major public health concern. (In Norway one-third of all pregnant women are on sick leave at any given time, and many of these because of back pain). There is little agreement on the best treatment for the various MSK problems in pregnancy and very little is known about the efficacy of chiropractic treatment in pregnancy. However, chiropractic care has been shown to be both popular with patients during pregnancy, as well as being considered safe and appropriate by chiropractors. The purpose of this paper is to describe a survey which investigated the characteristics of pregnant women who sought chiropractic care in Norway.

## Methods

The design of this study was a cross-sectional survey which was designed to collect demographic data from the first 100 pregnant women who presented in consecutive order within a specific time frame to a chiropractic clinic in Oslo, Norway. The data were abstracted from patient records of new patients who were pregnant and consulted the clinic from September 2007 to December 2008. Only the data from treatments during pregnancy were used; treatments after the end of pregnancy were not included. Only the data that systematically had been recorded in all the files were used. Inclusion criteria were that the patients were pregnant on presentation to the clinic, that they spoke Norwegian and received more than one treatment. If they had sought other treatment earlier in the same pregnancy, they were still included. Exclusion criteria were receiving only one treatment (to avoid patients travelling through

the area, and to avoid any assumptions of patients potentially not returning after the first treatment where it was impossible to re-interview or re-examine the patient). Only treatments during pregnancy were included. Episode of care was throughout the pregnancy, and did not extend past pregnancy.

All data were held completely confidentially and no patient was identifiable. All patient data were coded without use of names or identifying features. Patient's files on the computer were transcribed to an Excel spreadsheet. Descriptive statistics were used to analyze the data.

This study was approved by the Anglo-European College of Chiropractic Research Ethics Sub-Committee for postgraduate research in accordance with the Declaration of Helsinki. No further approval was required in Norway. There were no funding issues or conflicts of interest.

## Results

The mean age of the patients presenting to the chiropractor was 32.5 years (range 25-42). Forty percent (n=40/100) were in the group 29-32 years old, 40% were in the group 33-36 years old and 20% were under age 28, or 37 or above. About half of the patients (47%) were in their first pregnancy, the other half (49%) in their second pregnancy, and only a few (4%) in their third pregnancy. For 32% of the patients, the contact in this office was the first time they had ever received any care for any musculoskeletal problems in the health care system regardless of pregnancy status. Thirty eight percent had been to a chiropractor before, either before they were pregnant, or in a previous pregnancy. Thirty percent had been to a physiotherapist previously, either in the present pregnancy or an earlier pregnancy, or for any condition before they were pregnant.

In this clinic 44% were referred to the clinic by friends or family and 48% referred by other health professionals, 23% received advice from their midwife to contact the clinic, 15% from their medical doctor, and 10% from their physiotherapist.

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About 90% of the women had pelvic pain as the main reason why they had contacted the clinic during pregnancy. Six out of 10 had back pain, and 6 out of 10 had specific thoracic pain. Three out of 10 had neck pain, 29% had symphysis pubis pain, 15% experienced headaches and 2% migraines. Overall, 82% experienced a combination of pain sites.

Fifty-five percent of the patients received care in the pelvic/lumbar, thoracic and cervical areas. Forty-one percent received pelvic/lumbar and thoracic treatment and 4% in the pelvic/sacrum areas only.

When looking at the 82% who experienced a combination of pain sites, it was most common to have a combination of 3 sites, then 2, 4 or a combination of 5 or more.

In this study, 44% had experienced some form of back pain prior to this pregnancy. Twenty-one percent had experienced pain in an earlier pregnancy. Thirty-five percent had no previous experience with back pain.

The average gestational age was 26.5 weeks. The mode was 26 weeks.

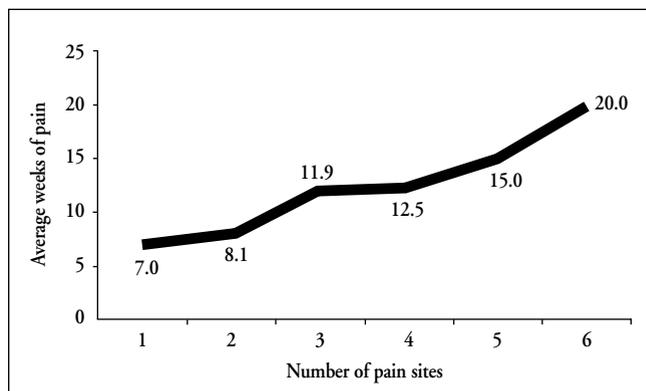
Fifty-two percent of the patients were in their second trimester (eleven percent in gestational week 26), 43% were in their third trimester (nine percent in gestational week 32 and ten percent in week 35) and 5% were in their first trimester.

Thirty-six percent of the patients noted that their pain had started at what they defined as the “beginning” of the pregnancy. Sixteen percent had had pain for 1-2 weeks, 10% 3-4 weeks, 8% 5-7 weeks and 20% had had pain for more than 2 months duration before clinical presentation. Those with the greatest number of pain sites had experienced it for the longest duration (*Figure 1*).

The most common number of treatments was 8.5 (range 2-19). Forty-seven percent received between 7-12 treatments, 34% received 2-6 treatments and 19% received more than 13 treatments. Many of the patients received care after birth; however these were not included. Number of treatments generally increased with the number of pain sites (*Figure 2*).

The patients who had had no previous experience with back or pelvic pain sought care on average after 4.5 weeks of pain. The patients who had had previous back pain not related to pregnancy waited on average 12.5 weeks before

**Figure 1. Average weeks of pain versus number of pain sites (n=100)**



seeking care. Those women who had experienced back or pelvic pain in a previous pregnancy waited on average 14 weeks before consulting a chiropractor.

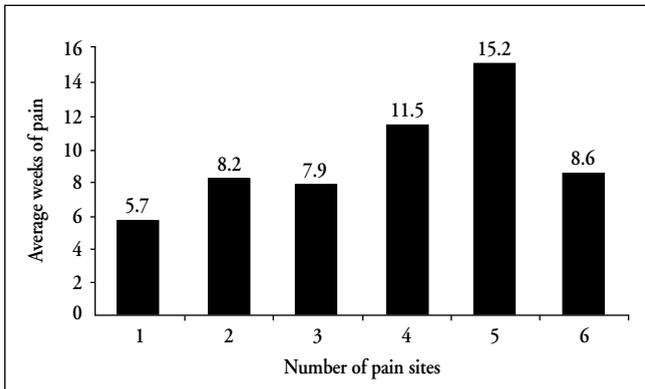
When studying the patients who waited the longest before seeking care (more than 20 weeks), it was found that only the women who had had earlier back pain waited that long before seeking care, 10 with a previous back pain history and 3 with pain in an earlier pregnancy. When looking at those patients who sought care within 1-3 weeks of pain, it was found that none of these 12 had had any previous experience with back pain. When looking at the trimester when the patients presented as well as how long they had had pain before they sought care, it was found that in the first trimester the patients had had pain for an average of 5.4 weeks, in the second trimester an average of 9.6 weeks and in the last trimester the patients had pain for an average of 12.7 weeks.

It was found that those who had never received any previous care waited 7.3 weeks on the average, those who had been to a chiropractor previously waited 11.6 weeks, and those who had been to a physiotherapist earlier waited the longest at 13 weeks.

## Discussion

In this survey, just over one-third (36%) of the patients claimed to have experienced pain since the “beginning of the pregnancy.” They presented in their second or third trimester (52% and 43%, respectively). Most commonly, they presented at 26 weeks of pregnancy and on average, had waited 11 weeks before they sought care. This puts a large number of the patients into a category of what would classically be termed chronic pain. Research has shown that over half of people with 3 or more months of pain,

**Figure 2. Number of pain sites versus average number of treatments (n=100)**



continue to have clinically significant back pain at 1 year.<sup>1</sup> Pregnancy itself is regarded as a risk factor for chronic back pain in women.<sup>2</sup> The length of time of pain before seeking care may perhaps have an influence on the course of the pain experienced after pregnancy. Many clinicians and patients accept back and pelvic pain as a normal side effect of pregnancy. Skaggs et al.<sup>3</sup> found that only 15% of the women with pregnancy related lumbo-pelvic pain received any care, only 10% of those were satisfied with the care given and most of the women in this study were not given any advice regarding available treatment options. Some women complained because they didn't know there were options for treatment. A statement by a patient presenting to my office follows:

*“Why didn't anyone refer me here earlier? It is just by chance I ended up here in this office. Had I known what I now know, I would have come much earlier.”*

We need to know whether encouraging women to seek care early significantly decreases the length of pain episode and chronicity. Further long-term research is required to answer those questions.

Those patients who never had back pain previously waited the shortest amount of time before seeking treatment (average 4.5 weeks) and those with previous pelvic or back pain in pregnancy waited the longest (14 weeks). A reason why first time pain patients sought care earlier may have been that the pain was terrifying and they needed to know what was wrong with them, or it may reflect a changing attitude of the younger generation who do not have a “wait and see” approach to their problem. The authors hypothesize that it may reflect a healthy attitude of these women; they may want to know at an early stage what can

be done for their condition, and how to prevent a progression of their problem.

Of those patients who had pain for more than 20 weeks before presenting to the chiropractor, all had experienced low back pain previously. The long wait could be due to them being less afraid of the pain (having experienced it before) and having learned to accept it, or having had previous treatment during earlier pregnancies that they perceived as being non-helpful. None of the patients whose first experience with back pain in her current pregnancy waited more than 20 weeks before seeking care. To have back pain for more than 20 weeks reflects the attitude of women with chronic pain; they “get used” to it and learn to live and deal with it and not complain about it.

Stevens<sup>4</sup> looked at “regular” chiropractic patients, whose average pain onset was three weeks before visiting the chiropractor was. This is two months earlier than this study. He found that one of the biggest barriers to seeking care was hope that the symptoms would go away. In the pregnant patient this may be true as well, as this is exactly what many patients in our study reported during their pregnancy. They would have sought care earlier, but were hoping that the pain would go away, only as the symptom worsened did they realize this was not the case. Others thought they could endure the pain because the end of the pregnancy was perceived to be close, but as the quality of life worsened they sought help for symptom relief. The authors hypothesized that the pain usually gets worse as the pregnancy progresses and the patient may, at some point, become desperate and decide to seek care. Another aspect of pregnancy pain is that it is often perceived as a “positive” pain, something good will come soon (the child) and there will probably be an end to the pain (the pregnancy will end).

For almost one-third (30%) of the patients in this study, chiropractic was their first choice of treatment, except visits to their medical doctor for routine checks. This may reflect a wider knowledge base of the patients, along with perhaps reflecting the growing status and position of chiropractic. In Norway perhaps this is a consequence of the law changes and privileges that chiropractors in Norway have been granted over the last few years. Chiropractors are primary care givers, have the right to write sick leave notes up to 12 weeks, have rights to prescribe physical therapy paid for by the government, as well as any kind of special testing such as radiographs, MRIs and further investigation by other specialists.

When reviewing these findings it is important to keep in mind the limitations of this particular study. As good as surveys can be at finding trends and locating gaps in information, the design of this study alone allows for many gaps in information. Due to the relatively small number of subjects (100 women) it is harder to draw conclusions and find trends than it would be with a larger population of subjects.

The patients presenting to this clinic may have unique characteristics from patients in other clinics, because it is a clinic specializing in pregnancy related problems. This clinic may also give an over representation of pelvic related pain, because the name of the clinic “bekken og barn” (pelvis and children) reflects a condition and implies a focus on problems relating to the pelvic girdle. This could potentially leave out patients, for example, who have migraines in pregnancy as their chief complaint. The characteristics of these patients may also have been influenced by the relatively limited catchment area (limited geographic location) also affecting the socio-demographic profile.

As for the treatment, it was carried out by only one chiropractor, not giving room for differences from different practitioners in regards to number of treatments given, the areas of the spine treated, and the treatment schedules, even though these are not directly discussed in detail here. Thus, what is true for treatments given in this clinic may not reflect the practitioners in clinics that are not specializing in treating pregnant women. If there is indeed a difference in those who seek care from specialists, especially in regards to education and job satisfaction, this may also affect the sick leave statistics. Further research might elucidate whether those who seek specialized care are more satisfied with their job, and would want to try “everything” so they can stay

working as long as possible. This may be especially true because they have to pay for their care out of their own pocket. In comparison, the most common alternative to a chiropractor is a physiotherapist, whose treatment in Norway is generally free of charge during pregnancy.

### Conclusion

Some women seek chiropractic care during pregnancy and in this study, half were sent by health care practitioners. For one-third of the patients, chiropractic was their first choice for treatment. All had pain relating to the pelvic girdle or low back; however most of them had a combination of two or more pain sites. This study found that the longer the patient had pain before onset of care, the more pain sites they experienced, the more areas of the spine were treated and the more treatment they required. Future studies should concentrate on efficacy of treatment (as well as the initiation of early vs. delayed treatment), cost-effectiveness and prevention of chronicity of back pain that begins during pregnancy.

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# Low Back and Pelvic Girdle Pain of Pregnancy: Recommendations for Diagnosis and Clinical Management

Maria C. Browning, BSc, DC, MSc

## ABSTRACT

**Introduction:** Low back and pelvic girdle pain are common and disabling conditions during pregnancy. Chiropractors are in a unique position to diagnose various pain syndromes with reliable clinical tests and offer a variety of treatments that are safe for both mother and fetus.

**Objective:** This paper explores the current evidence base on low back and pelvic girdle pain of pregnancy with recommendations for diagnosis and clinical management.

**Discussion:** Clinical tests used by chiropractors are reliable and a number of treatment techniques are available for the different low back and pelvic girdle pain syndromes of pregnancy

**Conclusion:** Treating the pregnant patient can be challenging and it is realistic for the goal to be supportive care and keeping quality of life static due the constantly changing dynamics of pregnancy.

**Key words:** chiropractic, pelvic girdle pain, low back pain, symphysis pubis dysfunction

## Introduction

Pregnancy should be a joyful time but can quickly turn into a miserable experience for women who have back or pelvic girdle pain and their quality of life can be seriously affected. This article will explore the validity of clinical tests, manual therapy techniques and exercises for low back pain (LBP) and pelvic girdle pain (PGP) in pregnancy in order to maintain optimal function.

## Discussion

LBP is usually defined by pain between the 12th rib and the gluteal fold whilst pelvic girdle pain is defined as pain experienced between the posterior iliac crest and the gluteal fold, particularly in the vicinity of the sacroiliac joints. The pain may radiate in the posterior thigh and can also occur in conjunction with or separately in the symphysis. The incidence of pelvic girdle pain in pregnancy is about 20%.<sup>1,2</sup> If low back pain is included, this figure rises to 84%.<sup>3</sup> Pelvic girdle pain can be further subdivided into pelvic girdle syndrome (daily pain in all three pelvic girdle joints) which affects 29.7% of pregnant women with pelvic girdle pain, symphysis pubis pain which affects 11.6%, one-sided sacroiliac pain which affects 27.3% and bilateral sacroiliac pain which affects 31.4%.<sup>1</sup> Significant risk

factors for developing low back pain or pelvic girdle pain in pregnancy are previous low back pain or pelvic girdle pain and/or previous trauma to the pelvis.<sup>1,2</sup> Predictors for having persistent pelvic girdle pain or combined pain after delivery are low endurance of back flexors, older age, combined pain in early pregnancy and work dissatisfaction.<sup>4</sup> Pelvic girdle pain during pregnancy has a significant effect on quality of life as the endurance capacity for standing, walking, and sitting is diminished. This is particularly so in the third trimester when the disability rating index (DRI) is significantly higher compared with pregnant women with low back pain only and pregnant women without pain. The highest DRI is found in women with bilateral posterior pelvic pain plus symphysis pubis pain. Women with pelvic pain in more than one location report more frequent use of crutches.<sup>5</sup>

Why do so many women experience low back or pelvic girdle pain during pregnancy? There has been much discussion in the literature on the role of relaxin, previously thought to be involved in the etiology of pregnancy-related PGP. Early studies concluded that an increased concentration of serum relaxin was a risk factor.<sup>6</sup> However, this correlation has not been confirmed by subsequent studies.<sup>7,8</sup> The anatomy of the sacroiliac joint leads to the highest coefficient of friction of diarthrodial human joints. This friction can be altered according to the loading situation along with nutation of the sacrum, resulting in functional adaptations to stabilize the pelvic girdle.<sup>2</sup> Therefore, it is

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**Table 1.**  
**Pain provocation test of the sacroiliac joints**

Test	Sensitivity	Specificity
<b>Posterior pelvic pain provocation (P4)</b>	<b>0.79</b>	<b>0.89</b>
<b>Patrick's Faber</b>	<b>0.55</b>	<b>0.99</b>
<b>Palpation of the long dorsal ligament/PSIS/SI joint</b>	<b>0.33</b>	<b>0.98</b>
<b>Compression</b>	<b>0.35</b>	<b>0.99</b>
<b>Separation</b>	<b>0.17</b>	<b>0.99</b>

*Adapted from Vleeming, 2008*

likely that the postural adaptations of pregnancy result in increased friction and loading on the sacroiliac joints.

Chiropractors have a range of clinical tests to assess low back and pelvic girdle pain. Which tests are most optimal for evaluating the various low back and pelvic girdle pain syndromes of pregnancy? The following tests are recommended by the European guidelines for the diagnosis of pelvic girdle pain.<sup>2</sup> A description of these tests can be found in Appendix 1.

The most reliable tests to identify pain originating from the sacroiliac joints are:

- the posterior pelvic pain test (thigh thrust or P4),
- Patrick Faber test,
- tenderness on palpation of the long dorsal sacroiliac ligament
- Gaenslens test.

The most reliable tests to identify pain originating from the symphysis pubis are:

- tenderness on palpation of the symphysis pubis
- modified Trendelenburg test.

A reliable test for pelvic function and stability is the active straight leg raise (ASLR). Women with pregnancy-related low back and pelvic girdle pain use significantly more effort during ASLR than pregnant women without pain. At both 0cm and 20cm leg raise height they have less hip flexion force and develop more muscle activity. Therefore, the ASLR demonstrates disturbed load across the sacroiliac joints in pregnant women with pregnancy-related low back and pelvic girdle pain.<sup>9</sup>

**Table 2.**  
**Pain provocation tests of the symphysis pubis**

Test	Sensitivity	Specificity
<b>Modified Trendelenburg test</b>	<b>0.51</b>	<b>0.99</b>
<b>Pain at palpation of the symphysis</b>	<b>0.79</b>	<b>0.92</b>

*Adapted from Vleeming, 2008*

The sensitivity and specificity of these tests are depicted in Tables 1, 2 and 3. Worthy of note is that a bilateral positive P4 corresponds to a higher DRI than a unilateral or negative P4. Additionally, there is a significantly higher DRI if the ASLR is more than 0.<sup>5</sup>

What is the most effective treatment for reducing pain and disability in pregnant patients with low back or pelvic girdle pain? The following management techniques are recommended by the European Guidelines for the treatment of pelvic girdle pain.<sup>2</sup>

### Manual therapy

The use of spinal manipulative therapy during pregnancy to reduce back pain and other related symptoms is supported by limited evidence.<sup>10</sup> A systematic review of 6 studies concluded that chiropractic care is associated with improved outcomes in pregnancy-related low back pain and pelvic girdle pain.<sup>11</sup>

### Specific stabilizing exercises

There is evidence that specific muscle strengthening exercises (focusing specifically on stabilizing exercises for control and stability), with advice on activities of daily living, result in a significant reduction in pain. However, use of a rigid or non-rigid pelvic support belt does not add to the effects provided by exercise and advice.<sup>12</sup>

### Water aerobics

There is limited evidence that water aerobics diminishes pregnancy related low back pain and sick leave due to pregnancy-related low back pain more than a land-based physical exercise program.<sup>13</sup> Nonetheless, regular water aerobics can result in significantly fewer requests for analgesia during labor and is a low risk exercise during pregnancy. However, there is no influence on maternal cardiovascular capacity, duration of labor or type of delivery.<sup>14</sup>

**Table 3.**  
**Functional tests of the pelvic girdle**

Test	Sensitivity	Specificity
<b>Active straight leg raise (ASLR)</b>	<b>0.72</b>	<b>0.95</b>

*Adapted from Vleeming, 2008*

### Acupuncture

There is some evidence that acupuncture, combined with stabilizing exercises, results in less pelvic girdle pain and may be a useful addition to a combined management program.<sup>15</sup> However, it should be noted that although no serious adverse events have been reported with the use of acupuncture during pregnancy, there is a risk of mild adverse events (painful treatment, headache and drowsiness, rash, nausea with feeling faint, sweating and dizziness) on the day of the treatment.<sup>16</sup>

### CHIROPRACTIC MANAGEMENT

Chiropractic care is safe during pregnancy although there are some suggested modifications. Adjustments should be low-force (remember that relaxin is present from the first trimester to 3 months postpartum.) The patient should experience no abdominal pressure. The practitioner should make sure that the uterus is supported when the patient is side-lying and flex the hip less than usual when doing side posture techniques.

The author uses the following techniques with a good rate of success in reducing pain and restoring optimal function for the pregnant patient so that she can continue her activities of daily living in comfort. However, it is realistic for the goal to be supportive care and keeping quality of life static due to the constantly shifting dynamics of pregnancy.

#### Treatment of Symphysis Pubis Dysfunction (SPD)

This can occur from the first trimester and ranges from mildly to severely disabling. Some women have extreme difficulty walking and need to use crutches. It can have a detrimental effect on most activities of daily living. Chiropractors can manage the pain but it often does not resolve completely until after the birth. There are direct and indirect treatment methods for SPD that the chiropractor can utilise. Direct treatment includes use of the activator on the inferior or superior pubic ramus. Indirect treatment includes correction of any sacroiliac joint restrictions, symphysis pubis mobilization and myofascial techniques.

The sacroiliac joints can be adjusted either in side posture or with a prone drop whilst lying on a pregnancy pillow. However, the author has found that utilizing the drop piece with the patient supine and contacting the ASIS gives good results too. It is also less alarming for the patient. The patient is supine with knees bent and feet flat on the couch. The chiropractor is at the foot of the table on the side of SIJ restriction. Reassure the patient that no pressure will be exerted on the baby but only on the side of the pelvis and that this is a safe and gentle technique. Contact the ASIS with the thenar eminence and the indifferent hand contacts the patient's posterior thigh on the same side. Lift the hip into slight flexion and apply a drop over the ASIS in an anterior to posterior with slight inferior to superior direction. Repeat a further 1-2 times.

Symphysis pubis mobilization is as follows. The patient is supine with both knees flexed and feet flat on the couch. The chiropractor tests whether resisted hip abduction or adduction causes pain over the symphysis pubis. If adduction is the less painful of the two, the chiropractor places the palms of both hands on the medial knees and asks the patient to push her knees together against mild resistance. The chiropractor then releases their hands. If abduction is the less painful of the two, the chiropractor places the palms of both hands on the lateral knees and asks the patient to push her knees apart against mild resistance. The chiropractor then releases their hands. The author has found that abduction is more often the most painful.

Myofascial techniques should include the round ligament, the long dorsal sacroiliac ligament, sacrotuberous ligament, gluteal muscles and piriformis. The long dorsal sacroiliac ligament has close anatomical relations with the erector spinae muscle, the posterior layer of the thoracolumbar fascia, and a specific part of the sacrotuberous ligament. Functionally, it is an important link between legs, spine, and arms. The ligament is tensed when the sacroiliac joints are counternutated and slackened when nutated. Slackening of the long dorsal sacroiliac ligament can be counterbalanced by both the sacrotuberous ligament and the erector muscle.<sup>17</sup>

#### Treatment of coccydynia

A couple of useful techniques for the chiropractor are the gluteal squeeze and coccygeal pump. For the gluteal squeeze, the patient lays prone and squeezes her buttocks together tightly. The chiropractor resists by pushing outwards with their hands in a cross-bilateral position then suddenly releasing. This can also be given as a home exercise with

the patient using their own hands to resist. The coccygeal pump is done in the same way as the sacral pump but the middle finger of the contact hand lies along the coccyx to encourage flexion and extension.

