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JCCP JOURNAL OF CLINICAL CHIROPRACTIC PEDIATRICS

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Case Report Components

- **Introduction:** State why this case is unusual or important.
- **Methods:** describe the search engine and key words used to review previously published literature on the subject
- **Case presentation:** Provide a brief summary of the pa-

tient's presenting demographics, other relevant characteristics, complaint(s) and related symptomatology.

- **Intervention and outcomes:** Describe the course of treatment, including frequency and duration, and summarize the patient's clinical outcomes, using recognized outcome measures if possible. Include whether informed consent was obtained and if there were any adverse events reported.

- **Discussion:** Succinctly state the important aspects of the case, in terms of its implications for patient care in general, or for specific patient populations or conditions. You may also compare/contrast the case to other cases in the published literature. Be cautious about overstating the importance/implications of your case.

Evidence-based Case Report Instructions

An Evidence-based Case Report (EBCR) is NOT the same as a traditional case report. The EBCR focuses on an answerable clinical question, how it was explored in the search, appraising the results and how it applies to the case, along with the integration of this information with the patient interaction. The final stage in this process is to audit the results.

These are the steps to include:^{1,2}

- Brief summary of the chief complaint: 50-100 words
- Briefly describe the clinical case: 250-400 words
- Explain how you developed the clinical question: 200-300 words
- Explain your search for evidence (key words, databases used, number of articles retrieved): 50-100 words
- Evaluate the articles retrieved: critically appraise the evidence for validity and relevance: 200-300 words
- Describe how you made your clinical decision by applying these findings to the case, including how you considered and integrated the patient's preferences and values: 250-400 words
- Evaluate your performance: 50-100 words

1. Heneghan C, Badenoch D. *Evidence-based Medicine Toolkit*, 2nd ed. Oxford, UK: Blackwell Publishing, 2006.

<http://onlinelibrary.wiley.com/doi/10.1002/9780470750605.index/summary> (download pdf of "all chapters" for free copy of the publication)

2. Jones-Harris AR. The evidence-based case report: a resource pack for chiropractors. *Clin Chiropr* 2003;6 73-84. (download for free from www.chiro.org/cases/FULL/Evidence-based_Case_Report.pdf)

Additional interesting articles to read about EBM and writing and EBCR:

Review an example of an EBCR at:

<https://www.ncbi.nlm.nih.gov/uidm/oclc.org/pmc/articles/PMC1126937/pdf/302.pdf>

Iran J Pediatr. 2010 Sep; 20(3): 261—268. Evidence Based Medicine in Pediatric Practice: Brief Review

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3446038/>

J Can Chiropr Assoc. 2014 March; 58(1): 6—7. **Evidence-based case reports**

<http://pubmedcentralcanada.ca/pmcc/articles/PMC3924510/>

3 BMJ. Vol 7, Issue 3, 2002, **Evidence-Based Medicine in Practice: EBM Notebook**

<http://ebm.bmj.com/content/7/3/68>

Developing the Core of Pediatric Chiropractic Leadership

By Sharon Vallone, DC, DICCP, FICCP

Time passes unnoticed as we do what we love to do in our offices on a daily basis. Working with children and their families fuels the passion we have as chiropractors to serve their health care needs with a safe and effective alternative to the barrage of chemical and surgical interventions that are too readily offered to treat symptoms without first exploring and correcting the root of the problem. The foundation of health rests on the triad of chemical, structural and spiritual/emotional balance and although these interventions may save lives in emergent situations, any long-term improvements in health must address all of these.

As chiropractors, we address biomechanical dysfunction — we adjust the subluxation. Our treatment restores movement to the joint in turn affecting the local neural, vascular and lymphatic activity while restoring smoother communication to the central nervous system. The profound interplay between functional movement and neurology, therefore physiologic homeostasis, is being explored by other scientific bodies giving credibility to the original chiropractic premise. Therefore, we too need to remain on the cutting edge forever questioning, exploring and researching why what we offer our patients is so effective.

Time may continue to pass unnoticed, But WE must pause now and take notice! Our profession needs to continue developing its leadership to take us into the future. Leadership is about stepping up to whatever challenges are before us.

Personally and professionally, one of the first requirements of leadership is being an effective and powerful communicator. Whether it is your communication to (or about) your patients or other professionals, tweeting and blogging, to being a public speaker or author, few of us are born with the skills but are very capable of acquiring them. We acquire them through education and experience. Practice! Practice! There are books, podcasts, blogs and professional organizations that one can utilize to improve communication skills that will make you an effective leader in all of your pursuits.

Leadership is also developed by pursuing advanced education to hone specific interests or to explore completely new ones (like public speaking, professional writing or coaching the Special Olympics Baseball Team!). Those new ideas and techniques will be applied, perhaps, for example, in the office setting with patients or in the community, and then, with repetition and experience, sharing them as an instructor ranging from small groups to a university setting. Some

of our leaders administrate in a social media forum where rapid fire ideas about managing your practice, chiropractic techniques and individual clinical cases are exchanged on a daily basis. Some of our leaders share their wisdom with us as chiropractors helping us learn to care for ourselves, support our own passion to serve, or to build healthy, ethical financial stability to care for our families. The opportunities to teach are diverse and plentiful.

I can see some of you shaking your heads and declining the challenge. But I assure you, you are already on the path. Leadership begins in the home with our families. To quote a popular meme: “Children will follow what they see you do, not what they hear you say.” If what we accomplish in this life is to raise healthy, happy, responsible children to adulthood, we’ve accomplished a very important goal.

Leadership in the workplace is demonstrated by our integrity, fairness, dependability and self-motivation. This again, is the example we set but also the bar we raise for our employees as we hold them accountable to develop those same strengths in their interaction with you and your patients.