For correction of coccygeal laterality, contact (with activator or thumb) immediately lateral to the base of the coccyx. The line of drive is lateral and superior. Avoid direct contact with the coccygeal apex as it is exquisitely painful.

### Round ligament syndrome

This is characterised by a sudden, sharp pain in the abdomen and/or groin. It occurs from sit to stand and with hip extension. After the 5th month of pregnancy the round ligament is palpable and is released by holding it as a trigger point. Always check the SIJ's and correct any restrictions.

Other techniques used by the author for pelvic girdle pain include the Webster technique, side-lying position, standing sacral release and orthopedic blocking.

The Webster technique was developed by a chiropractor particularly for the pregnant patient with a breech presentation and to address intrauterine constraint.<sup>18,19</sup> A practice-based study in the USA reported that the Webster technique is 69% effective with the greatest changes observed in frank breech presentations.<sup>20</sup> It is a useful technique but not in isolation. More satisfying results are obtained when it is used in combination with other techniques.

Most pregnant patients find the side-lying position very comfortable as a general stretching technique for the pelvic girdle. The chiropractor stands in front of the patient with legs against the couch at the level of the patient's belly. Contact over the lateral pelvis. Ask the patient to drop the top leg off the bed and support the pelvis to resist any forward roll of the body. Apply gentle pressure in a lateral to medial direction.

The standing sacral release is indicated for the nutated sacrum. The patient stands with both hands against the wall as if they are going to be "frisked". The chiropractor supports the belly with the indifferent hand and slides the heel of the other hand down the sacrum from superior to inferior. If the sacrum is not nutated, the hand slides smoothly down to towards the apex. However, if the hand 'catches' then the sacrum is in pronation. Apply a light pressure in a superior to inferior and posterior to anterior direction until

the hand slides smoothly down the sacrum.

How often should the chiropractor treat a pregnant patient? The author finds that twice a week for three weeks then once a week for two to three weeks works well. It depends on the gestation week on initial consultation and whether they have pain in more than one location. Once they reach 30 weeks, they are seen once or twice a week to maintain optimal function until the birth.

### Conclusion

There is evidence that low back and pelvic girdle pain can be assessed with reliable clinical tests and treated with a combination of manual therapy and specific exercises to reduce pain and disability during pregnancy.

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### Appendix 1:

#### Adapted from the European guidelines for the diagnosis and treatment of pelvic girdle pain.<sup>2</sup>

##### Active straight leg raise test

The patient lies supine with straight legs and the feet 20 cm apart. The test is performed after the instruction: "Try to raise your legs, one after the other, above the couch for 20 cm without bending the knee". The patient is asked to score any feeling of impairment (on both sides separately) on a 6-point scale: not difficult at all = 0; minimally difficult = 1; somewhat difficult = 2; fairly difficult = 3; very difficult = 4; unable to do = 5. The scores on both sides are added so that the sum score can range from 0 to 10.

##### Gaenslen's test

The patient, lying supine, flexes the hip/knee and draws it towards the chest by clasping the flexed knee with both hands. The patient is then shifted to the side of the examination table so that the opposite leg extends over the edge while the other leg remains flexed. The examiner uses this manoeuvre to gently stress both sacroiliac joints simultaneously. The test is positive if the patient experiences pain (either local or referred) on the provoked side.

##### Long dorsal sacroiliac ligament (LDL) test

The patient lies on her side with slight flexion in both hip and knee joints. If the palpation causes pain that persists for more than 5 seconds after removal of the examiner's hand it is recorded as pain. If the pain disappears within 5 seconds it is recorded as tenderness.

##### Modified Trendelenburg's test

The patient stands on one leg and flexes the hip

and knee at 90 degrees. If pain is experienced in the symphysis the test is considered positive.

##### Patrick's Faber test

The patient lies supine: one leg is flexed, abducted, and externally rotated so that the heel rests on the opposite knee. The examiner presses gently on the superior aspect of the tested knee joint. If pain is felt in the sacroiliac joints or in the symphysis the test is considered positive.

##### Posterior pelvic pain provocation test

The test is performed supine and the patient's hip flexed to an angle of 90 degrees on the side to be examined: light manual pressure is applied to the patient's flexed knee along the longitudinal axis of the femur while the pelvis is stabilized by the examiner's other hand resting on the patient's contralateral superior anterior iliac spine. The test is positive when the patient feels a familiar well localized pain deep in the gluteal area on the provoked side.

A similar test is described as the posterior shear or "thigh thrust" test.

##### Symphysis pain palpation test

The patient lies supine. The entire front side of the pubic symphysis is palpated gently. If the palpation causes pain that persists for more than 5 seconds after removal of the examiner's hand, it is recorded as pain. If the pain disappears within 5 seconds it is recorded as tenderness.

# Intercostal Neuralgia during Pregnancy and Chiropractic Care

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## Introduction

Intercostal nerves pass between the internal and external intercostal muscles from the thoracic spine to the anterior side of the body, terminating adjacent to the sternum. Intercostal neuralgia occurs when there is irritation to an intercostal nerve or group of nerves. The pain is often experienced as a burning or tingling sensation along the pathway of the intercostal nerve: between the spine and the anterior side of the body. The pain can be episodic or continuous, can progress to numbness in the area, or refer pain to the chest wall. The cause of intercostal neuralgia is often attributed to a distended abdomen, a rupture of abdominal muscles, and a complication of a post-herpes episode or surgery.<sup>1,2,3</sup> M.L. Rogers, et al wrote an article in the *European Journal of Cardiothoracic Surgery* in 2002 discussing intercostal nerve injuries during thoracotomy. They found that changing the positions of the ribs with a rib retractor created the most significant amount of potential damage to the intercostal nerves.<sup>4</sup>

When intercostal neuralgia occurs during pregnancy, the cause of the pain is the expanding uterus causing the upward movement of the abdominal organs. As the abdominal organs move up and to the sides, the lower ribs need to flare out and the costophrenic angle decreases. The diaphragm rests approximately 4cm above its normal resting place<sup>5,6</sup> and the thoracic circumference increases 10cm<sup>7</sup> by the end of the pregnancy. This flaring out creates a stretch of the intercostal muscles and thereby a compression of the intercostal nerves.

Allopathic treatment of intercostal neuralgia has consisted of neurectomy and implantation of the cut nerve into adjacent muscle or the rib itself,<sup>8</sup> transthoracic sympathectomy of the sympathetic nerves,<sup>9</sup> cryoanalgesia,<sup>10</sup> and epidural analgesia implantation at T8.<sup>11</sup>

Conservative chiropractic care for this condition facilitates appropriate movement of the thoracic spine and

ribs. It will not directly change the position of the uterus or fetus; the abdominal organs will still be pushed up and out by the expanding uterus. However, by achieving optimum movement of the spinal and rib segments, there should be less continuous contraction of the intercostal muscles and the mother should experience less discomfort. At times during the course of treatment, there may need to be external support in the form of an Ace wrap or tension wrap to the area due to the continued stress of the internal organs.

## Case Series

Three women, ranging from primipara to multiparous and from 24 to 34 weeks gestation, presented for chiropractic care for rib pain and were treated with chiropractic adjustments, soft tissue work, and provided with an external support in the form of an Ace wrap. The following is a brief synopsis of their histories, followed by the examination findings and treatment.

Mother A, primipara, presented for care at 33 weeks gestation with a complaint of pain wrapping around the right side of the ribcage to the area superficial to the liver. The pain had been constant for a duration of 2 weeks and was worsening. It was more noticeable while sitting and she was fairly comfortable while lying down and standing. She had not tried warm or cold application to the area. According to the midwife, the fetus was in a vertex, LOA, position.

Mother B, multipara, presented for care of right-sided rib pain at 34 weeks gestation. It had started as intermittent and had become constant 1 week prior to her presentation. The pain was described as burning, especially after sitting for longer than 30 minutes. It was minimal while standing or lying down. The mother stated that she had had a similar occurrence during the two previous pregnancies but that it had started later in the pregnancies. She also stated that she carried each child on her right hip regularly. The fetus was in a vertex, OP, position. No other treatment had been tried before initiating chiropractic care.

Mother C, pregnant with twins, presented at 24 weeks gestation with pain wrapping around bilateral from the

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lower thoracic spine and ending on the antero-lateral aspects. She had tried stretching and yoga; while they were helpful in a general manner, they did not address her pain. She was having difficulty with most activities of daily living and sleeping due to the pain. The obstetrician's plan was to induce labor at 36 weeks gestation if the pain continued. Baby A was in a vertex position, body on the right, and Baby B was in a transverse position, head on the right.

In all 3 scenarios, the obstetrician or midwife involved had been unable to provide relief and had recommended chiropractic care.

### Examination

After reviewing their histories and prenatal care paperwork from their midwives, Mothers A & B had adequate, normal weight gain, normal blood pressure, and normal blood work. Mother C (twin pregnancy) had gained 36 pounds and her blood pressure was within normal limits. None of the mothers were experiencing any extremity swelling and their postural alterations were classic for 3rd term pregnancy: increased lumbar lordosis, increased thoracic kyphosis, rounded shoulders and forward head carriage. All 3 mothers exhibited flaring of the lower ribcage when viewed from the posterior aspect. In all 3 mothers, active range of motion of the thoracolumbar spine was within functional limits due to the size of the pregnant uterus but pain was felt during lateral flexion (right lateral flexion for Mothers A & B, and bilateral flexion for Mother C). A gentle compressive force was applied to the lateral aspects of the lower ribcage and each mother stated that she felt more comfortable with the pressure on than without it. While the manual compression was applied, she was asked to laterally bend to the right and left and pain was decreased by approximately 50%. Also all mothers exhibited a positive Schepelmann's sign which indicated intercostal neuritis.<sup>12</sup> Schepelmann's Sign is elicited by having the person laterally flex to each side with their arms overhead. If there is pain noted on the concavity, it is suggestive of intercostal neuritis.

### Treatment

Since the mothers experienced less pain during the lateral flexion movements, a 3-4 inch tension wrap or Ace wrap was applied. It was wrapped around the lower ribcage, going under the breasts and over the upper abdomen. Slight tension was applied to the wrap and the mother was asked to go through the movements again. If the movements were more comfortable, she was instructed to keep the tension

wrap on. The wrap was to be worn daily, all day, for 3-4 days. After that, the wrap was to be worn for 2-3 hours in the morning and 2-3 hours in the later afternoon for 4-6 days. During this time, chiropractic care and soft tissue work was provided to the restricted regions of the thoracic and rib segments.

With the abdominal swing-away portion of the table released, the moms were able to lie prone comfortably for the treatment. Chiropractic care consisted of manual, diversified adjustments to the mid-thoracic region of the spine while in the prone position; each mom had slightly different subluxations segments but all were in the region of T5-9. The most common subluxation pattern was of left rotation restriction requiring a line of drive correction of posterior to anterior on the right transverse process of the appropriate thoracic vertebra. The associated ribs were gently mobilized with a posterior to anterior and medial to lateral rocking motion approaching the limit of muscle tension. Soft tissue work consisted of moderate pressure along the involved intercostal muscles with the mom in a prone position. As the intercostal muscle relaxed slightly, she then transitioned into a sidelying position, affected side up, so that she could raise her arm overhead while the pressure was applied to the intercostal muscles. Each mom was also given a home exercise of sitting on a vestibular disc and rocking to each side facilitating the lateral flexion in the thoracic region.

### Results

All mothers noted significant improvement in their level of pain. They were able to sit more comfortably throughout the day. Mothers A & B were able to stop wearing the Ace wrap after 8 days, while Mother C needed to wear the tension wrap for 14 days before being able to stop. All 3 mothers did wear it occasionally, briefly, during the rest of their pregnancy when the rib pain returned, often in conjunction with a position change of the fetus.

### Conclusion

Intercostal pain can be present during pregnancy with varying levels of severity. The allopathic options of surgery or medications are not available to these women and often are unnecessary. Some mothers need minimal intervention in the form of chiropractic care because of the mild nature of the pain; others benefit from chiropractic care and external supports. The use of a tension wrap or Ace wrap in conjunction with chiropractic care is an inexpensive solution to a difficult problem. It does not influence the

position of the developing fetus but encourages appropriate joint movement and supports over-utilized muscles. This is another area where chiropractic care can be a potential effective, long-term solution.

The author noted in 2 of these cases and more in her private practice the prevalence of right-sided intercostal pain. The author questions if this may be due to the density of the liver, a right-sided organ, and an inability to accommodate the upward and outward movement of the abdominal organs. It is the author's intention that this limited case series will create a dialogue to design a more comprehensive study of the benefits of chiropractic care and supportive care for the treatment of intercostal neuralgia during pregnancy.

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# Considering Non-Optimal Fetal Positioning and Pelvic Girdle Dysfunction in Pregnancy: Increasing the Available Space

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## ABSTRACT

**Introduction:** The aim of this paper is to examine the concept of Non-Optimal Fetal Positioning in relationship to pelvic dysfunction in pregnancy, drawing from recent publications in both spheres in order to help inform clinical practice.

**Keywords:** fetal positioning, pelvic dysfunction, chiropractic

## Introduction

The term Optimal Fetal Positioning (OFP) first appeared in midwifery literature in 1995 with the work of Jean Sutton and Pauline Scott.<sup>1</sup> This midwife and child-birth educator between them coined the term, OFP, and pioneered their work through international lectures and their seminal text “Understanding and Teaching Optimal Foetal Positioning”. This booklet has been used extensively by midwives and those working in the field of pregnancy and birth, and remains as current in its relevance and application today as when it was first published.

The theory behind OFP is based upon the observation that a mother’s position and movements may influence the way her baby lies in the uterus. The premise followed that the birthing process is influenced by the way an unborn baby aligns itself and then negotiates its way through the maternal pelvis.

## Pelvic Girdle Dysfunction in Pregnancy

Pregnancy related pain in the low back and pelvic area has been the subject of many studies, particularly during the past few decades.<sup>2,3,4</sup> The nomenclature Pelvic Girdle Pain, defined by Vleeming et al (2008), came into being following the publication of the European Commission’s guidelines on the diagnosis and treatment of pelvic girdle pain.<sup>4,5</sup>

The pelvic girdle may be an area of dysfunction with or without pain manifesting. As clinicians, chiropractors will see and examine pregnant women who require help

with structural realignment in order to increase the available space for their baby in utero. Webster, known for his work on the breech position, pioneered the technique of in-utero constraint to assist those women whose fetuses were presenting in a less than optimal position.<sup>6,7,8</sup>

Chiropractors will recognize that their findings of a pregnant woman presenting with non-optimal fetal positioning may identify with those signs of pelvic girdle pain, amongst which are pelvic asymmetry, muscular imbalances, postural influences, delayed or disrupted neuromuscular control/functioning or inhibition.<sup>2,4,9,10</sup>

When considering non-optimal fetal positioning, and the relationship of the fetus to the pelvis, it is possible that pelvic dysfunction is evident, with or without pelvic girdle pain.

## The Evidence

*Optimal Fetal Positioning:* The evidence around OFP has mainly involved studies that examine birth positions and the relationship with Occipital Posterior fetal positioning, where the fetus is lying in a suboptimal position with the fetal back against the maternal spine.<sup>11,12</sup> Much of the midwifery material is recognized as being part of an oral history or in the anecdotal sphere, and further studies are required. There are current websites devoted to natural birth which provide a wealth of practical information by experienced midwives who are helping women achieve optimal fetal positioning and, although not currently evidence based, this information is nonetheless relevant and used in practice to help produce positive, healthy, normal labour and births.<sup>13,14,15</sup>

Sutton and Scott’s “Optimum Fetal Positioning” has drawn criticism for its lack of evidence based research.

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Sutton's own statistics, however, which showed a dramatic reduction in the intervention rate (40% to 10%) in a rural maternity hospital in New Zealand, after the introduction of her OFP ideas when she was Principal midwife, are impressive.<sup>16</sup>

*Pelvic Girdle Dysfunction:* When we look at the research on pelvic girdle dysfunction in pregnancy it is necessary to have a wide field of reference. The chiropractic knowledge base and reported evidence in the literature is still building, however within related fields there is much from which we can learn.<sup>17,18,19</sup>

These related fields encompass those with interests in anatomy, physiology, biomechanics, function and movement, pain management, psychotherapeutics, clinical management and outcomes, obstetrics, midwifery, neurology; the list goes on.<sup>20-27</sup>

As clinicians we need to be informed and to be able to provide the best care we can with the best available evidence used together with clinical understanding built on experience; empirical knowledge. This will provide an inclusive model of care for pregnant women with pelvic girdle pain/dysfunction, using the research available in all its many forms from the clinicians to the anatomists, the functionalists to the psychotherapists.

### OFP/PGD: Theories

While the way a baby lies in utero can make it hard for it to move through the pelvis, the actual pelvic position needs considering. Midwives and childbirth educators rightly emphasize and encourage postural and body movement to facilitate optimal pelvic positioning, such as making sure the seated posture is one that encourages an anterior tilt to the pelvis and thus avoiding soft chairs and sofas, adjusting posture in car seats and avoiding 'bucket seats', such as sports car seats.<sup>1,13,14,15</sup>

The use of specific chairs and rockers are advocated to help develop and maintain anteriority of the pelvis and therefore give as much room as possible for the fetal head to sit comfortably and eventually engage into the pelvis. During labor these positions are re-emphasized, along with positions such as 'all fours' or 'hands and knees' to encourage the fetus to lie in an anterior position.<sup>1,16</sup>

As chiropractors we have skills that can help in facilitating a healthy pregnancy, reduce pain and possibly influence the birth outcome, as various authors report.<sup>28-31</sup>

There is still much to be done regarding data collection and published research in this field.

The available research in the allied fields provides interesting theories in the arena of both pelvic girdle pain and pelvic alignment.

Force and form closure for instance is highly relevant when examining pelvic alignment and symmetry.<sup>22,23</sup> Form closure describes the sacrum fitting into the iliac bones (the sacroiliac joint), and force closure as the increasing compression of the ligaments, muscle and fascia at the point of loading in movement. These dual mechanisms ensure both stability and functional movement. Dysfunction in either of these mechanisms can result in pain and/or dysfunction which may have a deleterious effect on the capacity of the pelvis to function efficiently, and consequently have an effect on the available space in the pelvis for the fetus to engage and negotiate during birth. For detailed description of the mechanics of form and force closure see Vleeming.<sup>22,23,24</sup> Research by Damon et al (2002) shows how sacroiliac asymmetry is a frequent feature in pelvic girdle pain.<sup>10</sup> Again, this effect creates an altered pelvic inlet and outlet and may contribute to reducing the available space to the fetus.

The influence of the sacrum and iliac bones in birth is well-known by midwives, and Jean Sutton (2001) attributes the Rhomboid of Michaelis, (the diamond shaped sacral triangle bordered by boundaries of both posterior superior iliac spines, the spinous process of L4 and the anal cleft) as a defining area of movement when the laboring woman is able to 'open her back' to allow the pelvic outlet to further open and increase the available space for the fetus.<sup>16</sup>

When viewed alongside the knowledge of the functional anatomy of the pelvis, nutation and counternutation of the sacrum, we can see how the influence of good mechanics can assist or hinder the birthing process.<sup>32,33</sup> The sacral position of nutation is assisted by the posterior rotation of the iliac bones and occurs bilaterally. In counternutation a corresponding anterior rotation, bilaterally of the iliac bones, occur. Lee and Vleeming (2007) describe the involvement of the long dorsal sacroiliac ligament becoming taut when the sacrum is counternutated, and the corresponding ligaments (sacro-tuberous and sacro-spinous) as less tensed.<sup>34</sup>

As chiropractors we may influence this process by our work on the biomechanics of pelvic function with particular regard to the sacro-tuberous and long dorsal

ligament. These structures provide access points to assess the flexibility or tension within the sacral/iliac movement. Force and form closure is the theoretical concept underlying our clinical approach to examination and treatment of the pelvis and related structures and tissues.

To increase the available space to the fetus, the requirements of good pelvic alignment should encompass not only pelvic symmetry and the ability for normal motion and function of the sacrum in relation to the ilia, but the relaxation/tension relationship within not only the soft tissues of the pelvis, but also those of the abdominal and uterine myofascial.<sup>8,10</sup>

There is a link between the work of Jean Sutton (1995, 2001) in her observation of pelvic anteriority for normal function in the birthing process, Webster's in-utero constraint, and the studies of Vleeming et al (2007), with their concepts of form and force closure, nutation and counternutation, and Damon et al (2002) and sacroiliac joint asymmetry.<sup>1,6-8,10,33</sup>

Nutation and counternutation of the sacrum govern the ability of the pelvis to move to allow the fetus through and so form part of the normal birthing process. This key component of normal birthing movement is something that chiropractors can indirectly help and translates into clinical practice.

## Treatment Options

Women during their pregnancy may present with PGP or for OFP work, but essentially the same structure is being examined and treated. As midwives have known for years how to influence birth by helping women to find appropriate positions to assist the movement of the baby through the pelvis, so chiropractors have been observing and treating low back and pelvic dysfunction. Gradually the studies are providing us with the evidence to describe in detail how the anatomy and physiology govern function.<sup>9,10,22,23,25,33</sup>

Treating women in pregnancy is a part of the whole. Techniques are adapted and revised in the light of the pregnant body and utilized with effect. Much of the postural work described by Sutton and Scott to facilitate birth can be used by chiropractors to guide women with self-help techniques as an integral part of chiropractic care.<sup>1,16</sup>

As function is regained a combined approach, with the woman using posture and positioning work, in addition to chiropractic treatment, will help to either restore or retain

a change in the biomechanics of the body.

Chiropractors provide assessment, which starts with observation, careful case history to identify low back and pelvic listings, muscle imbalance and neuromuscular dysfunction. Chiropractic treatment can help correct these mal-alignments. As the pelvic shape is restored, so is the environment for the fetus, and as chiropractors who treat pregnant women, we often will have observed an engagement of the fetus following treatment, and the woman reporting a change in the baby's position at the next visit.<sup>30</sup>

Chiropractic offers a diversity of treatment approaches and techniques and the purpose of this paper is not to instruct on technique but rather to highlight some of the problematic areas that may be found on examination with relation to pelvic dysfunction and fetal positioning.

Careful attention to the woman's story starts with listening and observing. Postural patterns are important and give necessary clues for diagnosis. Posture can be such an influence on function that Vleeming (2004) observed:

*"Influence the behaviour of patients and you influence the biomechanics".<sup>35</sup>*

It is not unusual to see pregnant women presenting with pronation of the feet, a 'tucked tail'/pelvis (posterior tilt), knees locked into extension, thoracic kyphosis, and a forward head carriage. This is likely to be a more pronounced version of their non-pregnant form. On examination there may well be tension within the posterior pelvic floor and weakness of the abdominal musculature. The sacrum may be 'fixed' in a position of nutation or counternutation, either bilaterally or with an asymmetry/pelvic obliquity of one sacroiliac joint.<sup>10</sup>

As well as postural adaptations and pain patterns, it is useful to note any previous trauma, particularly to the lower limbs as this may have ascending consequences on the pelvis and related structures. Treating the biomechanics of the lower limbs, and indeed the cranium, will also influence both the outcome to the mother and also the fetus with regard to optimal fetal space and positioning.

Key areas for examination are sacral function and function of the sacroiliac joints and associated ligaments, such as the long dorsal and sacro-tuberous. As well as acute subluxation complexes, there may be chronic restriction patterns or muscle imbalances involving the pelvic floor muscles, rectus abdominus, psoas, piriformis, gluteals and adductors amongst others. Trigger points are often elicited

in these muscles and it is wise not to overlook the pyramidalis muscle which can be a source of pain, especially into the pubic symphyseal area, for some women.<sup>36</sup> A thorough investigation of the soft tissues is required as well as a biomechanical survey into structure and function.

This work is currently under-researched and reported, but nonetheless, chiropractors treating women during pregnancy will be seeing these patterns in practice every day and using their sound technique of chiropractic adjustment and adjunctive therapy to help women in their care.

As the structures rebalance, the fetus is given the space to adopt the position he or she wants. This is most likely a cephalic presentation and an anterior position, but even if posterior, the fetus should then have the available space in which to rotate, and thus not be forced into a maladapted position that may inhibit normal birth.

### Self-help Techniques

Chiropractors can and would do well to inform the pregnant women in their care of self-help techniques, so that they are able to practice during pregnancy and also in early labor.<sup>1,16</sup>

These techniques can assist in the correct positioning and functioning of the biomechanical structure and allow postural and muscular imbalances to correct. Those involved in treating and teaching women during pregnancy will most likely be drawing on a wealth of experience, both empirical and from the available literature. It is useful to look both within and outside the chiropractic knowledge base and use a wide source of materials to provide an individualized program of care for each woman during her pregnancy. The work of Cecile Rost (2007), Liz Koch (1997), Eric Franklin (2002), Esther Gokhale (2008) and Wise and Anderson (2010) among others, are useful to help women to help themselves during their pregnancy, both for the relief of pain or discomfort and also to provide the best position possible for their fetus in utero. These aforementioned texts, as an adjunct to the chiropractic and pregnancy literature, are hugely informative in helping with postural and structural self-correction.<sup>21,26,27,37,38</sup>

With regard to OFP, encouraging women to work with their bodies particularly when the fetus is in an active state is beneficial as it encourages further movement of an already moving being. Using Sutton,<sup>1,16</sup> and with judicious use of the birthing websites, exercises directly related to pelvic and uterine alignment work can be given to assist in OFP.

As chiropractors we have knowledge of the individual's anatomy and function and can therefore give appropriate rather than generic advice to that individual. For example, if the posterior pelvic floor is hypertonic then this person needs to be able to access techniques that will help release these structures and restore normal function, rather than tighten the area.

Women with a laxity of the abdominal support system may require more in the way of contraction exercises to help increase muscle tone. Often there is tension within the posterior pelvic floor and a lack of tone in the anterior pelvic floor and abdominal musculature. This is where detailed individualized examination and treatment program is essential rather than advocating one mainstream exercise for all.

There are specific movements that can assist in releasing the pelvic floor and encourage movement of the ischial tuberosities, which will help in the second stage of labor. Franklin (2002), while not writing specifically for pregnancy, covers some excellent pelvic movements that can be used during pregnancy to assist with OFP and the mechanism of birth. Allowing space at the inlet and outlet of the pelvis, depending on the stage of labour, is a useful self-help technique and is easy to teach. Use 'all fours' rocking movement to drop the symphysis and open the inlet, a standing rolling of the feet to move the ischial tuberosities and 'open' the outlet. This will also aid in the releasing of the pelvic ligaments and facilitate nutation of the sacrum.<sup>38</sup>

The technique of performing exercise is as important as the exercise chosen, and time spent in a detailed analysis of body patterns and muscle imbalance will aid recovery.

### Mind/Body

During pregnancy the psychological as well as the physical aspects are important, not least because pregnancy is usually a time of the expectation of good health ('blossoming'), and not of illness or compromise, to the mother or fetus. Many women will respond well when the physical component is removed/resolved but we must also be aware of complex patterns that may be an influencing or inhibiting factor in well being and progress. Addressing these fears is an important aspect of the whole person health care. Much has recently been written about the biopsychosocial model; never has this terminology been more appropriate than with pregnancy.

## Summary

When pregnant women present to a chiropractor it is often with pain, and usually in the low back or pelvic girdle. Pelvic girdle pain/dysfunction and fetal positioning are often inextricably interlinked and the diligent practitioner will seek to help with both. It is possible that non-optimal fetal positioning may be a result of pelvic dysfunction or pelvic obliquity, with or without pain.

Unraveling the pain/dysfunction goes hand in glove with providing a more optimal space in the pelvis for the fetus. Many chiropractors and physical therapists will be doing this, even in a subconscious way.

Patients may present with the symptoms and signs of pelvic girdle pain. They are not just a condition of pregnancy alone, but when pregnant these symptoms take on a more problematic and distressing significance as the toll of pregnancy and the prospect of birthing appear.

There are many insightful texts and studies that can help the practitioner build up a knowledge bank to apply in clinical practice. Ultimately it is by experience, daily attention to detail and the actual practice, as in the “art” of chiropractic, that will bring rewards both to the patient and the chiropractor as progress is made and function is restored. By helping to increase the available space to the fetus, chiropractors are involved in assisting the birth process and with influencing the ongoing health of the mother and her newborn.

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# Gestational Diabetes Mellitus

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## ABSTRACT

**Introduction:** Type 2 diabetes and gestational diabetes mellitus are on the rise in the United States. For the most part, both are treatable and preventable with the adoption of healthy lifestyle choices. This paper provides an overview of diabetes and gestational diabetes mellitus, including their classifications, diagnosis, and management. Also discussed are adverse pregnancy outcomes associated with gestational diabetes mellitus and post-partum recommendations.

**Key Words:** diabetes, diabetes management, gestational diabetes, gestational diabetes mellitus, hyperglycemia, adverse affects of hyperglycemia on pregnancy.

## Overview of Diabetes

Diabetes is a chronic dysfunction of metabolism characterized by hyperglycemia. Hyperglycemia is the result of impaired insulin secretion, insulin resistance, or a combination of both.<sup>1</sup> The long term hyperglycemia of diabetes is associated with damage, dysfunction, and the eventual failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Symptoms of marked hyperglycemia include polyuria, polydipsia, weight loss, blurred vision, and susceptibility to infections.

## Classification

The majority of diabetes cases fall into two broad categories, those being type 1 and type 2 diabetes. Type 1, which accounts for 5-10%<sup>1</sup> of those with diabetes, usually develops during childhood or adolescence and results from beta cell destruction in the islets of the pancreas. It is believed to be autoimmune in origin and usually results in absolute deficiency of insulin secretion.<sup>1</sup> Treatment consists of pharmacological insulin replacement. Type 2 diabetes, also known as diabetes mellitus, is much more prevalent and accounts for 90-95%<sup>1</sup> of those with diabetes. It is caused by tissue resistance to insulin action and inadequate compensatory insulin secretion.<sup>2</sup> Once defined as adult onset diabetes, it is now being seen in childhood and adolescents. Type 2 diabetes is associated with obesity and a sedentary lifestyle, and treatment ranges from weight loss with diet and exercise modifications to the use of drug therapy to reduce blood glucose.

## Diagnosis

Diagnosis of diabetes is made by measuring plasma glucose levels and applying a set criteria of normal ranges.

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It can be measured as fasting plasma glucose (FPG) or with an oral glucose tolerance test (OGTT) whereby plasma glucose is evaluated 2 hours after consuming 75 grams of carbohydrate. Specified lab values are indicative of normal fasting plasma glucose, normal glucose tolerance, impaired fasting glucose (IFG), impaired glucose tolerance (IGT), and diabetes. IFG and/or IGT are considered pre-diabetes and should be taken seriously. A test result diagnostic of pre-diabetes or diabetes should be repeated for confirmation except when the diagnosis is clear on clinical grounds, such as a patient with classic symptoms of hyperglycemia or hyperglycemic crisis. The American Diabetes Association recognizes the following diagnostic criteria listed in Table 1.<sup>2</sup>

Another lab test that is helpful in the diagnosis and management of diabetes is called hemoglobin A1c (HgA1c). This test measures the amount of glucose bound to hemoglobin in a specified amount of blood. Since the glucose stays attached to hemoglobin for the life span of the red blood cell, which is normally 100-120 days, the level of HgA1c reflects the average blood glucose concentration over the past 3-4 months. Therefore, it is a useful indicator of how well the blood glucose concentration has been controlled in the recent past and may be used to monitor the effects of weight loss, diet, exercise, and drug therapy on blood glucose. The American Diabetes Association recognizes HgA1c values below 5.7% to be normal, 5.7-6.4% as pre-diabetes, and 6.5% and above as diabetes.<sup>2</sup>

## Glycemic Control

Glycemic control is essential to the management of diabetes. An observational study done by the United Kingdom Prospective Diabetes Study Group reported that each 1% reduction in HgA1c was associated with a risk reduction of 21% for any disease entity related to diabetes, 21% for deaths related to diabetes, 14% for myocardial infarction, and 37% for microvascular complications.<sup>3</sup> In addition,

several large studies have been conducted<sup>4,5,6,7</sup> that show improved glycemic control is associated with significantly decreased rates of microvascular and neuropathic complications. In the above mentioned studies, patients were divided into two groups. One group received standard diabetes care, while the other group received intensive management to reduce HgA1c levels to normal. Both groups showed reduction of diabetes complications with the greatest reduction being the intensive management group. However, this group was at greater risk of severe hypoglycemic events and weight gain due to the amount of drug therapy utilized to obtain normoglycemia. Another study, the Action to Control Cardiovascular Risk in Diabetes (ACCORD) trial, was halted due to the finding of an increased rate of mortality in the high risk patients of the intensive management group.<sup>8</sup> It has therefore been suggested that a HgA1c target of 7% may be the safest for the majority of the diabetic population.<sup>2</sup>

### Weight Loss

Weight loss is an important goal for overweight individuals with or without diabetes because it improves glycemic control, reduces risk of cardiovascular disease, and can prevent the development of type 2 diabetes in those that are pre-diabetic.<sup>9,10</sup> Weight loss of just 5% of body weight has been shown to improve insulin action, decrease fasting blood glucose concentrations, and to reduce the need for diabetes related drug therapy.<sup>10</sup> In addition, there is a direct relationship between the amount of weight lost and the improvement in fasting blood glucose.<sup>10</sup>

### Nutrition Therapy

Nutrition therapy is a component of diabetes prevention and management that focuses on meal planning and food exchanges. It is defined as a carbohydrate-controlled meal plan that promotes adequate nutrition with appropriate weight management, normoglycemia, and the absence of ketosis.<sup>11</sup> While all food groups and nutrients are important, the carbohydrate portion of the diabetic food plan is a key strategy in achieving glycemic control. The 2002 Dietary Reference Intake Report set a minimum level of 130 grams of carbohydrate per day and is based on providing adequate glucose as the required fuel for the central nervous system without reliance on glucose production from ingested protein or fat.<sup>2,11</sup> Carbohydrate consumed should be distributed fairly evenly throughout the day to avoid large shifts in glucose concentration. In addition, carbohydrate choices that have a low glycemic index (GI) will have less of an impact on postprandial blood glucose than foods with a high GI.<sup>11</sup> Because of the complexity of nutritional

**Table 1.**  
**Diagnostic Criteria for Diabetes**

	Fasting Plasma Glucose (mg/dL)	2 hours after eating OR 2 hour-75g OGTT
<b>Normal</b>	<b>&lt;100</b>	<b>&lt;140</b>
<b>IFG</b>	<b>100-125</b>	
<b>IGT</b>		<b>140-199</b>
<b>IFG and IGT</b>	<b>100-125</b>	<b>140-199</b>
<b>Diabetes</b>	<b>≥126</b>	<b>≥200</b>

Source: American Diabetes Association

issues, the literature recommends that a registered dietitian experienced in diabetes management be the individual to provide nutrition therapy and that dietary guidance be tailored to each person.<sup>2</sup>

### Physical Activity

Physical activity has been shown to improve blood glucose control, improve tissue insulin sensitivity, reduce cardiovascular risk factors, contribute to weight control, and improve well-being.<sup>2,10,11</sup> The U.S. Department of Health and Human Services' Physical Activity Guidelines for Americans<sup>12</sup> recommends that adults over the age of 18 years engage in a minimum of 150 minutes per week of moderate intensity (50-70% of maximum heart rate) or 75 minutes per week of vigorous (>70% of maximum heart rate) aerobic activity or an equivalent combination of the two. In addition, the guidelines suggest that adults do muscle strengthening activities that involve all major muscle groups at least two days per week.

A meta-analysis of the effects of exercise on glycemic control<sup>13</sup> was conducted and included data from 14 controlled trials. This analysis showed that an average of 3.4 aerobic exercise sessions per week for an average of 49 minutes per session caused a reduction in the HgA1c by an average of .66% as compared to the control groups. Another study conducted by the Diabetes Prevention Program Research Group<sup>14</sup> showed that lifestyle intervention that included 150 minutes of physical activity per week had a beneficial effect on glycemia in people with pre-diabetes. It therefore seems reasonable to recommend that people with diabetes do their best to follow the physical activity guidelines for the general population.

Also worthy of noting is that each session of aerobic exercise can have a positive effect on tissue insulin sensitiv-

**Table 2.**  
**Correlation of HgAlc**  
**with Average Plasma Glucose**

HgAlc %	Mean Plasma Glucose
6	126
7	154
8	183
9	212
10	240
11	269
12	298

Source: American Diabetes Association

ity for 24-72 hours, with length of time depending on the duration and intensity of the activity. It is therefore recommended that physical activity be distributed throughout the week with no more than 2 consecutive days without exercise.<sup>15</sup>

On a precautionary note, before beginning a program of physical activity, people with diabetes should be assessed for conditions that might contraindicate certain types of exercise or predispose them to injury, such as uncontrolled hypertension, severe autonomic neuropathy, severe peripheral neuropathy or history of foot lesions, and unstable proliferative retinopathy. Additionally, during times when ketosis is present, exercise should be avoided all-together.<sup>15</sup>

### Glucose Monitoring

Two primary techniques are available for health care providers and patients to evaluate the effectiveness of their diabetes management plan on glycemic control: patient self-monitoring of blood glucose (SMBG) or interstitial glucose and HgA1c.<sup>2</sup> Frequency and timing of SMBG should be determined by the needs and goals of the patient. Those being treated with insulin will need to monitor their blood glucose more closely to avoid asymptomatic hypo- and hyperglycemia. This may include SMBG 3 or more times per day and is generally done 1 or 2 hours postprandial. For patients that are not on insulin, SMBG may be done less frequently.

Interstitial glucose can be monitored by a continuous glucose monitoring (CGM) device that has sensors and

alarms for hypo- and hyperglycemic episodes. These are usually worn by some diabetic patients utilizing insulin as part of their diabetes management. Studies have suggested that CGM reduces the time spent in hypo- and hyperglycemic ranges and may contribute to improved glycemic control.<sup>2</sup>

HgA1c has been discussed previously in this paper and the American Diabetes Association recommends that it be tested two times per year in patients who are meeting treatment goals and have stable glycemic control, and quarterly in patients whose management has changed or who are not meeting glycemic goals.<sup>2</sup> As stated previously, a HgA1c target of 7% appears to be the safest for the majority of the diabetic population.<sup>2</sup> However, target goals should be individualized depending on risk factors and agreed upon by doctor and patient. Table 2 represents the correlation of HgA1c with average plasma glucose. These estimates are based on the A1c-Derived Average Glucose (ADAG) Study Group data utilizing 507 adults with type 1, type 2, and no diabetes. Approximately 2,700 glucose measurements over 3 months followed by a HgAlc measurement at the end of that time period were collected on each test subject.<sup>16</sup>

### Gestational Diabetes Mellitus

Diabetes is a common medical complication of pregnancy and can be divided into two broad categories: pre-existing diabetes (type 1 and type 2) and gestational diabetes mellitus (GDM).<sup>17</sup> GDM is defined as glucose intolerance with onset or first recognition during pregnancy.<sup>18</sup> It affects up to 14% of the pregnant population with prevalence varying significantly depending on the ethnic mix of the population studied.<sup>17</sup> Of concern is that the incidence of GDM is on the rise in the U.S. and at a rate parallel to the increase in type 2 diabetes.<sup>19</sup> Women at greatest risk of developing GDM are those who are obese, older than 25 years, have a previous history of abnormal glucose metabolism or poor obstetrical outcome, have first-degree relatives with diabetes, are members of ethnic groups (Hispanic, American Indian, Asian, or African-American) with high prevalence of diabetes, polycystic ovary syndrome, or hypertension.<sup>18,19,20</sup>

### Pathophysiology

During pregnancy, placental hormones, growth factors, and cytokines cause a progressive increase in insulin resistance.<sup>21</sup> Normoglycemia is maintained by a compensatory increase in insulin secretion. The primary component that results in the development of GDM appears to be a failure to compensate with increased insulin secretion.<sup>19,22</sup>

Because insulin resistance of pregnancy is greatest in the third trimester, GDM tends to develop going into this time period. Therefore, screening for GDM usually occurs at 24-28 weeks gestation and is diagnosed with an oral glucose tolerance test. This is accomplished by performing a 50-gram, one-hour glucose challenge. A normal plasma glucose concentration for this test is 130 mg/dL or below<sup>23</sup> with higher values being indicative of GDM.

### Adverse Pregnancy Outcomes Associated with Diabetes

The major significance of diabetes during pregnancy is that it is associated with adverse pregnancy outcomes. Women with poorly controlled prediabetes or diabetes around the time of conception and in the first trimester of pregnancy when organogenesis is occurring have an increased risk of early miscarriage and fetal malformations.<sup>24,25</sup> When HgA1c is mildly raised the rate of spontaneous miscarriages and fetal malformations appear to be low, however this rate increases with poor glycemic control.<sup>24</sup> This has led to a recommendation by the International Diabetes Federation<sup>24</sup> that women with an elevated HgA1c value above 8% be discouraged from becoming pregnant until their glycemic control is improved.

One of the most common complications of GDM is macrosomia. It is defined as a fetus that is large for gestational age or an infant with a birth weight that is greater than the 90th percentile for gestational age and sex.<sup>18</sup> When a fetus is exposed to high levels of maternal glucose after 12 weeks of gestation,<sup>21</sup> it responds by producing higher levels of insulin. Insulin has many growth hormone properties<sup>25</sup> and the result is fetal macrosomia. Excessive fetal growth is associated with birth by cesarean section, neonatal hypoglycemia due to hyperinsulinemia, and increased risk of birth trauma such as brachial plexus injury or clavicle fracture resulting from shoulder dystocia.<sup>19,23,25</sup> Should an obstetrician choose to deliver an infant early to avoid excessive size at delivery, complications related to prematurity, such as hyperbilirubinemia, hypocalcemia, and respiratory distress may result.<sup>18</sup> In addition, infants with macrosomia due to the exposure of intrauterine hyperglycemia are more likely to develop obesity and glucose intolerance later in life.<sup>19,21,26</sup> This is of concern as it creates an intergenerational effect, with GDM promoting diabetes in the offspring, who then perpetuate the cycle when the offspring herself becomes pregnant and develops GDM.<sup>19</sup>

Fetal ultrasound measurements can be used as a predictor for infants at low and high risk of macrosomia. Third trimester fetal abdominal circumference measurements

less than the 90th percentile for gestational age have been associated with a risk of birth macrosomia of less than 5% in full-term diet-controlled GDM pregnancies.<sup>27</sup> This information can be used to modify treatment plans in regards to relaxing glycemic targets in those at low risk and intensifying therapy in those at high risk. It also allows clinicians to make better choices regarding timing and mode of delivery, as well as to prepare for emergencies.

Maternal complications of hyperglycemia include those associated with diabetes as well as those associated with a macrosomic fetus. The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) Study showed a continuous linear association between the results of glucose tolerance tests and the rates of pre-eclampsia.<sup>23,28</sup> In addition, studies show<sup>22</sup> that after GDM, 35-60% of women develop type 2 diabetes within 10 years. Complications due to a macrosomic fetus include prolonged labor, labor enhanced with oxytocin, cesarean delivery, post-partum hemorrhage, infection, third and fourth degree lacerations, thromboembolic events, and anesthetic accidents.<sup>29</sup>

### Treatment of GDM

The treatment goals for GDM are to achieve normoglycemia and reduce adverse pregnancy outcomes by employing similar treatment strategies as for diabetics who are not pregnant. Strategies include weight management, nutrition therapy, physical activity, SMBG, and drug therapy, but with a few modifications.

### Weight Management

In a normal pregnancy, anticipated weight gain varies according to the pre-pregnancy weight. The Institute of Medicine (IOM) weight gain guidelines<sup>30</sup> suggest a small gain of 15 pounds for obese women and a larger weight gain of up to 40 pounds for women who are underweight at the onset of pregnancy. However, there are no evidence based guidelines regarding weight gain for women with GDM. It is therefore recommended that the pregravid body mass index (BMI) be assessed with individual weight gain targets being set at the lower range of IOM recommendations according to the BMI group.<sup>21</sup> Weight loss diets are not generally recommended during pregnancy.

### Nutrition Therapy

Nutrition therapy is the cornerstone of treatment of GDM. As such, the goals of nutrition therapy are to design a carbohydrate-controlled meal plan that achieves normoglycemia, provides the required nutrients for normal fetal growth, and does not induce weight loss, excessive weight

gain, or ketosis. As stated previously, all food groups and nutrients are important, but the carbohydrate portion of the diabetic food plan is a key strategy in achieving glycemic control. The 2002 Dietary Reference Intake Report set a minimum level of 130 grams of carbohydrate per day for non-pregnant women and 175 grams per day during pregnancy.<sup>11</sup> To minimize the impact of carbohydrates on blood glucose levels, consumption should be distributed fairly evenly throughout the day and carbohydrate choices should be those that have a low glycemic index. In addition, calorie restriction should be approached with caution as severe restriction (less than 1,500 calorie per day) may cause ketonuria and/or ketonemia which has been associated with reduced psychomotor development and IQ at three to nine years of age in the offspring of mothers with GDM.<sup>11,31</sup> Due to the complexity of nutritional issues, the literature recommends that a registered dietitian experienced in diabetes management be the individual to provide nutrition therapy.

### Physical Activity

The benefits of physical activity during pregnancy resemble those of the general population and include improved glucose control, improved tissue insulin sensitivity, reduced cardiovascular risk factors, decreased weight gain, reduction of fetal adiposity, better tolerance of labor, and an improved sense of well-being. A minimum of 30 minutes of light to moderate intensity physical activity per day is recommended when there are no medical or obstetrical contraindications to exercise<sup>19,21,22</sup> Preferable activities are those that avoid excessive abdominal muscle contraction and minimize the risk of falling. Women who have been physically active before pregnancy are encouraged to continue to do so, but the extent and type of activity may need to be modified as the pregnancy progresses. Women who have been sedentary are encouraged to walk briskly or do arm exercises in a chair for at least 10 minutes three times per day to achieve the 30 minutes per day goal.

The American College of Obstetrics and Gynecology and the Society of Obstetricians and Gynecologists of Canada have outlined the contraindications to exercise during pregnancy. Both organizations recommend that women who experience dyspnea, shortness of breath, chest pain, dizziness, headache, calf pain or swelling, vaginal bleeding, leakage of amniotic fluid, or painful uterine contractions should stop exercising and seek medical attention.<sup>21</sup> It is also suggested that the best time to exercise is after meals to avoid exercise induced hypoglycemia and that pregnant women should drink plenty of fluids before, during, and after exercise to avoid dehydration.

### Glucose Monitoring

SMBG is an important component of therapy for GDM. Frequent SMBG allows the patient to evaluate her response to therapy and assess whether glycemic targets are being achieved. In studies where both pre- and postprandial glucose were measured, postprandial glucose values were found to be the best predictor of fetal macrosomia and adverse pregnancy outcomes.<sup>11,19,21,24,31</sup> It is therefore suggested that women with GDM perform SMBG at least four times per day; fasting and one hour after the beginning of each meal.<sup>19,21,24</sup> Women using insulin as part of their therapy may need to monitor their blood glucose more frequently. The National Institute for Health and Clinical Excellence (NICE) recommendations for SMBG in pregnancy are to have a fasting glucose of 63-106 mg/dL and a 1 hour postprandial glucose less than 140 mg/dL.<sup>24</sup>

### Drug Therapy

The majority of women diagnosed with GDM can be managed with lifestyle modifications in regards to eating habits and physical activity. Those who continue to have difficulty meeting glycemic goals have traditionally been advised to begin insulin therapy. Insulin has been used in pregnancy since 1922 and is considered safe to use as clinical experience is vast and without problems.<sup>24</sup> However, availability of clinical trial evidence is limited.<sup>24</sup>

Insulin is expensive, relatively difficult to administer, and difficult to store if the circumstances are less than ideal. This has led to an interest in oral diabetic medications to treat GDM. The most common agents being studied are glyburide and metformin, and randomized trials show promise with no demonstration of short term harm to the pregnancy.<sup>19</sup> Some authors have reported that glyburide has replaced insulin as first line pharmacological treatment of GDM in many practices,<sup>19</sup> however these medications are not currently licensed for this purpose.<sup>24</sup> Use of oral diabetic medications during pregnancy remains controversial due to concerns about teratogenicity, prolonged fetal hypoglycemia, increased insulin resistance as the pregnancy continues making it difficult to meet glycemic targets, and long term effects on the mother and child.<sup>19,21,24,25,31</sup>

### Evidence that Treatment Improves Pregnancy Outcomes

Maternal hyperglycemia is associated with adverse pregnancy outcomes and studies show that treatment of even mild forms of hyperglycemia is associated with a reduction of GDM complications. The Australian Carbo-

hydrate Intolerance Study (ACHOIS)<sup>26</sup> was conducted utilizing 1000 pregnant women with mild GDM. 490 women were assigned to an intervention group that received dietary advice, instructions on SMBG, a request to SMBG 4 times per day, and insulin therapy. The remaining 510 women received standard pregnancy care consistent with care in which screening for GDM is not routine. This clinical trial showed that treatment of pregnant women with GDM utilizing dietary advice, SMBG, and insulin therapy reduced the rate of serious perinatal outcomes (defined as death, shoulder dystocia, bone fracture, and nerve palsy) from 4% to 1%.

Another similarly designed study involving a multi-center randomized trial of treatment for mild gestational diabetes<sup>23</sup> included 1889 women. This study demonstrated a reduction in macrosomia, neonatal fat mass, shoulder dystocia, birth by cesarean section, maternal hypertension, and pre-eclampsia when GDM was identified and treated.

The Standards of Medical Care in Diabetes-2010 state that changes to the OGTT are being discussed with hopes of implementing a 75-gram OGTT at 24-28 weeks of gestation with new diagnostic cut points for fasting, 1 hour, and 2 hour plasma glucose measurements. This change will significantly increase the prevalence of GDM but is being recommended due to the mounting evidence that treating even mild GDM reduces adverse pregnancy outcomes for both mother and baby.<sup>2</sup>

### Post-partum Management of GDM

Resolution of GDM tends to occur late in pregnancy as the placenta degenerates<sup>24</sup> with the majority of women returning to normal glucose tolerance immediately after delivery.<sup>22</sup> However, due to being overweight or obese, a significant number will remain diabetic or continue to have impaired glucose tolerance. Persistent hyperglycemia can be determined by measuring fasting or random capillary blood glucose levels before discharge from the hospital. Elevated values indicating diabetes should be confirmed with laboratory measurements of fasting plasma glucose or postprandial glucose.

Women who have had GDM that do not have diabetes immediately postpartum should have an OGTT at 6-12 weeks after delivery.<sup>22</sup> An OGTT is the preferred diagnostic test as a fasting plasma glucose will not sufficiently identify all women who have IGT or type 2 diabetes. Data presented at the Fifth International Workshop-Conference on GDM in 2005<sup>22</sup> indicated that during postpartum, only 34% of women with IGT or type 2 diabetes had impaired fasting glucose.

Intermediate and long-term follow-up after a GDM pregnancy depends on future pregnancy plans. If additional pregnancies are anticipated, an OGTT should be repeated prior to conception or during the first trimester. If no further pregnancies are likely, women who are at high risk of developing diabetes (ethnicity, obesity, family history) should have an annual OGTT. Those at low risk should have a fasting glucose test every 2-3 years.<sup>24</sup>

### Breastfeeding

Breastfeeding following a pregnancy with GDM is considered safe and mothers should be encouraged to breastfeed to the greatest extent possible during the first year of life unless contraindications exist. However, persistent hyperglycemia can influence the composition of breast milk giving it a higher glucose and energy content than that of non-diabetic mothers.<sup>24</sup> This has the potential to lead to excess weight issues in affected children. It is therefore advisable that nursing mothers maintain good glycemic control during the breastfeeding period.

In women with ongoing hyperglycemia that need diabetes medication, all types of insulin are considered safe to use while breastfeeding.<sup>22</sup> In addition, small studies on the use of glyburide, glipizide, and metformin have been conducted and show promise. In a recent non-randomized controlled study on the use of glyburide and glipizide, neither drug was detected in the breast milk and blood glucose was normal in the infants studied.<sup>32,33</sup> Studies conducted on metformin suggest that it is excreted in the breast milk but in amounts that seem to be clinically insignificant<sup>33,34,35,36</sup> with no reported adverse effects on the blood glucose of nursing infants. Larger studies on the use of oral diabetes medications during lactation would be beneficial in confirming their safety.

### Chiropractic and Diabetes

A review of the literature regarding chiropractic and diabetes was conducted by searching the Index to Chiropractic Literature (ICL), Manual and Alternative and Natural Therapy Index System (MANTIS), and Ebscohost's databases Alt-Health Watch, AMED, CINAHL, and Academic Search Premier. The following keywords and subject headings were input in various combinations: chiropractic, diabetes, diabetes mellitus, hyperglycemia, diabetes mellitus type 2, gestational diabetes, gestational diabetes mellitus, diabetes and pregnancy. A very limited number of articles relating to the subject of chiropractic and diabetes were identified by the search and most were on the topic of the musculoskeletal effects of diabetes. No

articles were located regarding chiropractic and gestational diabetes mellitus.

Diabetes patients have a greater incidence than the general population of several musculoskeletal conditions. These include muscle cramps, muscle infarction, loss of deep tendon reflexes, peripheral neuropathy, complex regional pain syndrome (formerly known as reflex sympathetic dystrophy syndrome), stiff hands syndrome, neuropathic joints, carpal tunnel syndrome, adhesive capsulitis of the glenohumeral joint, tenosynovitis, diffuse idiopathic skeletal hyperostosis, and Dupuytren's contracture.<sup>37,38</sup> With the increasing rate of diabetes in the U.S., there is a strong possibility of a diabetic patient presenting to a chiropractic practice with musculoskeletal complaints related to the hyperglycemic state.

As holistic health care professionals and as musculoskeletal specialists, chiropractors should be aware of testing procedures used to monitor blood glucose levels and target ranges for those lab values. In addition, with adequate knowledge of diabetes, the chiropractor should be able to ask pertinent questions to determine if the patient is properly managing their condition, assist and support patients needing to make lifestyle changes, and realize when a referral to their medical physician or endocrinologist is appropriate.

Chiropractors are in a unique position to intervene at several different points in the diabetes time line. By emphasizing and recommending healthy lifestyle choices to their patients, chiropractors have the opportunity to help decrease the incidence of obesity and poor dietary habits that predispose individuals to diabetes. In those patients who already show signs of glucose intolerance or who are already diabetic, complication rates can be reduced and the amount of time before complications occur can be lengthened by continuing to promote weight management, appropriate food choices, and regular physical activity. In addition, by recognizing the musculoskeletal effects and complications of diabetes, chiropractors can better manage, or co-manage, many of the conditions that are currently seen as a natural consequence of the hyperglycemic state.

## Conclusion

Pre-diabetes and type 2 diabetes have a long asymptomatic phase and frequently are not diagnosed until complications occur. It is estimated that approximately one-fourth of all people with diabetes in the United States may be undiagnosed.<sup>2</sup> Type 2 diabetes and GDM are on the rise, and if uncontrolled, are associated with a multitude of

adverse health conditions. While treatment exists for these conditions and their complications, the best treatment is prevention.

Women, as well as the general population, should be encouraged to adopt healthy lifestyle choices that include healthy eating habits, daily physical activity, and weight management. While the topic of food choices, portions, exercise, and weight issues are emotionally charged and may be difficult for some patients to discuss, chiropractors can do a great service to their patients and future generations by providing a safe and encouraging environment in which to approach this subject.

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# Musculoskeletal and Radicular Pain during Pregnancy, Labor and Delivery: The Concurrent Use of Spinal Manipulative Therapy (SMT), Craniosacral Therapy (CST) and Dynamic Body Balancing Techniques (DBB): Five Case Reports

Carol J. Phillips, DC

## ABSTRACT

**Objective:** It is the objective of this paper to show how the concurrent use of chiropractic adjustments or Spinal Manipulative Therapy (SMT), Craniosacral Therapy (CST), and Dynamic Body Balancing (DBB) techniques will benefit the pregnant patient by alleviating musculoskeletal and radicular pain.

**Clinical Features:** Five cases of pregnant patients in a private clinic setting who were referred for musculoskeletal and radicular pain were successfully treated by a concurrent protocol of SMT, CST, and DBB. Two patients were primiparous, three were gravida 3 para 2. All paragravida patients had similar histories of extreme radiculitis and prolonged first and second stage labors.

**Intervention and Outcomes:** All five patients were treated successfully with SMT, CST and DBB techniques.

**Conclusion:** Anecdotal success with SMT, CST, and DBB is encouraging and appears to be a viable option for concurrent therapy during the prenatal period. However, prospective, quality research is required before these techniques can be formally validated by the obstetrical community.

**Key Indexing Terms:** pregnancy; low back pain; radiculitis; sciatica; manipulation; chiropractic: craniosacral therapy; dynamic body balancing

## Introduction

Musculoskeletal pain and radiculitis presents with a unique challenge to the clinician treating a pregnant patient. An accurate diagnosis and a successful treatment plan that does not include methods that may prove harmful to the fetus must be developed and implemented. For the doctor of chiropractic, special equipment must be available in order to adequately place the patient in the prone position, while providing a solid base for the pelvis. If musculoskeletal complications present during labor and delivery, a treatment plan may require medical interventions that add additional stress and pain for both the mother and her unborn child. Musculoskeletal pain and radiculitis is common during pregnancy with approximately 48-56% of pregnant women presenting with a considerable level of complaint.<sup>1,2</sup> Mechanical complaints are often ignored by conventional medical professionals as the origin of pain appears to be of a special entity that is unrelated to the pregnancy.<sup>3</sup> Pain that occurs during preg-

nancy rarely improves with the use of exercise or support belts.<sup>4</sup> When a woman experiences elusive pain during her pregnancy she has a higher than average risk of having back pain during labor and her chance of having back pain in future pregnancies increases three-fold.<sup>5,6,7</sup> Therefore, a referral to a chiropractor who has the appropriate equipment and training to address these complications is essential for the health and well-being of both the mother and fetus.

It is the responsibility of the chiropractic profession to demonstrate the safety and efficacy of prenatal care<sup>8,9,10,11</sup> to educate other professionals as to our role in alleviating structural misalignments that are resulting in musculoskeletal pain and radiculitis<sup>12-21</sup> and to encourage birth attendants to make a timely referral for collaborative treatment when such complications do occur.

Chiropractors must also recognize when SMT is not addressing musculoskeletal pain or radiculitis quickly enough, and a timely referral to another healthcare provider who can provide concurrent diagnostics and/or therapies is also appropriate. This article will report on five such cases and give a plausible hypothesis of why additional extraspi-

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nal therapy is essential to speed the recovery of structural imbalances during pregnancy. Scientific methods have not yet established the efficacy of this protocol, but the author offers anecdotal reports of successful outcome after instituting a protocol that includes Spinal Manipulative Therapy and Dynamic Body Balancing techniques (i.e., Craniosacral Therapy, Myofascial Unwinding, specific pre-natal techniques, Spinal Cord Release etc.) with this treatment approach. The author has reported on these techniques in the literature<sup>22-25</sup> and has used this protocol successfully for nearly two decades with thousands of pregnant women and offers it today for consideration by all professionals who work closely with pregnant women.

## Case Reports

### Case 1

In this first case, a 37-year-old primiparous patient was referred during her sixth month of pregnancy with low back pain (LBP) and stiffness, tingling down her arms to the finger tips, neck stiffness and sciatic pain.

- **Previous Chiropractic Prenatal Care:** The patient was referred to the author for consultation after eight chiropractic sessions had resulted in only moderate relief of LBP.
- **Trauma Hx:** Motor vehicle accident (MVA) three years prior. As the driver, the patient fell asleep, loss control of the car and hit a tree. She was able to get out of the vehicle before it “burnt to the ground”. The patient was apparently uninjured in the accident.
- **Fetal Exam:** The fetal position was an oblique lie with the pelvis in the right upper quadrant (RUQ). Fetal occiput was in mother’s right lower quadrant (RLQ) and de-flexed. (Optimum is to have both the fetal occiput and sacrum in the mother’s left upper and lower quadrants with the fetal head in flexion).<sup>26,27</sup>
- **Treatment:** Dynamic Body Balancing (DBB) techniques were performed, which included a Standing Sacral Release,<sup>22,23</sup> a Myofascial Release of the right leg,<sup>28,29,30</sup> Soft Tissue Release of the piriformis muscles, Craniosacral Therapy (CST),<sup>10,25</sup> and SMT to correct a posterior sacrum on the left.
- **Outcome:** All symptoms of LBP and radiculitis resolved. The patient received four more treatments during the pregnancy. The onset of labor was spontaneous. The duration of labor and delivery was within the normal range of 1cm/hr and delivery required no medical intervention.

### Case 2

This 32-year-old primiparous patient was referred at 36-weeks gestation with LBP and midback pain described as a burning and stabbing pain.

- **Previous Chiropractic Prenatal Care:** The patient was referred to the author for consultation after two chiropractic sessions that were unsuccessful in relieving her back pain.
- **Trauma Hx:** History was negative for significant trauma. This patient worked as an accountant and spent long hours working on a computer.
- **Fetal Exam:** The fetus was on the patient’s right side and compressed under the liver. (Fetal occiput and sacrum were in the mother’s right upper quadrant with the occiput de-flexed.) The patient’s midwives were concerned that the fetus would turn into an occiput posterior (OP) position prior to delivery.
- **Treatment Outcome:** The patient received SMT, CST and DBB. This patient was seen again at 38-weeks. The fetus was still in the mother’s right upper and lower quadrants, but her back pain had resolved. At 39-weeks, the fetus had rolled onto the mother’s left side with the occiput in flexion. (Left occiput lateral and anterior (LOL/A)). The patient reported no problems with back pain. Onset of labor was spontaneous at 40-weeks. The duration of active labor was five hours. The patient reported no back pain or need of medical intervention.

### Case 3

This 34-year-old gravida 3 para 2 patient was referred at 29-weeks gestation when an emergency house call was requested due to immobility from the intensity of B/L sciatic and LBP.

- **Previous Chiropractic Prenatal Care:** This patient began having significant sacral pain at 20-weeks gestation. She was treated for six weeks with SMT and seemed to be doing better until she suddenly became immobile due to severe sciatic pain at 28 weeks.
- **Trauma Hx:** History was positive for trauma with six MVA’s noted. One MVA occurred while the patient was sleeping in a reclined passenger seat. The car left the road and slammed into a tree. Injuries were significant with a concussion, broken ribs and bruised organs.
- **Previous OB Hx:** Both previous pregnancies and deliveries were complicated with back pain and sciatica.

Both deliveries required augmentation and analgesics prior to emergency c-sections.

- **Fetal Exam:** The fetus was in the ROL/P position on the mother's right side. After performing DBB techniques, the patient's symptoms resolved enough for her to be seen at 30-weeks in the office.
- **Treatment Outcome:** The patient received DBB, CST, and SMT during nine subsequent visits. Sciatic and LBP was intermittent during that time and a brace was utilized during the final weeks of gestation. The onset of labor was spontaneous and a successful vaginal birth after two previous caesarean deliveries (VBAC) was achieved without back pain or the need for obstetrical assistance.

#### Case 4

This 38-week gravida 3 para 2 patient presented with LBP, neck stiffness, bilateral hip pain, thyroiditis and headaches. Hip and LBP had resulted in the adoption of a seated position for sleeping that began during week 32.

- **Previous Chiropractic Prenatal Care:** The patient reported intermittent SMT since the onset of back and hip pain in 1999 with no success. No chiropractic care had been solicited during this pregnancy.
- **Trauma Hx:** The patient's history was positive for an MVA at 5-years-old when she was thrown forward and struck her head on the front seat. When she was 10 years old she took a significant fall on ice and injured her hand.
- **Previous OB Hx:** This patient reported that her first pregnancy was uneventful, but the delivery was horrific due to excruciating back pain that radiated from her shoulders to her knees (front and back of both thighs) with each contraction. Contractions were prolonged with only seconds between. The first stage of labor lasted for 9 hours at this intensity. The second stage of labor was difficult as the patient felt numb from her shoulders to her knees due to the level of pain she was experiencing. After 1 hour and 15 minutes of unsuccessful pushing, an episiotomy and vacuum extraction was performed. This resulted in a third-degree tear, extreme blood loss, and pain which took 3-4 months to resolve. Post-partum hypothyroidism occurred in the 4th month after delivery.

The second pregnancy was also uneventful except for three urinary tract infections (UTIs) that were treated with antibiotics. Delivery was induced at 41-weeks

due to oligohydramnios and required two rounds of antibiotics because she tested positive for Group B strep. The fetal position was occiput posterior (OP) with the same radiculitis as the previous birth. The patient reported feeling that she was being electrocuted with each contraction. The patient delivered after a long second stage without the use of pain medication or medical intervention. During the 4th month post-partum she again slipped in a hypothyroid state and began to take thyroid supplementation.

- **Fetal Exam:** The fetus was in an oblique lie with the head de-flexed in the mother's left lower quadrant (LLQ) and the pelvis in the mother's right upper quadrant (RUQ).
- **Treatment Outcome:** The patient received DBB, CST, and SMT. The uterus disengaged from under the liver and the fetus assumed a vertical position (LOL/A) with the occiput flexed. The patient was seen again at 39-weeks and reported no back or hip pain and was able to sleep in a reclined position. Labor was spontaneous at 40-weeks with the active stage of labor lasting approximately 6 hours. The patient experienced a normal labor that was void of back pain or radiculitis. The second stage of labor lasted approximately 5-10 minutes and did not require pain medication or medical intervention. Thyroid function normalized during the post-partum period and to this date she has had no need for thyroid supplementation.

#### Case 5

This 32-year-old gravida 3 para 2 patient was experiencing Restless Leg Syndrome and midback pain. She had suffered from extreme back labor with both of her previous deliveries and both had an active First Stage of more than 40 hours. The patient was hoping that by incorporating concurrent therapies she might be able to prevent a recurrence of back labor with this delivery.

- **Current Chiropractic Prenatal Care:** The patient was under chiropractic care and was referred to the author's clinic for concurrent therapy to incorporate DBB techniques.
- **Trauma Hx:** The patient's history was positive for an MVA in 2000. A passenger in the back seat, this patient was not wearing a seatbelt and suffered a concussion as a result of a blow to the side window. Her Grandmother died from injuries to her ribs during the accident. In 2005, the patient suffered a back injury while lifting a large dog onto an exam table. She currently has a 2<sup>1/2</sup>

year-old and a 14 month-old that she frequently has to lift and carry, which exacerbates her back pain.

- **Fetal Exam:** Fetal back was on the mother's right side but the occiput appeared to be in the mother's RLQ (LOL) resulting in extreme neck rotation.
- **Treatment Outcome:** DBB and SMT were performed on two occasions. The patient's back pain resolved. Restless leg pain resolved for a week but slowly returned prior to the second visit. Restless leg pain slowly resolved but was replaced by extreme pubic bone pain. The patient returned for care at 40 weeks. The fetal position was LOA with an apparent arm resting against the pubic rami. The patient received a standing Myofascial release, CST and SMT. Pubic bone pain improved immediately and the patient traveled back to her home state. The patient went into labor at 42 weeks gestation. The First Stage of labor lasted approximately nine hours and was void of pain until the patient was found to be 8cm. Mild pain was then noted in the anterior and posterior abdominal regions. The patient then requested an epidural due to the fear that she would experience the pain she felt in previous deliveries. The Second Stage of labor occurred within one hour and lasted through only one mild contraction to push the shoulders out.

## Discussion

Dynamic equilibrium within the reproductive system of a pregnant woman is maintained by the uterine ligaments as they grow in length and width to support the growing fetus within the mother's body. A review of the anatomy of the supporting structures of the pelvic bowl will assist us in understanding the possible etiology of elusive radicular pain and structural imbalances that are often dismissed by birth attendants as a self-limiting condition common in pregnancy.

### Broad Ligaments

The broad ligaments are wide folds of peritoneum that connect the sides and back of the uterus to the walls and floor of the pelvis. Divided into three subcomponents, the broad ligaments assist in stabilizing the posterior portion of the uterus. The largest portion of the broad ligament is the Mesometrium or mesentery of the uterus. The Mesometrium, which is anchored into the sacrum and posterior iliac bones, flows into the second portion that surrounds the fallopian tube, the Mesosalpinx.<sup>31</sup> The Mesosalpinx portion of the broad ligament flows into the anterior portion, the Mesovarium, which encapsulates the ovaries, the

anterior uterus and the round ligaments.

Infiltrated with striated muscle fibers, the broad ligaments have the strength and flexibility to support the growing uterus, the fallopian tubes and the ovaries. Balance in the tone and position of these ligaments will allow for dynamic equilibrium of the uterus. While the tone and position of these ligaments are of little concern to the birth attendant, it is of great concern to a chiropractor working with a pregnant patient, as misalignment in the sacrum or posterior aspect of the ilium may result in an alteration in the tone and position of these supportive ligaments and the growing uterus.

An increase in the tone of the broad ligaments will pull the uterus posteriorly, often referred to as a "tipped" uterus. A decrease in the tone will result in an anterior tipping of the uterus. A unilateral spasm will result in an anterior/lateral tipping of the uterus to the ipsilateral side of spasm. This form of imbalance in a pregnant woman will typically result in the patient complaining of hip or rib pain as the fetal head or pelvis becomes trapped in the lateral portion of the pelvis or rib cage. The fundal height may suddenly decrease from the expected range of growth (1cm/week). If the lateral tipping of the uterus is not taken into consideration by the birth attendant, a mother may be subjected to unnecessary pain, emotional stress and unnecessary sonogram evaluations.

Typical symptoms of an imbalance in any portion of these ligaments might be back pain, premature contractions, SI joint pain, ectopic pregnancy, infertility, or a displaced cervix making a descent difficult or delivery almost impossible to achieve. Restoring normal biomechanics to the sacrum and ilium results in a rapid restoration in the tone of the broad ligaments and restores dynamic equilibrium to the uterus.

### Round Ligaments

The round ligaments are narrow folds of peritoneum located on the lateral/anterior aspect of the uterus. Exiting the uterus through the deep inguinal ring, the round ligaments pass through the inguinal canal and blend into the fibers of the mons pubis before anchoring into the pubic rami.<sup>31,32</sup> Infiltrated with striated muscle fibers, these ligaments will grow and stretch with the growing uterus as they provide the strength and flexibility to support the anterior aspect of the uterus, thus insuring dynamic equilibrium as the mother bends and twists her torso. A unilateral increase in the tone of a round ligament will result in a pregnant patient complaining of sharp lateral groin pain when twist-

ing or rising from a reclined position. SMT and DBB used concurrently will restore tone and dynamic equilibrium to the pelvis and uterus and often results in an immediate resolution of the groin pain.

A bilateral spasm in the round ligaments may result in an anterior tipping of the uterus. A pregnant patient would then present with anterior pubic bone pain and menstrual-type cramps. During the third trimester, this misalignment may result in an unexpected sharp pain that shoots from the inguinal area to the anterior/medial aspect of the thigh. This pain forces a mother to suddenly flex forward and freeze in position as she cries out in alarm. This sudden sharp pain is a result of the round ligament pressing hard against the femoral nerve and artery in the inguinal canal. After a few seconds, a mother will gradually lift her uterus and fetus off the canal and the pain will resolve quickly, but this will often be followed by consistent premature contractions. Theoretically, this form of radicular pain may be due to the anterior displacement of the fetus and pressure being applied to the cervical portion of the uterus. The premature pressure results in a release of prostaglandins, which travel through the endocrine system to the brain.<sup>33</sup> The brain then directs the release of oxytocin from the pituitary gland, which results in contractions of the uterus and a premature attempt to expel the fetus from the womb.

Conventional recommendations for this complication are immediate bed rest and pharmaceuticals to relax and resolve the premature contractions. In many cases, bed rest, which tips the uterus back and reduces the pressure on the cervix, is effective in temporarily resolving the problem. Unfortunately, bed rest is often inconvenient for a mother who has a family to attend to. While on bed rest, the lack of movement may be harmful for a growing fetus that depends on movement of the uterus to assist in the activation of primitive reflexes and development of the vestibular system. Utilizing SMT and DBB techniques the doctor of chiropractic is often able to restore balance to the pelvic structures, proper tone to the supporting ligaments of the uterus and stop premature contractions without the need for bed rest or pharmaceuticals.

### Uterosacral Ligaments

The uterosacral ligaments consist of recto uterine folds of peritoneum that contain fibrous tissue and non-stripped muscular fibers that are attached to the posterior wall of the uterus and the anterior wall of the sacrum. An increase in the tone of these ligaments may result in a caudal pull on the uterus. A pregnant patient will often present with the complaint that the baby is "falling out". The baby's head is

so low in the pelvis that walking becomes uncomfortable. If the spasm is not released, the mother may present with premature rupture of the membranes. The onset of labor may either be delayed due to malposition of the uterus or precipitous (rapid) due to the caudal pressure being applied to the cervix.

Restoring balance and motion to the sacrum and pelvic bones (SMT), along with a pelvic diaphragm release of the pelvic muscles and uterine ligaments (DBB), often results in an elevation of the uterus and a rapid resolution of the cervical pressure.

### Posterior and Pubocervical Ligaments

Two uterine ligaments of great concern to the chiropractor, as well as the birth attendant, are the posterior ligament, which anchors the posterior aspect of the cervix to the coccyx, and the pubocervical ligament, which anchors the anterior portion of the cervix to the pubic symphysis. A fall at any time in the life of a pregnant woman may result in a misalignment in the bony pelvis, a shift in the position of the cervix and a change in the tone of either one of these ligaments. An OB/GYN or midwife would be aware of this shift as it becomes difficult to do a pap smear or to find the OS during a cervical exam. An imbalance in these ligaments may also result in uneven dilation during labor and delivery (often referred to as a lip of cervix). Restoring balance and motion to the coccyx and pubic rami allows for a shift in the cervix, which contributes to an unhindered descent of the fetus into the birth canal and may also prevent postnatal coccydynia and pubic symphysis pain.

### Pelvic Muscles

A discussion of pregnant anatomy would not be complete without discussing the iliopsoas and piriformis muscles; two of the most important muscles that help stabilize the pelvis during the fetal descent through the pelvic bowl.

The psoas muscles attach to the spine from T12-L5 and traverse the abdominal cavity as they move anterior to the abdominal structures. Muscles fibers of the psoas will blend into the iliacus muscle in the area of the inguinal canal before it anchors firmly into the lesser trochanter of the femur. This muscle assists the pregnant mother in lifting her pregnant torso against gravity every time she bends forward and has to stand back up. Pelvic rotation of any kind will result in a torsion of the psoas muscles with one becoming hypertonic and one hypotonic. Abnormal tone in the psoas muscles of a pregnant woman could result in

pressure being applied to the aorta (resulting in an elevation in blood pressure and a decrease in the blood flow to the lower extremities and placenta), or to the inferior vena cava (resulting in an obstruction of blood returning to the cardiac system and varicosities).

Torsion of the iliopsoas muscle will rotate the pelvic bowl, alter the shape of the pelvic inlet, distort the uterine ligament attachments to the pelvic brim, and alter the tone of the urogenital pelvic floor muscles. If left unbalanced, this deviation in the musculoskeletal system may result in dystocia and the need for medical intervention during delivery. A common explanation for surgical intervention is cephalopelvic disproportion. In many cases, this may not be the result of the size of the fetal cranium or the mother's pelvic outlet, but rather the dynamic rotation of the pelvic inlet and outlet as a result of muscular imbalance.<sup>31</sup>

### Piriformis

Torsion of the pelvis from an iliopsoas imbalance will affect the piriformis and gluteal muscles as they insert into the greater trochanter.

Anchored firmly into the anterior wall of the sacrum, the piriformis allows for flexibility of the sacral segments during the fetal descent through the pelvis. A hypertonic piriformis will restrict the dynamic movement of the sacrum and may result in an A/P rotation of the sacrum and P/I rotation of the ilium. During pregnancy, the hypertonic piriformis will apply a pull on the sacrum with traction of the piriformis on the contralateral side of the pelvis. Traction on that piriformis muscle often results in pressure being applied to the sciatic nerve traversing through or under the piriformis. An immediate referral to a chiropractor is always appropriate so the imbalance can be addressed and the nerve pressure relieved.

A piriformis spasm that results in pelvic rotation will also result in a rotation of the uterus, due to the ligamentous attachments into the pelvis. When this happens, a fetus may be forced to defy gravity and rotate to either an oblique, transverse or complete breech position. The rotation may result in pain for the mother but most commonly goes completely unnoticed until a birth attendant or chiropractor palpates the fetus and notices the malposition.

Correction of the muscular and structural imbalance often results in an opening of the pelvic bowl, a balancing of the uterine shape and a rotation of the fetus back into the vertex position.

If a pregnant patient is not responding to a course of

SMT, a referral to another chiropractor trained in DBB techniques is appropriate. There are three specific pre-natal techniques that have been proven anecdotally to be effective in balancing uterine ligaments and the muscles influencing the pelvic floor. These are the Standing Sacral Release, the Side-Lying Position, and Inversion.<sup>22</sup>

### Conclusion

Creating a treatment plan for the resolution of musculoskeletal pain and radiculitis during pregnancy can be challenging for both obstetrical and chiropractic prenatal providers. Concurrently utilizing SMT and DBB techniques has been proven anecdotally to result in a rapid resolution of back pain, and radiculitis with the added benefit of restoring dynamic equilibrium to the structures associated with uterine stability (i.e. uterine ligaments and pelvic floor muscles). Restoring balance to the musculoskeletal system of a pregnant patient decreases her need for medical intervention during labor and delivery and provides hope for future pain-free pregnancies. It is the author's hope that this report will spark additional professional dialogue and collaborative research between both medical and chiropractic prenatal providers.

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# A Review of Complementary and Alternative Care for Infertility Issues

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## ABSTRACT

**Objective:** To describe and discuss various forms of complementary and alternative health care (CAHC) for reducing the negative impact of stress and to promote fertility.

**Background:** Conventional medical treatments for infertility are advancing rapidly along with the cost of these procedures. Due to the invasive practices and expense, many couples are seeking CAHC care as an independent or as co-treatment with medical care.

**Methods:** Narrative overview of the literature synthesizing the findings within the literature retrieved from searches of computerized data bases and authoritative texts.

**Discussion:** An overview of chiropractic, acupuncture, massage therapy, natural hormone therapy, detoxification, nutrition, and stress management and how each approaches care for infertility. The primary goal of each discipline is to utilize the body's innate healing capacity, restoring balance and function.

**Conclusion:** Stressors, ranging from internal negative thought processes to external environmental factors, all play a role decreasing the delicate balance of fertility. Although a different approach is utilized in each discipline listed, all work to restore homeostasis and create a positive fertility cycle. Further investigation within this new paradigm is required of these care plans.

**Key Words:** infertility, IUI, in vitro fertilization, chiropractic, acupuncture, massage therapy, nutrition

## Introduction

### Summary of Reproductive Physiology

Human reproduction in the female begins with GnRH (Gonadotropin-releasing hormone) produced by the hypothalamus to be secreted to the pituitary gland triggering production of FSH (follicle-stimulating hormone) and LH (luteinizing hormone). Feedback from estrogen and androgens control production and synthesis of LH and FSH. When GnRH is released, FSH stimulates the growth of a follicle on the ovary during the menstrual phase with Estradiol as the key hormone in the cycle to prepare the womb for pregnancy. As the estrogen increases and the follicle matures, FSH decreases and LH surges, triggering ovulation. Progesterone, produced by the corpus luteum, begins to build as LH peaks increasing the body's temperature. The follicle is released into the fallopian tube to be met by the spermatozoa. If the sperm penetrates the ovum, it proceeds to the uterus where it imbeds in the lining. The new embryo releases hCG (human chorionic gonadotropin) which can be detected by lab analysis indicating pregnancy. Nerve supply from the lower thoracic, lumbar and sacral regions stimulate the function of the organs of reproduc-

tion as well as the accessory structures. The T12 nerve root directly innervates the fallopian tubes, uterus, and ovaries and has influence on the adrenals in the sympathetic chain. S2 nerve roots supply the scrotum, labia majora, corpus cavernosum, clitoris, external genitalia, cervix and the associated glands.

In the male, testosterone is the dominant and manufactured in the interstitial (Leydig) cells of the testes and is essential for the production of sperm. Production of testosterone is controlled by LH from the anterior lobe of the pituitary gland which, similar to females is controlled by GnRH from the hypothalamus. Sperm are produced and refresh every 72 days in the testes located in the scrotum. Within the testis are seminiferous tubules where the sperm develop. As maturation occurs, the sperm leave the tubules and enter the epididymus where they fully mature with an enzyme-coated head and develop proper motion with a tail. To exit the male body, sperm travel through the epididymus, the vas deferens and ejaculatory duct. Secretions from the epididymus, vas deferens, seminal vesicles and prostate join with the sperm to create semen. Upon male orgasm, the fluid moves through the urethra and exits the penis into the vagina. Sperm are thus able to move through the cervix to the uterus and enter the fallopian tube where fertilization takes place.

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## Infertility Overview

Infertility can be one of the most traumatic issues a couple or individual can face. The most basic desire to have a child with the same DNA is denied for reasons that may not be well understood and many are willing to go through any procedure and spend astronomical sums of money to achieve this goal.

Infertility is defined as the inability to become pregnant after trying for one year. In the United States, 7.3 million women between the ages of 15-44 have impaired fecundity equaling 11.8%; the number of married women between ages 15-44 equals 2.1 million with a percentage of 7.4%. Over 7.3 million women have used infertility services.<sup>1</sup> When broken down, 20% of all infertility cases involve both male and female factors, 35% involve male factors, 35% involve female factors and 10% are unknown.<sup>2</sup> Female infertility is broken down into five categories: cervical, uterine, ovarian, tubal and other. Cervical issues, which account for 5-10% of infertility, can include stenosis, a functional issue or abnormal mucus-sperm interaction which affects transport and capacitation of the sperm which changes with estrogen levels.<sup>2</sup> Uterine factors include congenital anomalies and acquired defects, such as endometriosis, D & C scarring, placental polyps, and fibroids (25-50%).<sup>2</sup>

Ovarian issues are the most common female reason for infertility. To understand the complexity here is a brief synopsis of function. Stimulation of the hypothalamus-pituitary-ovarian axis results in a complex cascade of gonadotropic releasing hormones resulting in the production of follicle-stimulating hormone and luteinizing hormone which act upon the target organ, the ovary. Primary amenorrhea, secondary amenorrhea or oligomenorrhea may result if there is dysfunction at any point along the axis, but the most familiar is polycystic ovarian syndrome (PCOS). PCOS is one of the most commonly recognized endocrine disorders and is associated with hyperandrogenism, ovulatory dysfunction and obesity, and affects 5-10% of women of child-bearing age.<sup>2</sup> Cysts cover the ovaries and reduce production of the hormones that allow an ova to mature. Tubal defects, including obstruction, absence, or scar tissue, can cause abnormal implantation or failure to pass into the uterus.

The other category includes disorders of the peritoneal cavity such as previous or current infection from pelvic inflammatory disease, adhesions from endometriosis, scarring from abdominal surgery or ovarian cyst rupture. The age of the woman is also a significant factor. Female fertility begins to decrease at 27 and significantly drops at age 35.<sup>3</sup>

## Conventional Medical Management

Conventional treatments vary from administering hormones, ovulatory stimulation medications or antibiotics, to minor surgery, Intrauterine insemination (IUI) or In-Vitro Fertilization (IVF).

*Fertility medications* are designed to stimulate the follicles of the ovaries to produce multiple eggs in one cycle manipulating the timing of follicular rupture to maximize fertility. Clomiphene Citrate is a pill for infrequent or long menstrual cycles. Side effects include appetite increase, constipation, dermatitis or rash, depression, diarrhea, dizziness, fatigue, hair loss/dry hair, increased urinary frequency/volume, insomnia, light-headedness, nervous tension, vaginal dryness, vertigo, and weight gain/loss. Ovarian cancer has been infrequently reported in patients who have received fertility treatments. Gonadotrophins are injectables designed to induce the release of the egg. Side effects include abdominal distention, bloating, mood swings, fatigue, and restlessness. Glucophage is prescribed traditionally to lower insulin levels for diabetics, but in the case of PCOS, it has been shown to reverse endocrine abnormalities creating normalization of blood pressure, reduction in weight and regulation of menses. Side effects include abdominal discomfort and headache. Parlodel is utilized to lower prolactin levels and reduce pituitary tumor size. Risk includes allergic reaction or extreme drowsiness. Oral contraceptives, progestins, androgens or GnRH agonists prove beneficial in restoring normal function in patients with endometriosis enabling natural fertility. Risks vary based on the medication used.

*Surgical intervention* including laparotomy, operative laparoscopy and operative hysteroscopy are designed to remove myomas, polyps, scar tissue, and developmental abnormalities increasing fertility. Utilization of specialized instruments, miniature cameras equipped with microscopes, fiber-optic lights, and high-definition monitors has dramatically improved fertility outcomes. Risks include additional scar tissue forming and post-operative infection.

*IUI* requires the sperm to be "washed" (the process of separating sperm from seminal fluid by density gradient centrifugation or by direct swim up technique) and introduced through vaginal insemination through a needleless syringe or uterine insemination by a catheter. Semen is inserted twice within a treatment cycle. An alternative is the use of a conception cap to hold the semen in place near the entrance of the cervix for several hours to allow fertilization. Risks involve multiple births if drugs have

been used to stimulate follicle development and release of more than one egg.

IVF envelopes many different procedures based on the infertility issue. The most basic IVF technique includes the following steps: 1) ovarian stimulation started on the 3rd day of menstruation and involving medication to develop multiple follicles, 2) follicular aspiration with the help of human chorionic gonadotropin to retrieve the eggs, 3) oocyte classification as the eggs are stripped of surrounding cells, 4) sperm preparation the semen are prepared by removing inactive cells and seminal fluid (sperm washing), 5) the sperm are placed in a special growth medium until they consist of eight cells, 6) the sperm are an issue, intracytoplasmic sperm injection (ICSI) involves a sperm being injected directly into the egg, 7) embryo transfer to the uterus through a catheter. Risk factors include multiple births, [increase danger of pregnancy loss, obstetrical complication, prematurity, and neonatal morbidity]. Other factors include ovarian hyperstimulation syndrome from the hCG which can cause persistent premenstrual symptoms. Depression is a strong risk factor as IVF has a high mental, physical and financial investment with a low success rate. GIFT (gamete intrafallopian transfer) and ZIFT (zygote intrafallopian transfer) are IVF related procedures.

*Male infertility* affects 1 in 25 men and can be categorized as pre-testicular, testicular, and post-testicular etiologies.<sup>4</sup> Pre-testicular involves congenital or acquired diseases of the hypothalamus, pituitary, or peripheral organs that alter the hypothalamic-pituitary axis, such as idiopathic hypogonadotropic hypogonadism, prolactinomas, gonadotropin deficiencies, and Cushing syndrome. Testicular factors can be genetic (Klinefelter syndrome), or environmental (drugs, radiation, infections, trauma, or varicoceles). Advancing age also impacts testicular factors with diminished testosterone levels, gonadotropin levels, sperm concentration, and semen volume. Sperm is judged on count, motility, or morphology issues. Approximately 10% of oligospermia (low count) can be treated medically, but the other 90% is idiopathic. Post-testicular factors affect the transport of sperm (defective or absent vas deferens, infection, surgery, or trauma). Men exposed to DES in-utero may also have a ductal obstruction.<sup>4</sup>

Treatment of male factors can be very limited and invasive. Varicoceles can be treated surgically but can take up to 3 months until results are known. IUI, IVF and ICSI are the most common fertility treatments with male infertility factor. IUI and IVF can be done with simple

ejaculatory techniques. ICSI requires surgically opening the testicle to retrieve viable sperm. L-Cartinine and hormone treatment may be beneficial to improve sperm quality, but studies are limited.

### CAHC Management Plans

*Chiropractic.* The Association of Chiropractic Colleges states, "Chiropractic is concerned with the preservation and restoration of health, and focuses particular attention on the subluxation." Within their bylaws subluxation is defined as, "A complex of functional and/or structural and/or pathological articular changes that compromise neural integrity and may influence organ system function and general health. A subluxation is evaluated, diagnosed, and managed through the use of chiropractic procedures based on the best available rational and empirical evidence."

The neurology of the reproductive system is dominated by the nerve roots T12 to the sacrum. The T12 nerve root innervates the fallopian tubes, uterus, and ovaries, and has adrenal influences in the sympathetic chain. The sacrum supplies the scrotum, labia majora, corpus cavernosum, clitoris and associated glands, external genitalia, and, most importantly, the cervix. T11 has some impact on the uterus, and the lumbar innervate all the reproductive organs. L1 controls the scrotum and muscles of the uterus. L2 has influence on the genitals and innervates the scrotum, cremaster muscle, skin of the scrotum and labia majora. The sacral nerves also influences the reproductive organs but also more directly innervate the cervix.

The nervous system is extremely complex and has intertwining influence on other systems of the body including the endocrine and immune systems. For example, an adjustment at C1 (atlas) provides mechanoreceptor stimulus via the spinal cord to the pituitary gland, T1 to the thyroid gland, and T10 to the adrenal glands. Chiropractors theorize that the stimulation provided by the adjustment at the proper segmental levels alters the current flow of energy in the corresponding nerve root to influence changes in these accessory systems. In line with this thought process, chiropractic is also excellent in decreasing stress in the body and boosting immune function. Restoring homeostasis is the key to the body healing both "macro" and "micro" damage and regaining full function.<sup>6</sup>

There are currently no large studies documenting that the reduction of vertebral subluxation via a spinal adjustment can increase fertility directly, but several small studies and case reports suggest a possible link. A May 2003 study published in the *Journal of Vertebral Subluxation Research*

demonstrated positive fertility outcomes for 15 women in 14 separate articles.<sup>5</sup>

The first case report is of a 40-year-old female with a history of miscarriage. Diversified technique was used by the practitioner along with NET (Neuro Emotional Technique and Activator). After a course of 3 times/ week over 4 weeks, then reduced to 1-2 times/ week for four months, the female conceived using IUI.<sup>6</sup> A case report of a 36-year-old patient with unexplained infertility was adjusted at C1-C2, T11-T12, and L4-5 three times/wk for two weeks, twice a week for four weeks and once a week for 3 weeks. She became pregnant shortly thereafter. The technique was not described.<sup>7</sup> Another report of a 34-year-old female patient with one aborted IVF attempt began Network Spinal Analysis (NSA). Following almost 2 months of care a second IVF attempt was performed and was successful.<sup>8</sup> Two patients with infertility and other chiropractic complaints presented. TRT (Torque Release Technique) with the assistance of an instrument known as the Integrator. Both women became pregnant following care.<sup>9</sup> A 40-year-old patient presented with menorrhagia and a sluggish cycle. TRT was used for 5 weeks which shifted uterine function.<sup>10</sup> A case report of a 27-year-old woman following 2 miscarriages and 9 months of anovulation was cared for with TRT twice per week for 30 days and once per week for 30 days. The patient regained ovulation after 60 days of care and became pregnant after her second ovulation cycle.<sup>11</sup> A 32-year-old female patient diagnosed with infertility for two years was cared for with DNFT for two months. A second attempt of IVF following chiropractic care yielded a viable pregnancy.<sup>12</sup> Another 31-year-old patient under medical infertility care was care for with Diversified Technique for the first three months and TRT an addition four months. By two months the patient was having regular menses and by four months was having non-drug menses. Nine months following beginning chiropractic care, the patient conceived without medication.<sup>13</sup>

*Acupuncture.* Acupuncture has been considered in traditional Chinese medicine, dating back to 11 AD, to be an effective treatment for infertility. Although still considered controversial in mainstream health care due to a lack of large scale studies, small studies and case reports have shown acupuncture to regulate the menstrual cycle, increase sperm motility, and most importantly to enhance the function of the whole body.<sup>14,15</sup> Liver Qi stagnation is a key finding, along with a history of irregular periods, PMS, breast pain with distention, worry, irritability, depression and headaches. The radial artery pulse reveals a wiry and small quality pulse in a patient with liver imbalance. This

imbalance affects blood flow in the pelvic cavity including the endometrium, and can be corrected over the course of several months. Through the Chong and Ren channels, the uterus is nourished and can adjust levels of FSH, LH, and E2 and raise progesterone levels to normal. Electro-acupuncture has shown to be more beneficial than manual acupuncture.

Acupuncture has been suggested to help with spasm of the fallopian tubes, eliminate repeated miscarriage, idiopathic infertility, luteal phase defect, hyperprolactinemia, polycystic ovarian syndrome (PCOS), and male factors. Low levels of FSH have been shown to increase with the support of Chinese herbal medicine as well. A study was conducted on 20 patients with PCOS in which low-frequency Electro-Acupuncture along with physical exercise was utilized to decrease the hyper-muscle sympathetic nerve activity.<sup>16</sup> Direct recordings of the multiunit efferent postganglionic muscle sympathetic nerve activity of the peroneal nerve performed pre and post a 16 week course of treatment demonstrated that low-frequency Electro-Acupuncture lowered high sympathetic nerve activity.<sup>17</sup> Another study utilized electro-acupuncture and showed an increased ovarian blood flow supported regular ovulation in rats by effecting the ovarian sympathetic nerves. High frequency acupuncture decreased ovarian blood flow. A study of 16 men with low sperm quality was conducted in which their sperm was examined before and then 1 month after a treatment regime of twice a week for 5 weeks, with a control group of identical 16 men with no treatment. The fertility index of the males in the group treated with acupuncture increased significantly at  $<.05$  and total functional fraction increased  $<.05$ .<sup>18</sup>

Acupuncture is also used in combination with IVF or donor egg transfer, typically utilized 3-4 months before insemination. A study published in the *Journal of the American Society for Reproductive Medicine* utilized two controlled groups, one with acupuncture treatment and one without. An increase in serum cortisol and prolactin was noted in the acupuncture group, along with a normal fertile cycle dynamic.<sup>19</sup> A second study reported in the *British Medical Journal* utilized a sample of 1,366 women undergoing IVF receiving true acupuncture treatment or sham directly before embryo transfer. The women with true acupuncture treatment had clinically relevant improvements in clinical pregnancy and live births.<sup>20</sup> In 2002, a German study reported an increased success rate of 50% in IVF pregnancy when acupuncture treatment was used in tandem with two acupuncture treatments immediately before and after embryo transfer. This study has not been

replicated. There are 6 contraindicated acupuncture points which should be avoided once pregnancy is achieved including Gallbladder 21, Stomach 12, Large Intestine 4, Spleen 6, Bladder 60, Bladder 67, and any points located in the lower abdomen.

*Massage Therapy.* Massage therapy utilizes the manipulation of superficial layers of muscle and connective tissue to enhance the function and promote relaxation and well-being. Acting on and manipulating the body with pressure on target tissues include muscles, tendons, ligaments, skin, joints or other connective tissue, as well as lymphatic vessels and organs of the body. Benefits of working on these tissues includes the alleviation of anxiety, alignment of the uterus, maintenance of blood pressure, alleviation of fatigue, improvement of blood circulation, strengthening immune function, and stress relief on joint of the body. Research studies demonstrate reduced cortisol levels, decreased pain, improved immune function, and reduction in depression symptoms. Couples struggling with infertility face tremendous stressors, both internal and external. This increased stress can elevate cortisol levels, decrease the function of the adrenal glands and hinder the implantation process.

Certain massage techniques stand out in the literature in the aid of infertility: Wurn's, Reflexology, and Reiki.<sup>21,22,23,24</sup> Wurn's technique is a site-specific, manual soft tissue therapy designed to break down excess collagenous cross-links in the musculature, allowing improved mobility of the reproductive organs. This technique has been found to be very effective in cases of abdominal surgery and/or infections. Reflexology release the blockage of an invisible energy field, Qi, through massage on areas of the hand and feet correlated directly with internal reproductive organs and supportive structures known as "zone therapy". Reiki is a Japanese massage technique with benefits including relaxation, stress reduction and promotion of healing by manipulating the life energy that flows through all living things. These therapists begin with the head and move their hands down the body channeling. A more Eastern approach to massage includes Reproductive Organ Massage (ROM) known as Chi Nei Tsang (CNT) with the goal of cleansing, balancing and relaxing the female body to make it ideal for conception. CNT works the spleen, stomach, liver, kidneys, lungs and heart along with the reproductive organs. Mayan Abdominal Massage works to correct a displaced uterus for females suffering from painful periods, dark blood at the beginning and end of menses and excess vaginal discharge (utilizing a scooping motion by hand up the pubic bone and lower abdomen).

The Bowen technique involves manipulation of muscle and soft tissue with light pressure through clothing on the coccyx, lower back, legs, shoulders and neck. The goal is to regulate the cycle, and optimize ovulation improving the nervous and lymphatic systems.

*Nutrition* is the cornerstone of body function, with a delicate balance of too much versus too little contributing to dis-ease. Understanding dietary needs as they relate to the reproductive system is not always adequately addressed in mainstream maternity reading. Due to lack of information, misinformation and contradictory studies, health care providers are often hesitant to undertake the daunting task of nutritional education. The following are the basic elements of nutrition that are important for general health, and for the reproductive health specifically. Protein is necessary for cell repair and hormone production, 60-70 grams per day.<sup>25</sup> One study found that consuming 5% of total energy intake as vegetarian protein vs. animal protein increased fertility by 50%. Essential fatty acids are necessary to produce hormones, transport cholesterol, and reduce inflammation.<sup>26</sup> Complex carbohydrates fuel the body; fiber assists with bowel movements and voiding discarded hormones. Fruits and vegetables supply vitamins, minerals and phytochemicals. Water is vital to the human body. About 75% of Americans are chronically dehydrated, which increase production of cholesterol used to wrap around cells sealing in water. Increased serum cholesterol alters the main three reproductive hormones (estrogen, testosterone and progesterone). When dehydration persists, in order to maintain homeostasis, the body is forced into selective deprivation of water to areas of the body. As the testes and ovaries are not essential for survival, they are adversely affected early on.<sup>27</sup>

Specific vitamins and mineral deficiencies, particularly folic acid, vitamin E, B6, B12, iron, magnesium, zinc and selenium contribute to infertility issues. However, simply prescribing these supplements without proper testing for deficiency and absorption abnormalities is irresponsible. Omega 3 fatty acids are highly recommended to diminish pro-inflammatory responses which adversely affect the pelvis and reproductive organs. For sperm, specifically, the amino acid L-carnitine promotes sperm production, while Ferulic acid found in Dong quai improves sperm quality. Diets high in peppers, spinach, and citrus appear to produce higher quality and faster sperm due to high antioxidant qualities.<sup>28</sup>

Reducing or avoiding smoking, caffeine, drugs and alcohol greatly increases fertility, as reproductive organs are extremely susceptible to free radicals and oxidative damage.

Free radical damage is also noted in diets high in red meat consumption due to lack of antioxidants causing an inhibition of sperm production. In females, too much dietary fiber can decrease estrogen levels causing changes in hormone concentration, decreasing ovulation. Voiding the diet of trans-fats, refined sugars, excessive additives or nutrient depleted foods diminishes the pro-inflammatory response that weakens immune function. Restoring a healthy diet allows the body's innate ability to optimize healing by rebalancing hormones, decreasing excess estrogen, promoting weight loss and ultimately to revitalize fertility.

There is a lot of 'noise' in the world of infertility, both from outside sources and your own inner voice. Conceiving, for many, was something to be avoided during youth and essential for self esteem in adulthood. Society places tremendous emphasis on one's ability to procreate. Well intentioned and some not so well intentioned individuals can demean one's primal instinct to carry on their DNA sabotaging the mind-body connection and creating an impenetrable wall of self-loathing, self-doubt and lack of personal self-worth. Breaking this wall is a fearsome task and may require professional therapy. Shattering internal and external negative messages stemming from childhood is important to the path to fertility. Society has developed a mantra of looking outside of oneself to find the answers when in actuality self reflection and introspection often is the tool that unlocks the mental blocks to fertility. Many of the techniques already discussed in this article are beneficial for reconnection in the mind/body realm, but meditation, yoga, tai chi, pilates, low impact cardio workouts, long walks in the woods or on the beach and holistic retreats can eliminate the noise and restore internal energy. Encouraging a reconnection with nature and the earth expedites a restoration to personal equilibrium.

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# Grand Rounds Case #1: Sacroiliac Joint Dysfunction in Pregnancy

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## PRESENTER

### **Belinda Siddle BSc, MChiro, DICCP**

*Belinda Siddle is a chiropractor in private practice in Brisbane Australia. She holds a Diplomate in Clinical Chiropractic Pediatrics (DICCP) from the New Zealand College of Chiropractic/International College of Chiropractic Pediatrics.*

## **Presenting case history and chief complaint**

A 37-year-old female presents to the clinic complaining of left sided sciatica of three months duration. She is 25 weeks pregnant. The pain is felt anteriorly and posteriorly around the tops of the thighs. The patient reported no paraesthesia. She was unable to recall any specific precipitating incident, but the pain began suddenly and was quite strong and stabbing in nature. At the time of presentation the pain is a constant dull pain which is aggravated by bending over, mopping and picking up her 2-year-old child. She is able to feel less pain by taking care with her posture and decreasing strenuous activity. She often has pain on waking in the morning, especially if she has slept on her side.

Upon further questioning, the patient also suffers abdominal discomfort in the left lower quadrant. The patient had seen a physiotherapist recently for this complaint but with no significant improvement. The patient reports that she experienced a similar problem in her last (third) pregnancy, however, this episode had started at an earlier stage in the pregnancy. She has no history of lower back pain until after her first labor and delivery. The patient also reported upper thoracic pain and neck tension.

The patient is a healthy 37-year-old multiparous female. This is her fourth pregnancy, having successfully delivered three children. There is no history of miscarriage or abnormal bleeding. She has had no injuries, motor vehicle accidents, falls or ill health. Morning sickness was reported for the first three months, but otherwise her general health is good. She is not undertaking any regular exercise but used to run for 45 minutes three times a week. She is taking no other medication apart from Elevit (a multivitamin). She has been hospitalized for removal of a cyst from the left ovary, wisdom teeth extraction and childbirth. Her three previous pregnancies were uneventful with natural deliveries, each without pain relief. After

her third child, she suffered mild post natal depression requiring no medication.

## **Physical examination**

System survey was unremarkable. Blood pressure was 100/60. Lumbar lordosis was increased with compensatory anterior head carriage. Chiropractic evaluation revealed a Category II strain of the left sacroiliac joint (Sacro-Occipital Technique (SOT)) with a right posterior sacrum. There were subluxations at C1/2 and T4/5 and L5/S1 levels. The left side of the pubic symphysis was positioned anteriorly and very tender on palpation. There was palpable tension in the respiratory diaphragm and hypertonicity in the psoas and piriformis muscles bilaterally. There was also tenderness and palpable tension in the left round ligament. Neurological examination was normal.

No radiological or laboratory tests were performed.

## **Differential Diagnosis**

1. Left sacroiliac joint strain causing concurrent Symphysis Pubis Dysfunction (SPD)
2. Posterior right sacrum subluxation causing compensatory left sided pain
3. L5/S1 intervertebral joint misalignment
4. Piriformis Syndrome
5. Lumbar spine or hip pathology

## **Diagnosis**

Left sacroiliac joint strain causing SPD was the diagnosis. SPD describes the pregnancy associated pain, instability and dysfunction of the symphysis pubis joint and/or sacroiliac joint.<sup>1</sup> For so many pregnant women, low back pain and sciatica have always been explained away by their physician as simply the position of the fetus or a 'normal' part of pregnancy. However, dysfunctional motion of the sacroiliac joints and pubic symphysis, as well as the lumbosacral junction are often the cause. These joints are under particular strain secondary to the forward shift in the centre of gravity, the increase in the lumbar lordosis, and external rotation of the legs to maintain balance.<sup>2</sup> A distorted pelvic girdle causes distortion of the uterus and uterine ligaments. Often the best way to resolve SPD is through realigning the pelvic girdle and soft tissues.

## Treatment Plan

The patient was seen twice a week for two weeks and then weekly for the remainder of her pregnancy.

Chiropractic care consisted of specific chiropractic adjustments to L5/S1, T4/5, C1/2 and sacrum. Myofascial release of the psoas, respiratory diaphragm and piriformis muscles was performed, as well as SOT Category II blocking of the sacroiliac joints. Webster's in-utero constraint technique and the Bagnell Technique were utilized: these involved release of the round ligament and traction releases of the pubic symphysis.

Ice therapy was advised for both the sacroiliac joints and pubic symphysis whilst in the acute stage. The patient was given advice on how to get in and out of her bed and car, in order to avoid placing further shearing stress on the sacroiliac joints. A trochanteric belt was given to the patient to be used for long periods of weight bearing.

As the patient's symptoms improved, gentle stretches and mobility exercises were prescribed, using Pilates and a theraball. Specific exercises for both the transverse abdominals and pelvic floor muscles were taught to improve tone and help stabilise the pelvic girdle.

## Progress and outcomes

The patient reported immediate relief after the first treatment. The SIJ strain was resolved after 4 treatments but was aggravated at 30/40 after rotating on the left hip. This also aggravated the pubic symphysis. The patient's symptoms were alleviated and maintained until delivery. She reported a spontaneous labor at 40 weeks lasting 6 hours with no pain relief medication.

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## DISCUSSANT 1

### **Trudi Cullinan MBBS, FRACGP**

*Trudi Cullinan is a General Practitioner (GP) in Brisbane, Australia and a Medical Educator for the University of Queensland School of Medicine and the Remote Vocational Training Scheme (RVTS), an organization that trains GPs in rural and remote areas of Australia.*

Depending on the source, references have published

that 25 percent to over 50 percent of pregnant woman experience some form of back pain during a pregnancy.<sup>1,2</sup> This pain is often labeled as being part of "normal pregnancy" and being self limiting in nature. It is important that sacroiliac (SI) joint dysfunction not be overlooked as a cause of this pain<sup>3</sup> and that the patient is referred to the appropriate health service provider, whether it is a chiropractor or a physiotherapist. It is in the patient's best interest that this health professional has an interest and/or specialist training in pregnancy related issues.

Sacroiliac joint pain can have wide-ranging effects on the patient's life and their functional capacity. These effects include:

- The patient's ability to work, particularly maintaining their usual work hours and performing their usual vocational duties. This of course depends on their exact job. The consequence of this can result in a change in household income and possibly the patient's job security.
- The patient's capacity to carry out their activities of daily living, such as vacuuming and mopping the floor, carrying groceries, lifting children etc.
- The effect on the patient's lifestyle, in this case example the patient would be unable to continue her running, which in turn may lead to weight gain and its potential sequelae.

All of the above effects can contribute to an increase in emotional stressors.

In addressing treatment of this patient, in addition to the management already detailed in the case discussion, it is important that the following areas be considered:

- It is essential that, at the beginning of a pregnancy, the woman is educated as to what can be expected throughout the pregnancy, that the patient is encouraged to ask questions and to report any symptoms or concerns that she develops during the pregnancy.
- Provide advice on how to reduce the stress to the SI joint. Practical information is vital; for example, placing a plastic shopping bag on the car seat to help getting in and out of the car, have the groceries delivered rather than carry them in from the car, kneel down to give her 2-year-old a hug and then hold his hand while walking, rather than lifting him up, may diffuse the tantrum that follows the refusal to lift him.
- Inquire into the patient's social supports, and what

could be organized to reduce or remove activities that exacerbate her pain. For example, can the husband, an older child, or extended family member do the vacuuming or mop the floors?

- Educate the patient on the likely time frame and natural history of the problem. This can serve to allay any fears or expectations as to what will happen. For example, it is possible that the patient has fears of the pain extending past the pregnancy and worry she will not cope with looking after a new baby. This would be particularly important in a patient with a past experience of postnatal depression.
- It should be noted that in severe cases, SI joint injection with a local anaesthetic mixed with a steroid may provide significant relief of symptoms. This should be performed by an experienced clinician.

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## DISCUSSANT 2

*Shannon Morris, MA Mid (Master of Midwifery Studies)*

This case presents a common story, particularly for a multiparous woman. Sciatic pain in pregnancy is a sign a woman's body has come out of balance; it can also be aggravated by the position of the fetus particularly in later pregnancy.

The musculoskeletal system experiences enormous changes during the childbearing year: weight gain, muscle stretching, muscle compression, loosening of ligaments and displacement of the centre of gravity. Additionally the pelvis is designed to open at three stretch points — the symphysis pubis and the two sacroiliac joints — these points are full of relaxin hormones.<sup>1</sup>

Midway through the second trimester of her pregnancy this client's pelvis is already quite 'loose' and she is likely to have lax tone in her abdominal muscles from her three previous pregnancies. While she once regularly ran, there is no mention of any other exercise or how long it has been since she undertook regular exercise.

Posture and movement influence uterine balance. The uterus works most effectively when the abdominal ligaments, muscles and fascia are in balance. Uneven postures used habitually over time can tilt the uterus, tightening uterine and cervical ligaments on one side which in turn twists the uterus. Periods of prolonged standing or sitting, at work, in the home or in the car, and lying for long periods on your side (as is common in pregnancy) are particularly significant as this compromises pelvic circulation and places undue strain on certain muscles and ligaments.<sup>2</sup> Compression or irritation of the sciatic nerve may cause sciatica. Neural tension and movement may be affected by abnormal movement of the head, neck, thoracic cage and lumbar spine, also contributing to sciatica, and displacement of the uterus as it enlarges.

Throughout pregnancy movement and exercise helps improve muscle tone and helps the pelvic joints stretch and relax. It is my experience that active women who regularly walk, swim or do yoga have less incidence of sciatic and other pelvic pain than those women who don't engage in these activities.

For this woman I would have suggested initial chiropractic techniques and care as physiotherapy, to which referrals are usually free as part of public hospital pregnancy care, was of no immediate benefit.

Once the uterus and the surrounding supportive structures are in alignment, I would recommend good maternal postures and regular gentle exercise. She may also benefit from supporting her belly with a pregnancy belt which can substitute for any missing tone in the abdominal muscles, and observing the positions below and/or participating in the following activities and exercises:

- Forward-leaning positions
- Belly Dancing
- Pelvic tilt
- Yoga
- Freestyle swimming
- Move symmetrically, don't twist
- Ensure pelvis is tilted forward and higher than knees — use cushions, rolled towels or a wedge under the bottom
- Not cross her legs
- Various exercises done on all fours can help, e.g. wiggling her hips from side to side, or arching the back like a cat, followed by dropping the spine down.

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## DISCUSSANT 3

### **Karen Wallwork, Adv.Dip Ayu, Dip AT, RMT, MFR**

*Karen Wallwork is a Natural Therapist in Brisbane Australia, providing a commonsense approach to using natural therapies in an integrated treatment regimen.*

This discussion is based on the use of Remedial Massage Therapy<sup>1</sup> within a chiropractic protocol for the treatment of sacroiliac dysfunction in pregnancy.

The sacroiliac joint's stability is maintained through a combination of bony structure, muscles and strong ligaments. The cause of dysfunction is likely to be a disruption of movement between the sacroiliac joints. The pain is usually felt anteriorly.

Women are considered more likely to suffer from sacroiliac pain due to their structure and the hormones released during pregnancy.<sup>2</sup> These hormones allow the connective tissues in the body to relax and the pelvis can then stretch to allow for the birthing process. This stretching can result in changes to the sacroiliac joints, making them hyper mobile. The more pregnancies a woman has, the more adhesions can appear within the structure allowing misalignment and causing dysfunction.

After viewing the chiropractic diagnosis, a postural assessment and dysfunction tests (e.g. Gillet/Stork when the therapist palpates the Ilium and sacrum of one SI joint then the patient flexes to 90°. If normal the PSIS would drop caudad relative to sacrum. If dysfunctional, there would be increased or decreased movement of Ilium relative to sacrum.) would be performed to indicate the soft tissues requiring work. The chiropractor may already have indicated what is required depending on their treatment protocol.

Suggested muscle groups would include: Quadratus lumborum, gluteals (especially G.medius), piriformis as well as the inguinal ligament. Remedial massage and myofascial release techniques<sup>3</sup> would be applied either along the muscle fibres to induce their release or across them to facilitate their return to normal positioning and movement. Most of this work would need to be performed in a side-lie position (affected side superior) or

supine with the right hip elevated.

Psoas, ilacus & coccygeus muscles would be considered within the treatment for this type of dysfunction but would be directed by the chiropractor for the pregnant client.

Attention should also be directed to the hamstring group, iliotibial band and quadriceps as they may be subsequently affected by the dysfunction. Once again using both remedial massage and myofascial release techniques.

As the sacrum movement is often linked to the occiput (noted in the chiropractor's physical examination appraisal), it would be beneficial to check their synchronised movement at the end of the session. This is a cranio-sacral technique.

Post treatment care is essential. Suggest to the client that the application of ice may be required to various areas that have been worked.

These sessions would be scheduled either pre or post chiropractic treatment dependent upon the chiropractor's objective and the severity of the problem being experienced by the client. They may also be scheduled between chiropractic sessions.

Another variable that needs to be considered is client habit. Many women with small children will place them on their hip whilst performing tasks with their dominant hand placing enormous strain on an already compromised structure.

This may explain why there was no significant incident preceding the onset of pain in this client. Would also check client's sleeping position due to pain being experienced on waking. An additional support pillow may be required to stabilise the lumbar pelvic area.

The chiropractor has already instructed the client how to get out of the bed and car.

Many pregnant women opt for "comfortable" shoes due to oedema. This is not necessarily ideal. Correct and supportive footwear is essential after any structural treatment. This would require investigation if treatments were not "holding" in between sessions.

Additional considerations would include nutrition and exercise. There should be sufficient calcium, magnesium, protein etc. within the diet as this can affect the client's body structures. Even though this client is taking Elevit (a once-daily vitamin and mineral supplement for pregnancy

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(Bayer HealthCare) this may not have been enough to address the needs of her dysfunction.

Also yoga or other forms of stretching exercise could be suggested to tone and stabilize the pelvic structure while minimizing adhesions.

This combined treatment protocol (chiropractic/remedial massage) will provide for not only a less painful pregnancy but a more stable pelvis in the future for this client.

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## DISCUSSANT 4

### **Catriona McNamara, BSc, MChiro**

*Catriona McNamara has been in private practice in Brisbane Australia for 15 years. She has a BSc from the University of Queensland and an MChiro from Macquarie University. She is a Gonstead Diplomat.*

SIJ pain in the pregnant patient is a very common presentation in the chiropractic clinic. However, given the ease with which this can be alleviated, not common enough!

Pregnancy, by nature is an emotional and physical challenge without the complication of lower back pain. This case demonstrates the ease with which this common and debilitating problem can be alleviated. The mechanisms contributing to pregnancy induced SIJ dysfunction, are explained by the interplay between the hormonal changes of the pregnant state associated with altered postural and pelvic function.

Interestingly, the onset of her SIJ pain and Symphysis Pubis Instability coincides with the end of her first trimester. The laxity at this point is attributable to higher levels of relaxin and oestrogen. This predisposes parturients to strains of the SI joints.

Additionally in this case, there were a number of predispositions to having SI joint strain. These included substantial residual ligament laxity from her previous three pregnancies,

the mechanical strain of lifting her two-year-old toddler and the history of SI pain in her previous pregnancy.

A right posterior sacrum (P-R) is often associated with a left externally rotated ilium (EX) in the Gonstead analysis of pelvic misalignment (Plaugher, 1993).<sup>1</sup> Left EX Ilium misalignment will often mimic sciatica down the back of the left leg and localised posterior SI oedema and pain.<sup>1</sup> The mechanical stimulus involved in adjusting the sacrum affects the innervations of: the round ligament (lumbar, sacral and ovarian plexuses);<sup>2</sup> the piriformis — the sacral plexus; and of course the local SI joint — sacral and lumbar plexus. All of which play a significant role in the onset of symptoms described in this paper.

The chiropractic approach to this patient seems to have been both comprehensive and successful.

Treatment involved ligamentous release, muscular stretching, spinal adjustments, SI belt and general postural advice.

It is my opinion that the rapid relief of SIJ symptoms in the pregnant patient requires specific, well-timed adjustments. Further to the intervention carried out, I would have additionally assessed the need for an Ilium adjustments. Although it was unclear how many times each of the segments listed were adjusted, my understanding would be that a more conservative approach would have occurred once the pelvis stabilized and the pain resolved. I would have advised minimal lifting of her two-year-old toddler and a reduction in domestic duties such as mopping and making beds whilst her SIJ pain was acute. If these activities were going to be undertaken, a further intervention that could be considered would include the SIJ belt. This acts to stabilize the pelvis during these activities.

Pregnancy predisposes women to SI joint pain via the combination of hormone induced ligamentous laxity, exaggerated lumbar lordotic posture, increased weight gain and in this case also continuous lifting her two-year-old and it being her 4th pregnancy. Chiropractic, regardless of technique leanings, is an efficient and conservative approach to the resolution of the age-old problem of SI joint dysfunction in pregnancy.

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# Grand Rounds Case #2: Multi-Disciplinary Management of Pelvic Girdle Instability

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## Part A: CHIROPRACTIC PRESENTER

**Tone Tellefsen Hughes BSc, DC, FCC (paeds),  
FAECC (paeds)**

*Tone Tellefsen Hughes is a member of the British Chiropractic Association (BCA), College of Chiropractors (COC) and General Chiropractic Council (GCC). She practices at Luck's Yard Clinic, Portsmouth Road, Milford, Surrey, UK.  
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**Patient: Mrs C. DOB: 16-11-72**

Mrs C. consulted the clinic for a routine chiropractic visit in her third pregnancy at 5<sup>1</sup>/<sub>2</sub> weeks gestation.

### **General history**

*First pregnancy:* Mrs C had delivered her first born after 12 hours of labor, during which she was positioned in the lithotomy position (laying back with legs bent in air) and needed the assistance of ventouse suction (vacuum extraction) due to a shoulder dystocia presentation.

*Second pregnancy:* In the latter part of the third trimester of her second pregnancy, Mrs. C received chiropractic care as well as pregnancy massage and had the assistance of a birthing doula. She presented at the chiropractic clinic at 36 weeks gestation with a chief complaint of bilateral sacroiliac pain and pain at the symphysis pubis joint (SPJ) on the left, as well as lumbosacral pain with referred pain down the posterior right thigh. Additionally, the patient reported "heart burn" (reflux pain at the esophageal stomach hiatus).

Mrs. C received four chiropractic treatments. The techniques used aimed to improve the alignment of the lumbo pelvic girdle and myofascial release to the abdomen and diaphragm. After the first treatment, the baby dropped deeper into the pelvis and she reported moderate relief from reflux pain. She also reported an improvement in the SPJ, gluteal and leg pain after two weeks of care. Mrs. C reported feeling general improvement after chiropractic care. On the day of labor her waters broke naturally at 6pm but the contractions did not start. She was kept at the local hospital overnight as she was previously scheduled

for an induction in a few days. The contractions began the following morning after induction via a cyntosin drip, and she delivered her second child vaginally after 2 hours and 45 minutes with only entonox for analgesic support.

During labor Mrs. C was assisted by her birthing doula and did not require any medication or instrumentation. The position in which she labored was flexed over the back of the bed until the last minute when she delivered laying prone for the final few pushes. It was described by the patient as being very calm and much shorter than her first birth.

Mrs. C received post partum chiropractic care and reported that her pelvic joint pain improved instantly, except for some recurrent mild, intermittent sacroiliac (SIJ) discomfort.

*Third pregnancy:* Mrs C consulted me during a routine visit at 5<sup>1</sup>/<sub>2</sub> weeks gestation when she reported a dull ache in the symphysis pubis (SP) area and recurrent SIJ pain bilaterally. This was 23 months after the birth of her second child. She weighed 8 stones 6 (118 lbs) and is 5 feet 1 inch tall.

### **Chiropractic examination**

Observation revealed pronation of the right subtalar joint, and a right posterior rotation and tilt of the pelvic girdle. When the right foot was temporarily aligned in talar neutral position, the pelvic alignment improved and the SP discomfort reduced. Palpation revealed restricted articular motion and point tenderness of the right cuboid and cuneiform bone articulations on the right. The right sacroiliac joint was restricted and painful in posterior rotation and there was spinal joint restrictions noted of the T6/7 vertebral motion segment in extension and C2/3 in right rotation. The glutei muscle group and piriformis were tender and hypertonic on the right.

### **Clinical and working diagnosis**

Pelvic girdle and global joint laxity due to hormonal changes of the ligaments during pregnancy, aggravating a pronation of the right subtalar joint and thereby exacerbating

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bating an already existing pelvic girdle dysfunction and symphysis pubis dysfunction (SPD).<sup>1,2,3</sup>

### Treatment plan

The treatment plan was to offer chiropractic care tailored to the changes of pregnancy and improve the pelvic alignment without compromising the hyper mobile joint structures. This included specific, gentle diversified adjustments to the cervical, thoracic and lumbar spine as clinically indicated, with reduced rotation in side posture especially for the lumbar corrections. It also included corrections to improve joint malalignment of the hips, knee and feet.

The pelvic alignment would be corrected using Sacro Occipital Technique (SOT) blocks in the supine position and/or with gentle craniosacral techniques (low force/low amplitude), hereby improving the joint alignment of the SIJ and SP joint, and reducing the open wedge effect which could aggravate the hyper mobility and reduce the form and force closure effect of the pelvis.<sup>4,5,6</sup> The muscle and fascial tension of the pelvic, hip and abdominal tissues would be released using soft tissue and myofascial techniques. It was also recommended that she use a sacroiliac belt for pelvic support and stability. Mrs. C was educated throughout the pregnancy about the importance of addressing posture and core stability exercises early on and it was recommended she see a Pilates instructor for a one on one education on home exercises.<sup>7</sup> We discussed the importance of which brand of shoes to wear for pedal stability. It was also recommended she consult our in-house podiatrist to be evaluated for orthotics in order to improve the foot and ankle alignment and hopefully the pelvic alignment. She was also advised to continue receiving massage from her pregnancy massage therapist who would also give her assistance as a birthing doula during delivery.

### Chiropractic management

Mrs. C received 12 treatments over the next eight months and 3 sessions post partum.

After the second treatment the SP pain was virtually non-existent. At 20 weeks she reported “feeling fine” until she slept on her side on a sofa. On this occasion we discussed pelvic strengthening exercises which could be done on the physio-ball. This chiropractic care plan helped maintain the patient’s function with minimal discomfort until 30 weeks when it exacerbated again. This time it was painful during sleep and specifically in the round ligaments (lower abdomen; groin) after getting up from lying down. At this point therapeutics were focused on the abdomen and the supportive connective tissue structures of the uterus including

the round ligaments. We introduced the knee-chest table where the soft tissue structures of the abdomen and pelvis could be released easily as well as sacral release techniques. Gentle mobilization of the lumbar and thoracic spine was also performed using the same bench.

At 38 weeks Mrs C reported feeling much improved (so much so that she wanted to cancel her appointment). The baby was engaged at this point, lying in the occiput anterior position. During this second to last session we introduced a standing sacral release, aiming to increase the pelvic available space,<sup>8</sup> as well as a standing ischial spine release to gently stretch the pelvic floor aiding in the descent of the fetal head.<sup>9</sup>

During the visit at 39<sup>1</sup>/<sub>2</sub> weeks gestation Mrs. C had started pre-contractions. She reported feeling good in her pelvic joints and her lower back. Treatment was performed at this visit as usual.

### Post-natal history

Mrs. C delivered a baby boy at 40 weeks 2 days gestation, 2 years and 8 months after the second birth. Again, she was due to be induced on her due date if nothing happened naturally. Four days prior to a scheduled prenatal visit, there was reduced fetal movement. Mrs. C visited the midwife who sent her to the hospital suspecting gestational diabetes after an abnormal urine test. She was kept in the hospital overnight and labor was induced the next morning using a 'traditional' induction with a hormone pessary and several hours later she was offered a syntocinon drip. Once contractions began, the birth was very quick — 1<sup>1</sup>/<sub>2</sub> hours from ‘active’ or second stage labor to birth. She had a very calm delivery and lay on her left side during the entire birth.

Mrs. C came back 6 weeks postnatal and reported feeling sore from the birth and from the ergonomics of holding and feeding the baby. She reported no pelvic pain. She said she felt well at her second post natal visit 4 months post-partum. Chiropractic treatment was resumed with consideration to the hypermobility while breast feeding, as well as addressing postural issues concerning breastfeeding and holding the baby.

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## Part B: PODIATRY PRESENTERS

**Maninder Barbh, BSc (Hons), MChS, HPC,  
Yvette Mann, BSc (POD) Hons, MChS, HPC**

*Podiatrist & Chiropodist practicing at Luck's Yard Clinic,  
Portsmouth Road, Milford, Surrey, UK  
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Mrs. C consulted Miss Barbh presenting with Symphysis Pubis Dysfunction (SPD) in pregnancy. She was referred by Tone Tellefsen Hughes, a chiropractor in the same clinic. During the case history Mrs. C. reported that her pain was similar to the one she had experienced in her first pregnancy. It had occurred earlier in this pregnancy. Her symptoms included: pain in the pubic and groin area, slight back pain, pain on rotation of hip joint and pain walking and standing for long periods.

### Examination findings

Lack of external rotation of hip was noted, but internal and anterior movement were normal. Weak lateral muscles of leg and foot were found and she displayed a 'pronated foot-type': collapsing, abduction, eversion and dorsi flexion of the foot. One half of the pelvis was moving more than the other during the gait cycle and hence the area around the symphysis pubis would become tender.

At the second appointment to fit her devices a further reduction of external rotation from 40 to 20 degrees was noted. The symptoms had worsened and the excessive pronation had increased.

### Treatment

The three main parts of the foot are the forefoot, the

midfoot, and the hindfoot. The forefoot consists of the toes and the connecting long bones (the metatarsals). The midfoot, or arch, consists of five irregularly shaped tarsal bones, which are connected to the forefoot and hindfoot by muscles and the plantar fascia (arch ligament). The hindfoot, which is comprised of three joints, links the midfoot to the ankle (talus) and includes the heel bone (calcaneus). The heel is the largest bone in the foot and it joins the talus to form the subtalar joint.

In treating this patient, insoles were issued to correct the hindfoot to neutral and thus aiming to stabilise the pelvis and to limit the pelvic rotation and the waddling gait. This was more pronounced on the right side. The gait improved immediately as did the reduction of movement in the pelvis. Exercises were recommended to be performed in the in water, and to rest when there was a flare up and have chiropractic alignment treatment as well as muscle work for the soft tissue tension.

### Post treatment

Mrs C. felt much improvement with the insoles and was reviewed regularly during the pregnancy as there was some degree of change in her feet throughout. She has not had any treatments since pregnancy as she has felt well. During the check-up treatments Mrs. C reported that she was able to walk again pain-free and her back pain had reduced.

The exercises helped with movement in general. She was able to recognize 'flare-ups' and have her insoles adjusted according to changes of her feet during the pregnancy thus offering full support to the pelvis and reduce abnormal movement.

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## DISCUSSANT 1

**Yvette Mann, BSc (POD) Hons, MChS, HPC**

*Podiatrist & Chiropodist practicing at Luck's Yard Clinic,  
Portsmouth Road, Milford, Surrey, UK  
Email: enquiries@lucksyardclinic.com*

Podiatrists are seeing more patients during pregnancy with lower limb pain/discomfort, including hip, knee and foot pain.<sup>1</sup> When the symptoms tend to come mid to late pregnancy, it suggests that the biomechanical factors play a larger role than hormonal influences.

The type of insoles used to correct the lower limb biomechanics for pelvis stabilization depends on a number of factors including:

- 1) The stage of pregnancy
- 2) The degree of biomechanical abnormalities
- 3) History of pain (i.e., during previous pregnancies)

Chair side insoles usually using a suitable arch support and hindfoot posts, correct midfoot and hindfoot instability. These are very effective during later stages of pregnancy, where casted orthotics would be deemed too much for the body to adapt to.

'Off the shelf insoles' including the vasyli range of products, which have a standard arch support and an intrinsic rearfoot post of 2-6 degrees, help maintain a neutral subtalar joint position of the rearfoot are very useful for mild imbalance. These devices can be adapted easily during pregnancy. They are heat mouldable. Heel lifts can be added as well as rearfoot and forefoot posts where needed. The important thing is to treat each limb as a separate entity. If this is done correctly, after a thorough examination, then a more balanced and stable pelvis will be achieved.

Casted orthotics, where a cast is taken of both feet for absolute accuracy, are deemed in my view as safe in early stages of pregnancy, especially if the patient has known biomechanical issues even before pregnancy. Forefoot instability are very well corrected in the casting process which is difficult to achieve with all other types of devices.

Finding research to link pelvic girdle instability with lower limb biomechanical issues is very challenging, as is the success rate of treating the patient with insoles or orthotics.

Some podiatrists are still wary of treating pregnant women thus explaining why there is not enough research being carried out.

A very small trial of four patients was carried out in Prague by the Faculty of Physical Education and Sports trying to establish if there is a link between foot instability during pregnancy.<sup>2</sup> Unfortunately this particular trial was inconclusive but there is a very strong argument to say that a sample of just four women is too small. But it does show that there is interest in the topic to warrant carrying out research in the first place.

It is this author's hope that some day a long term randomized trial involving both pregnant and non-pregnant women with pelvic instability will be conducted with a focus on the success rates of improving pelvic stability through the use of insoles or orthotics. It would be very

interesting to see the outcome of such a study.

Clinically, from personal experience, all of my patients treated with insoles, simple, 'off the shelf' or casted orthotics, do feel more stable and generally feel more comfortable during the remainder of their pregnancy. This increased lower limb stability does allow chiropractors and other practitioners to work effectively without their good work being undone every time the patient takes a step after treatment.

The most important decision when treating patients with pelvic instability is to decide if treatment is appropriate, when to treat them and what type of shoe inserts/ devices are most suitable. It is also of importance to educate them about appropriate shoe and exercise/stretching routine and refer them to the appropriate chiropractor, Pilates teacher, physiotherapist or other therapists. It is imperative to do regular follow up visits during pregnancy to monitor any changes that may occur and to work as a team whenever possible.

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## DISCUSSANT 2

### **Bridget Lincoln, BSc**

*Bodyzone Pilates, Northfields, Lower Ham Lane, Elstead, Surrey, UK.  
Email: lincoln.bodyzone@tiscali.co.uk*

## Introduction

Mrs C commenced Pilates classes with me in November 2007. She recently had her second baby and during the pregnancy had suffered Symphysis Pubis Dysfunction (SPD).<sup>1</sup> She had seen a chiropractor throughout as well as receiving treatment from a podiatrist and massage therapist.

At the time that Mrs C started Pilates, she reported suffering daily back ache, sporadic lower back pain and upper back, neck and shoulder tension. She was keen to improve these symptoms, gain strength and prepare herself physically for a third pregnancy.

## Aims

The initial goal was to reduce lower back pain through increasing muscle strength around the pelvis, improving

mobility in tight joints and releasing tight muscles through flexibility.<sup>2</sup> It was important to avoid any movements that aggravated the SPD. It was apparent early on that all the exercises we covered in class could be done comfortably. By regularly following a low intensity programme it was hoped that Mrs C's back pain would reduce.

A secondary goal was to improve upper body posture to help relieve tension. Having two babies is very stressful for the upper body. Changes in posture during pregnancy, breastfeeding and increased breast weight, lifting, carrying and pushing a buggy all contribute to the postural changes that can be seen post-natally.

Pilates exercises are ideally suited for helping post-natal women.<sup>3</sup> The chest muscles are stretched and back extensors are strengthened. Scapula positioning is addressed along with the balance between neck flexor/extensor strength. Thoracic breathing helps to open the chest and lift the upper body into a better position.<sup>4,5,6</sup>

Exercises such as those done in Pilates bring about an increased awareness in one's body and how the body moves, balances and works.<sup>5,7,8</sup> Better posture, feeling stronger a flatter stomach and enhanced breathing all contribute to an improved body image and increased self confidence.<sup>6</sup>

### Outcome and discussion

Mrs C feels that all the goals were achieved over the year that she attended the Pilates classes. She stopped attending shortly after becoming pregnant with her third child.

It is important to note that Mrs C's class was a group of 12. The exercise programme she followed was a general format and though, of an appropriate level for her, it was not tailored to her specific needs.

It is also relevant to consider that throughout the time that she attended Pilates she was also receiving treatment from several other practitioners and that Pilates served as a valuable adjunct to support her neurologic integrity and rehabilitation as a pregnant and post-partum patient, as it does for all women during the stages of childbirth and post delivery.

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### DISCUSSANT 3

#### **Sarah Dowdeswell, RMT, APNT Dip (Well Mother)**

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Mrs C first came to me when she was 35 weeks pregnant with her second child. She was experiencing moderate to severe SPD, with pain presenting in the pubic area and at other times in the pelvis around the sacro iliac joint. We worked regularly to reduce muscle pain with deep tissue massage which was most effective in conjunction with chiropractic sessions. During massage, I used various techniques from sports and remedial,<sup>1</sup> MET to trigger point work,<sup>2</sup> none of which required contact with the actual painful area of the pubic bone. Direct pressure on the sacral area with the patient on all 4's was a good form of natural pain relief used both at home (having taught the technique to Mrs C's husband), and during labor. Particular emphasis was placed on relieving tight gluts, piriformis and all attachments to the sacrum and lumbar area supporting the physical changes of pregnancy, improving muscular and hormonal imbalances and realignment of the pelvis.

Following a first traumatic birth, building confidence to allow the thought of a vaginal delivery was the first major consideration to address.<sup>3</sup> Learning safe and effective positions during labor, breathing flow and finding her inner safehouse were all things that followed over the weeks when Mrs. C came for regular treatments. Her confidence grew knowing she would have continual support during the lead up to the birth and throughout labor — she felt safe and therefore relaxed. During labor we concentrated on massage and relaxation in between contractions, also

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introducing shiatsu point pressure to encourage downward movement.

During Mrs. C's third pregnancy, we implemented the techniques mentioned above and though birthing positions were slightly different from the second delivery, both were very calm, carried out in a peaceful and safe environment. Mrs. C put her complete trust in those around her to be able to accomplish two such wonderful birthing experiences. She achieved this through being well informed as to what she needed as her support network.

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## DISCUSSANT 4

### ***Tone Tellefsen Hughes, BSc. DC. FCC (paeds), FAECC (paeds)***

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## Chiropractic discussion

This is one of many cases where the chiropractor has been able to work with a team of therapists and a Pilates instructor in order to offer the best possible multi-disciplinary care to a patient during and after pregnancy. After nearly 20 years in practice, it is my clinical experience that the whole body needs to be addressed in conditions such as low back and pelvic girdle pain (PGP),<sup>1,2,3,4</sup> related to pregnancy, and special care needs to be focused on the feet and the hips. Also, when women have addressed the alignment of their feet and shoe-wear as well as using rehabilitation exercises and correcting their posture, they can self-manage their condition much more efficiently through their pregnancies, and recover faster after birth.

It is interesting to note that the choice of footwear is of more importance during the summer term, as many women choose to wear "flip-flops" (loose fitting, backless sandals), which offer no support to the ankle and arches of the feet.

Cases in my practice have also shown that many women may suffer from similar type of pelvic girdle pain (PGP)

symptoms during pregnancy, but with different hormonal and biomechanical causes.<sup>3</sup> Many women present with articular joint restrictions and many others display hypermobility of their pelvic joints. Occasionally some women may present with muscle dysfunction of the pelvic and hip region such as the adductors attaching to the SP joint, due to the imbalance from the feet or hip joints. There are also women that may also suffer from a combination of lumbar spine, pelvic girdle pain and soft tissue pain. It is the author's clinical experience that these are often the patients that suffer the most.

In 2003 C. Andrew wrote an article on symphysis pubis dysfunction.<sup>5</sup> She used feedback questionnaires from 23 patients from our practice. The outcome was that the women reported definite positive changes from receiving chiropractic care for SPD. All 23 women (100%) reported that they had experienced improvement, with 25% having a complete recovery, 62.5% moderate recovery and 12.5% showing a slight improvement. In summary, 75% of the patients felt a marked positive result from the chiropractic care. It is of vital concern that any chiropractors dealing with pregnant women have a thorough knowledge of the physiological and mechanical changes occurring during this time, in order to be able to offer the best possible and safe care for each individual woman that they see.<sup>6</sup>

The aim for the chiropractor should be to appropriately diagnose the patient's biomechanical profile and then tailor a suitable management program for her, including self-management help during this time.<sup>6</sup>

The challenge for the chiropractor is to ascertain if the pelvic girdle is causing pain and dysfunction due to joint malalignment, instability in one of more joints, general hypermobility or a combination of the above, including muscle imbalance, weakness or hypertonia. The chiropractor then needs to decide upon a course of treatment which may include corrective adjustments using high velocity thrust or mobilization-type corrections, or indeed non-dynamic low force adjustments such as SOT blocks. This could be in combination with muscle and soft tissue therapeutics such as massage, trigger point therapy, neuromuscular release techniques, as well as postural advice, muscle rehabilitation and stretching exercises.

Future research into this area of care needs to take into account that every woman has a different clinical profile with different biomechanical functions. We have to consider her previous medical history, including any injuries, her profession, hobbies (past and present) family

history, previous pregnancies, weight, current fitness and emotional well-being. It therefore gives the private clinician the scientific challenge to find enough women that we can divide into separate sub groups and equally find the corresponding control group in order to make the scientific data valuable.

As a profession we need to create and update clinical protocols and examination procedures that can help us to more specifically diagnose and determine if the pelvic structure is misaligned, hyper-mobile or unstable, so that we can safely tailor a specific treatment protocol for each individual person.<sup>7</sup>

PGP is historically a relatively poorly investigated condition in pregnancy which could potentially affect many aspects of a woman's life, including the social, professional and psychological sides, as well as her family relations.<sup>2,4</sup> We must therefore be vigilant in addressing these symptoms early on in pregnancy, or ideally before conception, to reduce the pain and stress this could cause.

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## PATIENT REFLECTION

### Mrs. C., Patient

The combined care and support I received during my second and particularly my third pregnancy was instrumental in the management of my pelvic-girdle pain. My SPD began at just 6 weeks with my third pregnancy, which filled me with horror and fear of what was to come, but through a program of chiropractic treatments, podiatry supports in my shoes, reflexology and deep-tissue massage my condition was controlled and my pain reduced. Exercise and maintaining muscle strength were also important contributing factors — I swam 1,800m twice weekly until 38.5 weeks and did weekly pilates sessions until 26 weeks. At 36 weeks I was pain-free and continued to be so for the rest of my final pregnancy.



# Abstracts of Interest

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**Freeman MP. Complementary and alternative medicine for perinatal depression. *J Affect Disord* 2009 Jan;112(1-3):1-10. Epub 2008 Aug 8.**

**INTRODUCTION:** Perinatal Major Depressive Disorder (MDD) is common and poses particular treatment dilemmas. Complementary and Alternative Medicine (CAM) treatments are widely used, accessible, and understudied for well-defined psychiatric indications. Women are more likely than men to both suffer from MDD and use CAM. **METHODS:** A PubMed/Medline search was conducted to assess the evidence base for commonly utilized CAM treatments, MDD, and perinatal depression. **RESULTS:** Among CAM treatments, omega-3 fatty acids have received the most specific study in terms of epidemiological, preclinical, and clinical research for perinatal depression. Three randomized placebo-controlled trials have been conducted in which investigators assessed omega-3 fatty acids vs. placebo for perinatal depression, with conflicting results. CAM interventions that can be easily added to a treatment plan with little risk and general health benefits for most women include omega-3 fatty acids, exercise, and folate, although data are insufficient at this time to recommend any of these as monotherapy for perinatal depression. S-adenosyl-methionine (SAME) and bright light therapy may be reasonable to consider based on the evidence in MDD. St. John's Wort requires further study with regard to safety in pregnancy, and drug interactions can be a potential problem. **DISCUSSION:** Further study is required to elucidate the role of CAM treatments for perinatal depression, and the clinical context of perinatal depression requires safe, effective, and accessible treatment options.

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**Hartvigsen J, Hestbaek L. Children and chiropractic care: a window of opportunity. *J Manipulative Physiol Ther* 2009;32(8):603-605.**

Health and lifestyle early in life have profound impact on health and quality of life in later years. Common public health problems such as musculoskeletal disorders, cardiovascular disease, and depression tend to cluster in individuals, and this pattern is established early. At present, no health care profession has convincingly assumed the responsibility of spinal and musculoskeletal health for children. Considering the magnitude of the challenges ahead for both researchers and clinicians, this may be a good opportunity for doctors of chiropractic to take responsibility and engage in a determined effort to bring forward evidence-based strategies for prevention of spinal

pain and other musculoskeletal problems. Chiropractors may play a significant role in finding and implementing evidence-based prevention and treatment strategies aimed at infants, children, and adolescents.

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**Hong P, Lago D, Sargeant J, Pellman L, Magit AE, Pransky SM. Defining ankyloglossia: a case series of anterior and posterior tongue ties. *Int J Pediatr Otorhinolaryngol* 2010 Sep;74(9):1003-6. Epub 2010 Jun 16.**

**INTRODUCTION:** Ankyloglossia is a congenital condition in which tongue mobility is limited due to an abnormality of the lingual frenulum. The impact of ankyloglossia on breastfeeding is poorly understood but there is a recent trend toward more recognition of this condition and early intervention when needed. Currently, there lacks clear definition of ankyloglossia and different subtypes have been proposed with no clinical correlation. **OBJECTIVE:** To determine the prevalence of anterior versus posterior ankyloglossia in a large series of consecutive patients and to assess clinical outcomes after frenotomy. **METHODS:** Retrospective chart review of patients from July 2007 to July 2009 who were diagnosed with ankyloglossia and underwent office frenotomy. Baseline characteristics, specific feeding issues, type of ankyloglossia, and clinical outcomes after frenotomy were reviewed. **RESULTS:** Of the 341 total patients, 322 (94%) had anterior ankyloglossia and 19 (6%) had posterior ankyloglossia. Median age at presentation was 2.7 weeks (range 1 day of life to 24 weeks); 227 were males and 114 were females. Revision frenotomy rates were significantly higher for the posterior ankyloglossia group (3.7% anterior and 21.1% posterior,  $p=0.008$ ). **CONCLUSION:** Anterior ankyloglossia is much more common and readily managed when compared to posterior ankyloglossia. Posterior ankyloglossia is a poorly recognized condition that may contribute to breastfeeding difficulties. The diagnosis is difficult due to the subtle clinical findings but relevant health care providers should be aware of this condition. Frenotomy is a simple, safe, and effective intervention for ankyloglossia which improves breastfeeding.

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**Kalder M, Knoblauch K, Hrgovic I, Münstedt K. Use of complementary and alternative medicine during pregnancy and delivery. *Arch Gynecol Obstet* 2010 Feb 23. [Epub ahead of print].**

**PURPOSE:** To assess the use of complementary and al-

ternative medicine (CAM) during pregnancy and birth and the reasons behind it from the patient's perspective. **METHODS:** In a prospective study, we assessed the use of CAM before and during pregnancy as well as during delivery in women by means of a self-report questionnaire. **RESULTS:** Some 205 patients completed the questionnaire at a response rate of 43.2% (205/475) and 104 women used CAM during pregnancy, especially homoeopathy, acupuncture, and phytotherapy. Stepwise regression analysis identified CAM use prior to pregnancy, greater income, and nationality as the most important predictors of CAM use. **Conclusions:** In accordance with earlier studies from Germany, we determined the most important methods used in the field of obstetrics. Interestingly, these are not evidence-based and those methods which are evidence-based are not now used. Also, the predictors of CAM use in pregnancy were similar to those in oncology. Future studies should focus on the safety and efficacy of CAM in pregnancy.

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**Khorsan R, Hawk C, Lisi AJ, Kizhakkeveettil A. Manipulative therapy for pregnancy and related conditions: a systematic review. *Obstetr & Gynecol Survey* 2009;64(6):416-427.**

**OBJECTIVE:** The objective of this review is to evaluate the evidence on the effects of Spinal Manipulative Therapy (SMT) on back pain and other related symptoms during pregnancy. **DATA SOURCES:** A literature search was conducted using Pubmed, Manual, Alternative and Natural Therapy Index System, Cumulated Index to Nursing and Allied Health, Index to Chiropractic Literature, the Cochrane Library, and Google Scholar. In addition hand searches and reference tracking were also performed, and the citation list was assessed for comprehensiveness by content experts. **METHODS OF STUDY SELECTION:** This review was limited to peer-reviewed manuscripts published in English from 1966 until September 2008. The initial search strategy yielded 140 citations of which 12 studies were reviewed for quality. **TABULATION, INTEGRATION, AND RESULTS:** The methodological quality of the included studies was assessed independently using quality checklists of the Scottish Intercollegiate Guidelines Network and Council on Chiropractic Guidelines and Practice Parameters. The review indicates that the use of SMT during pregnancy to reduce back pain and other related symptoms is supported by limited evidence. **CONCLUSION:** Overall, this body of evidence is best described as emergent. However, since effective treatments for pregnancy-related back pain are limited, clinicians

may want to consider SMT as a treatment option, if no contraindications are present.

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**Malloy MH. Infant outcomes of Certified Nurse Midwife attended home births: United States 2000 to 2004. *J Perinatol* 2010;30(9):622-627.**

**OBJECTIVE:** Home births attended by certified nurse midwives (CNMs) make up an extremely small proportion of births in the United States (<1.0%) and are not supported by the American College of Obstetrics and Gynecology (ACOG). The primary objective of this analysis was to examine the safety of certified nurse midwife attended home deliveries compared with certified nurse midwife in-hospital deliveries in the United States as measured by the risk of adverse infant outcomes among women with term, singleton, vaginal deliveries. **STUDY DESIGN:** United States linked birth and infant death files for the years 2000 to 2004 were used for the analysis. Adverse neonatal outcomes including death were determined by place of birth and attendant type for in-hospital certified nurse midwife, in-hospital 'other' midwife, home certified nurse midwife, home 'other' midwife, and free-standing birth center certified nurse midwife deliveries. **RESULT:** For the 5-year period there were 1,237,129 in-hospital certified nurse midwife attended births; 17,389 in-hospital 'other' midwife attended births; 13,529 home certified nurse midwife attended births; 42,375 home 'other' midwife attended births; and 25,319 birthing center certified nurse midwife attended births. The neonatal mortality rate per 1000 live births for each of these categories was, respectively, 0.5 (deaths=614), 0.4 (deaths=7), 1.0 (deaths=14), 1.8 (deaths=75), and 0.6 (deaths=16). The adjusted odds ratio (95% confidence interval) for neonatal mortality for home certified nurse midwife attended deliveries vs in-hospital certified nurse midwife attended deliveries was 2.02 (1.18, 3.45). **CONCLUSION:** Deliveries at home attended by CNMs and 'other midwives' were associated with higher risks for mortality than deliveries in-hospital by CNMs.

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**Menacker F, MacDorman MF, Declercq E. Neonatal mortality risk for repeat Cesarean compared to vaginal birth after Cesarean (VBAC) deliveries in the United States, 1998-2002 birth cohorts. *Maternal and Child Health J* 2010;14(2):147-154.**

To examine trends in repeat cesarean delivery, the characteristics of women who have repeat cesareans, and the risk of neonatal mortality for repeat cesarean birth com-

pared to vaginal birth after cesarean (VBAC). Trends and characteristics of repeat cesareans were examined for: the period 1998-2002 for [1] all births, [2] low-risk births (singleton, term, vertex births) and [3] "no indicated risk" (NIR) births (singleton, term, vertex presentation births with no reported medical risks or complications). For low-risk and NIR births, neonatal mortality rates for repeat cesareans and VBACs were compared. Multivariate logistic regression was used to examine the risk of neonatal mortality for repeat cesareans and VBACs, after controlling for demographic and health factors. In 2002 the repeat cesarean rate was 87.4%, and varied little by maternal risk status or by demographic and health characteristics. From 1998-2002 rates increased by 20% for low risk and by 21% for NIR births, respectively. For low-risk women for the 1998-2002 birth cohorts, the adjusted odds ratio for neonatal mortality associated with repeat cesarean delivery (compared with VBAC) was 1.36 (95% C.I. 1.20-1.55). For NIR women, the adjusted odds ratio was 1.24 (0.99-1.55). The experience of a prior cesarean has apparently become a major indication for a repeat cesarean. Regardless of maternal risk status, almost 90% of women with a prior cesarean have a subsequent (i.e., repeat) cesarean delivery. This is the case even if there was no other reported medical indication. Our findings do not support the widely-held belief that neonatal mortality risk is significantly lower for repeat cesarean compared to VBAC delivery.

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**Mercer JS, Vohr BR, Erickson-Owens DA, Padbury JF, Oh W. Seven-month developmental outcomes of very low birth weight infants enrolled in a randomized controlled trial of delayed versus immediate cord clamping. *J Perinatol* 2010;30(1):11-6. Epub 2009 Oct 22.**

**OBJECTIVE:** The results from our previous trial revealed that infants with delayed cord clamping (DCC) had significantly lesser intraventricular hemorrhage (IVH) and late-onset sepsis (LOS) than infants with immediate cord clamping (ICC). A priori, we hypothesized that infants with DCC would have better motor function by 7 months corrected age. **STUDY DESIGN:** Infants between 24 and 31 weeks were randomized to ICC or DCC and follow-up evaluation was completed at 7 months corrected age. **RESULT:** We found no differences in the Bayley Scales of Infant Development (BSID) scores between the DCC and ICC groups. However, a regression model of effects of DCC on motor scores controlling for gestational age, IVH, bronchopulmonary dysplasia, sepsis and male gender suggested higher motor scores of male infants with DCC. **CONCLUSION:** DCC at birth seems to be protective of

very low birth weight male infants against motor disability at 7 months corrected age.

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**Miller JE, Miller L, Sulesund AK, Yevtushenko A. Contribution of chiropractic therapy to resolving suboptimal breastfeeding: a case series of 114 infants. *J Manipulative Physiol Ther* 2009;32(8):670-674.**

**OBJECTIVE:** The purpose of this study was to describe the circumstances, clinical features, role, and results of chiropractic management of infants who were referred to a chiropractic clinic for failure to adequately feed at the breast. **METHODS:** Clinical case series of 114 infant cases of hospital-diagnosed or lactation consultant diagnosed feeding problems that were treated with chiropractic therapy in addition to routine care and followed to short-term result. **RESULTS:** The most common age of referral was 1 week (mean, 3 weeks; range, 2 days-12 weeks), and the most common physical findings were cervical posterior joint dysfunction (89%), temporomandibular joint imbalance (36%), and inadequate suck reflex (34%). Treatment was chiropractic therapy in addition to any support given elsewhere. All children showed some improvement with 78% (N=89) being able to exclusively breast feed after 2 to 5 treatments within a 2-week time period. **CONCLUSION:** Cooperative multidisciplinary care to support breastfeeding was demonstrated in this population. Chiropractic treatment may be a useful adjunct to routine care given by other professionals in cases of diagnosed breastfeeding problems with a biomechanical component.

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**Miller JE, Phillips HL. Long-term effects of infant colic: a survey comparison of chiropractic treatment and nontreatment groups. *J Manipulative Physiol Ther* 2009;32(8): 635-638.**

**OBJECTIVE:** Investigation into the alleviation of long-term effects of infant colic on the toddler is a neglected area of research. The aim of this study was to document any behavioral or sleep disturbances experienced by post-colicky toddlers who were previously treated with chiropractic care vs those who had not experienced this treatment as an infant. **METHODS:** Two groups of children were sampled from clinic records from a chiropractic clinic and from a child care center in similar regions of England. Patients were classified in the treatment group if they had been treated for infant colic with routine low-force chiropractic manual therapy. The nontreatment group consisted of post-colicky children in the same age group who had received no chiropractic care

for their diagnosed colic as infants. A survey of parents of 117 post-colicky toddlers in a treatment group and 111 toddlers in the nontreatment group was performed. **RESULTS:** Toddlers who were treated with chiropractic care for colic were twice as likely to not experience long-term sequelae of infant colic, such as temper tantrums (relative risk, 2.0; 95% confidence interval, 1.3-3.0) and frequent nocturnal waking (relative risk, 2.0; 95% confidence interval, 1.5-2.8) than those who were not treated with chiropractic care as colicky infants. **CONCLUSION:** Untreated post-colicky infants demonstrated negative behavioral patterns at 2 to 3 years of age. In this study, parents of infants treated with chiropractic care for excessive crying did not report as many difficult behavioral and sleep patterns of their toddlers. These findings suggest that chiropractic care for infants with colic may have an effect on long-term sequelae.

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**Murphy DR, Bender MI, Green G. Uterine Fibroid Mimicking Lumbar Radiculopathy: A Case Report. *Spine (Phila Pa 1976)* 2010 Nov 15;35(24):E1435-E1437.**

**STUDY DESIGN:** Case report. **OBJECTIVE:** To present the case of a patient with low back and lower extremity pain suspected to result from lumbar radiculopathy but who was discovered to have symptomatic uterine fibroid (UF). **SUMMARY OF BACKGROUND DATA:** UFs are usually asymptomatic but at times can produce symptoms such as excessive menstrual bleeding, intermenstrual bleeding, dysmenorrhea, pelvic pain, pelvic pressure, bloating, dyspareunia, urinary and bowel disturbance, subfertility, and pregnancy-related complications. In rare cases, they can cause neural impingement leading to lower extremity pain, which can be mistaken for lumbar radiculopathy. **METHODS:** The patient was a 44-year-old woman who presented with low back pain and left leg pain. Examination suggested lumbar radiculopathy but lumbar magnetic resonance imaging was negative with the exception of a large mass in the pelvis. Pelvic magnetic resonance imaging confirmed this to be a large UF. **RESULTS:** The patient's symptoms completely resolved following hysterectomy. **CONCLUSION:** In a female patient with suspected radiculopathy, in whom lumbar imaging is negative, or who does not respond as expected to treatment, UF should be considered.

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**Murphy DR, Hurwitz EL, McGovern EE. Outcome of pregnancy-related lumbopelvic pain treated according to a diagnosis-based decision rule: a prospective observational cohort study. *J Manipulative Physiol Ther* 2009;32(8):616-624.**

**OBJECTIVE:** The purpose of this study was to describe the clinical outcomes of patients with pregnancy-related lumbopelvic pain (PRLP) treated according to a diagnosis-based clinical decision rule. **METHODS:** This was a prospective observational cohort of consecutive patients with PRLP. Data on 115 patients were collected at baseline and on 78 patients at the end of the active treatment. Disability was measured using the Bournemouth Disability Questionnaire (BDQ). Pain intensity was measured using the Numerical Rating Scale for pain (NRS). Patients were also asked to self-rate their improvement. Care was provided by a chiropractic physician/physical therapist team. **RESULTS:** Fifty-seven patients (73%) reported their improvement as either "excellent" or "good." The mean patient-rated improvement was 61.5%. The mean improvement in BDQ was 17.8 points. The mean percentage of improvement in BDQ was 39% and the median was 48%. Mean improvement in pain was 2.9 points. Fifty-one percent of the patients had experienced clinically significant improvement in disability and 67% patients had experienced clinically significant improvement in pain. Patients were seen an average 6.8 visits. Follow-up data for an average of 11 months after the end of treatment were collected on 61 patients. Upon follow-up, 85.5% of patients rated their improvement as either "excellent" or "good." The mean patient-rated improvement was 83.2%. The mean improvement in BDQ was 28.1 points. The mean percentage of improvement in BDQ was 68% and the median was 87.5%. Mean improvement in pain was 3.5 points. Seventy-three percent of the patients had experienced clinically significant improvement in disability and 82% patients had experienced clinically significant improvement in pain. **CONCLUSIONS:** The management strategy used in this study appeared to yield favorable outcomes in this patient population and appears to be a safe option for patients with PRLP, although because of this study's sample size, rare complications are not likely to be detected. In addition, the absence of randomization and a control group limits interpretation with regard to clinical effectiveness. Randomized, controlled trials are necessary to distinguish treatment effects.

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**Pohlman KA, Potocki EN, Lawrence DJ. A descriptive analysis and checklist critique of the articles in the *Journal of Clinical Chiropractic Pediatrics*, 1996 to 2007. *J Manipulative Physiol Ther* 2009;32(8):654-659.**

**OBJECTIVE:** The purpose of this study was to conduct a bibliographic analysis and assessment of the literature published in the *Journal of Clinical Chiropractic Pediatrics*

(*JCCP*). **METHODS:** The content of the 13 existing issues of the *JCCP* (1996-2007) were assessed. Articles were categorized by type, and information concerning author affiliation, academic/professional background and gender were tabulated. A second-level analysis applied specific criteria checklists to applicable articles to determine the quality rating of each paper. **RESULTS:** There were 72 articles included in the analysis, of which 46% were case reports, 17% editorials, 13% case series, 10% narrative literature reviews, 10% commentaries, 4% "other," and 1% cross-sectional studies. Seventy-five percent of the authors were "private practitioners." A certification in chiropractic pediatrics was held by 43% of the authors; 65% of the authors were females, and 83% of the articles had a single author. After applying the checklist to specific articles, 13 articles (18%) scored 40% or better (range of 40%-67%), whereas 59 articles (82%) scored less than 40%. **CONCLUSIONS:** The findings of this analysis suggest there is room for improvement in article type and publication quality of papers in the *JCCP*.

**Rikke Damkjær Maimburg RD, Bech BH, Væth M, Møller-Madsen B, Olsen J. Neonatal jaundice, autism, and other disorders of psychological development. *Pediatrics* 2010;126(5):872-878**

**OBJECTIVES:** The goals were to study the association between neonatal jaundice and disorders of psychological development in a national, population-based cohort and to study whether gestational age, parity, and season of birth influenced that association. **METHODS:** A population-based, follow-up study of all children born alive in Denmark between 1994 and 2004 (N=733,826) was performed, with data collected from 4 national registers. Survival analysis was used to calculate hazard ratios (HRs). **RESULTS:** Exposure to jaundice in neonates was associated with increased risk of disorders of psychological development for children born at term. The excess risk of developing a disorder in the spectrum of psychological development disorders after exposure to jaundice as a neonate was between 56% (HR: 1.56 [95% confidence interval [CI]: 1.05-2.30]) and 88% (HR: 1.88 [95% CI: 1.17-3.02]). The excess risk of infantile autism was 67% (HR: 1.67 [95% CI: 1.03-2.71]). This risk for infantile autism was higher if the child was conceived by a parous woman (HR: 2.71 [95% CI: 1.57-4.66]) or was born between October and March (HR: 2.21 [95% CI: 1.24-3.94]). The risk for infantile autism disappeared if the child was conceived by a primiparous woman (HR: 0.58 [95% CI: 0.18-1.83]) or was born between April and

September (HR: 1.02 [95% CI: 0.41-2.50]). Similar risk patterns were found for the whole spectrum of autistic disorders. **CONCLUSIONS:** Neonatal jaundice in children born at term is associated with disorders of psychological development. Parity and season of birth seem to play important roles.

**Rubin D. Resolution of breech presentation using an Activator adjusting instrument to administer Webster's Technique in three women undergoing chiropractic care. *J Pediatr Matern & Fam Health - Chiropr* 2010 (1):Online Access only p 18-21.**

**OBJECTIVE:** To describe the results obtained in three women with breech presentations (In-Utero Constraint) who experienced a turning of the fetus using the Activator Adjusting Instrument (AAI) in conjunction with the Webster's Protocol. **CLINICAL FEATURES:** Three women presented to the author's office specifically for reduction of In Utero Constraint and were found to have subluxations consistent with the Webster analysis and protocol. **INTERVENTIONS AND OUTCOMES:** Webster's Technique was administered with the sacral component completed using the Activator adjusting instrument. Each fetus successfully turned within 4 visits. Of the three, two went on to have normal vaginal deliveries while one developed other complications during delivery and required an emergency C-section. **CONCLUSION:** The Activator Adjusting Instrument was used successfully in these cases to reduce the posterior sacral subluxation component of the Webster In-Utero Constraint Technique.

**Smith JF, Eisenberg ML, Millstein SG, Nachtigall RD, Shindel AW, Wing H, Cedars M, Pasch L, Katz PP; Infertility Outcomes Program Project Group. The use of complementary and alternative fertility treatment in couples seeking fertility care: data from a prospective cohort in the United States. *Fertil Steril* 2010 May 1;93(7):2169-74. Epub 2010 Mar 24.**

**OBJECTIVE:** To determine the prevalence of complementary and alternative medicine (CAM) use among couples seeking fertility care and to identify the predictors of CAM use in this population. **DESIGN:** Prospective cohort study. **SETTING:** Eight community and academic infertility practices. **PATIENT(S):** A total of 428 couples presenting for an infertility evaluation. **INTERVENTION(S):** Interviews and questionnaires. **MAIN OUTCOME MEASURE(S):** Prevalence of com-

plementary and alternative medicine therapy. **RESULT(S):** After 18 months of observation, 29% of the couples had utilized a CAM modality for treatment of infertility; 22% had tried acupuncture, 17% herbal therapy, 5% a form of body work, and 1% meditation. An annual household income of > or = \$200,000 (odds ratio 2.8, relative to couples earning <\$100,000), not achieving a pregnancy (odds ratio 2.3), and a positive attitude toward CAM use at baseline were independently associated with CAM use. **CONCLUSION(S):** A substantial minority of infertile couples use CAM treatments. CAM was chosen most commonly by wealthier couples, those not achieving a pregnancy, and those with a baseline belief in the effectiveness of CAM treatments.

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**Stone JA, Yoder KK, Case EA. Delivery of a full-term pregnancy after TCM treatment in a previously infertile patient diagnosed with polycystic ovary syndrome. *Altern Ther Health Med* 2009 Jan-Feb;15(1):50-2.**

There is a growing body of literature supporting the use of traditional Chinese medicine (TCM) for increasing the likelihood of conception and carrying a pregnancy to term. The use of TCM in fertility treatment is becoming more widely recognized, and several clinical trials are being supported by the National Center for Complementary and Alternative Medicine to assess the efficacy of such treatments, as evidenced by the listings in the National Institutes of Health's Computer Retrieval of Information on Scientific Projects (CRISP) database. In addition to subjecting TCM to the rigors of Western scientific standards, it is important that TCM and other CAM practitioners share their expertise and practical experiences through case reports in the same spirit that their Western medical counterparts do. This dissemination of knowledge is critical in increasing awareness about TCM within the broader scientific community. The clinical case report presented here describes the course of TCM treatment that resulted in a successful pregnancy in a previously infertile woman who had been diagnosed with polycystic ovary syndrome (PCOS). It also illustrates the importance of the need for collaborative efforts between TCM and Western medical practitioners.

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**Van Poecke J, Cunliffe C. Chiropractic treatment for primary nocturnal enuresis: a case series of 33 consecutive patients. *J Manipulative Physiol Ther* 2009;32(8):675-681.**

**OBJECTIVE:** The purpose of this study was to evaluate

the effect of a specific type of chiropractic treatment on the wet night frequency of patients between the ages of 3 and 18 years who were treated for primary nocturnal enuresis (PNE) in the chiropractic setting. **CLINICAL FEATURES:** Thirty-three consecutive patient records, dating over a 3-year period, of children 3 to 18 years old who had been treated for PNE using a form of chiropractic treatment method (NeuroImpulse Protocol) were included. **INTERVENTION AND OUTCOME:** All patient records were analyzed for a baseline wet night frequency and at 3, 6, 9, and 12 months after the commencement of treatment. Data were collected regarding the number of treatment visits over the 12-month period and the presence of constipation and/or positive family history at presentation. Data were analyzed using descriptive statistics, Friedman's test, and Dunn's Multiple Comparison test. Of the 33 patient records analyzed, 22 showed resolution of PNE during the 12 months after commencement of chiropractic care. The mean number of treatments in the responders group was  $2.05 \pm 1.33$ . Ten responders presented with constipation and a further 8 with a positive family history of PNE. Resolution of constipation was noted to be essential to the successful response to treatment. A combination of constipation and positive family history at presentation represented a poor prognostic factor. **CONCLUSIONS:** There was a 66.6% resolution rate within 1 year in 33 consecutive children and teenagers who experienced PNE. This study provides an indication for possible effectiveness of chiropractic treatment in patients with PNE.

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**Zoorob RJ, Sidani M, Williams J, Grief SN. Women's health: selected topics. *Prim Care* 2010 Jun;37(2):367-87.**

Complementary and alternative medicine (CAM) therapies have become increasingly popular for the treatment of a variety of conditions. The World Health Organization has recognized the value of traditional healing techniques, which are classified as CAM, for 30 years. In the United States nearly 50% of women use CAM for common medical conditions, significantly more than men. This pattern is frequently seen in the treatment of women's health conditions such as infertility, premenstrual syndrome, and menopause. This article provides an integrative approach for conditions commonly encountered in the primary care setting among women, discusses alternative therapies used to treat these health conditions, and provides an evidence-based summary of recommendations based on a review of the literature.

**Breastfeeding Report Card — United States, 2010. Centers for Disease Control and Prevention, 1600 Clifton Rd, Atlanta, GA 30333. Accessed at: <http://www.cdc.gov/breastfeeding/data/reportcard.htm>**

**BACKGROUND:** Improving the health of mothers and their children is a primary goal of the Centers for Disease Control and Prevention (CDC). Protecting, promoting, and supporting breastfeeding, with its many known benefits for infants, children, and mothers, is a key strategy toward this goal. There are many different ways that communities support mothers and babies to breastfeed, and everyone plays a role. The CDC Breastfeeding Report Card provides

state-by-state data so that health professionals, legislators, employers, business owners, community advocates and family members can work together to protect, promote, and support breastfeeding. The Report Card indicators measure types of support in key community settings as well as the most current data on the breastfeeding goals outlined in *Healthy People 2010*. The Report Card brings together all of this information to help tell the story of breastfeeding practices in your state. It condenses many types of data so that community partners can monitor progress, celebrate state successes, and identify opportunities for growth and improvement.



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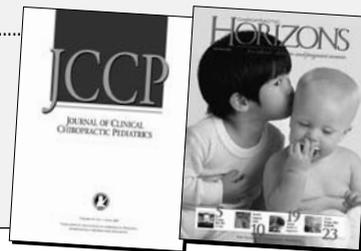
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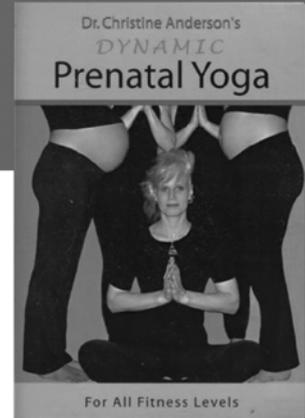
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