Leadership with our patients is provided by our service to educate and support them as they seek their own journey to health. We can only bring our patients as far as we are willing to work ourselves. It is a collaborative effort on many levels!

We all have the opportunity to provide leadership in our volunteer activities in our community and in our profession. Having the courage to step forward and volunteer, knowing you may not immediately succeed but being courageous enough to try and ask for support in areas you may need mentoring. To be willing to put in the time and do the most mundane or seemingly insignificant task that might be the cornerstone of accomplishing the ultimate goal for an individual (like a political campaigner who licks the envelopes for contribution requests) or an organization (like handing out playbills at your child’s orchestra performance)... No service is too small and each person who offers to help is a leader, an example of selflessness.

Professionally your leadership may move you to a role in your state, nationally or even internationally. We do not all have the desire to serve in this capacity but without those who do, we would have no forward progress let alone security to retain the gains we’ve already made. We are a pyramid of leaders each holding the next one on our shoulders.

Leadership doesn’t always put each one of us in the spotlight. It often can be helping others be in the spotlight. A

leader may help you rehearse your talk for the PTA, or edit your submission to the local newspaper. A leader may pass on an opportunity to appear on TV or request you represent the profession in front of the state legislature because they will be out of town. A true leader may be an excellent delegator who can identify and encourage the best person for the job to take the lead.

I have been blessed with the opportunity to be mentored by many of the great leaders, many in the chiropractic profession, too numerous to list without fear of leaving an important person out. To them, I am forever grateful for molding me both personally and professionally. I have also the joy of being touched by so many of our young leaders who hold the promise of our future. I encourage them to, in the words of a popular author, "Rise Strong!" I would also like to share with you the advice of the woman, Dr. Lorraine Golden, who showed me my own future in chiropractic:

"SERVICE is the best public relations that the chiropractic profession can ever have. We should never start any project with the sole purpose of getting something out of it as far as our profession is concerned. If the project is begun and carried out with the idea of serving the public — or a group of people in the general public — then it cannot help but succeed when it is pursued with the firm belief that it WILL succeed. There is work to be done— much work — so



The late Lorraine M. Golden, D.C., founder and executive director of Kentuckiana Children's Center, Louisville, Kentucky.

there must be people to do that work. When the foundation of a program is simply that of service, then individual differences are submerged in the sea of common interest. What better unity can be hoped for than the binding force of accomplishing together some project that seeks only to benefit persons outside the profession?"

Improvements in a three-year-old girl diagnosed with autism spectrum disorder following a trial of chiropractic care: a case report

By Stephanie K. Makela, DC¹

1. Associate chiropractor in private practice, Cedar Rapids, Iowa, USA.

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ABSTRACT

Introduction: This case report describes the effects of chiropractic care on a three-year-old girl who was previously diagnosed with autism spectrum disorder (ASD) experiencing significant language delays as well as delays in other aspects of development including sociability, cognitive awareness, and behavior. The patient was followed for a period of seven months. **Presenting Concerns:** A three-year-old girl diagnosed with ASD was brought into the chiropractic office by her mother for a trial of chiropractic care. The patient was non-verbal, walked on her toes and was often “off-balance” when walking. Temper tantrums often ensued when the patient was touched by someone. The patient’s mother was hoping for a general reduction of ASD symptoms. **Interventions:** Chiropractic care commenced and initial treatment plan was to see the patient for 12 visits over a six-week period. The examination had to be tailored to the patient based on her ability and willingness to comply with instructions. Spinal manipulations, also called chiropractic adjustments, were performed using a spring-loaded instrument. **Outcomes:** The patient’s mother reported improvements in all areas of development over the course of the treatment. Improvements were documented in cognitive awareness, sociability, and behavior, as measured objectively by the Autism Treatment Evaluation Checklist (ATEC), which the patient’s mother completed before treatment and after the initial six weeks. Before starting treatment, the ATEC composite score was 105; after six weeks of care the composite score dropped to 63. The patient’s mother, who was satisfied with the outcomes, chose to continue treatment and completed the ATEC monthly. After seven months of care, the ATEC composite score was a 32. **Conclusion:** This case report helps to strengthen the relationship between correcting subluxations and the improvements in the myriad of symptoms of children diagnosed with ASD.

Key Words: spinal manipulation, chiropractic adjustment, autism, neurodevelopmental disorders, ATEC

Introduction

Autism spectrum disorder (ASD) is a complex developmental disorder that can cause problems with cognition (thinking), emotion (feeling), language (talking) and sociability (the ability to relate to others). It is a neurological disorder affecting the higher order functions of the brain. The effects of autism and the severity of symptoms are different in each person.¹ In 2018, the Centers for Disease Control (CDC) reported that 1 in 59 children are reported as having ASD.² According to the Center for Disease Control’s *Community Report on Autism* released in 2016, the economic burden of treatment for individuals nationwide diagnosed with ASD from birth to age 17 was estimated to be between \$11.5-\$60.9 billion per year in the United States.³

There is no known cure for ASD, and all medical treatments that are offered today are applied on an individual basis to help reduce the symptoms of ASD and support the child’s learning and development. These can include but are not limited to behavior and communication therapies, occupational therapy, family and educational therapies, and medications which can be prescribed to assist with the symptoms that are associated with ASD. Medications are often

prescribed to help hyperactivity; behavioral problems are often treated with antipsychotic drugs; and antidepressants may be prescribed for anxiety or anxiety-like symptoms.⁴

In an article written by Gleberzon on the chiropractic management of children with autism, he broke down the treatment of children with autism into two categories. The first type is Applied Behavioral Analysis (ABA), which primarily concentrates on helping the child master life skills, such as dressing or bathroom habits, by taking complex tasks and breaking them down into smaller parts eventually combining them all in order to complete the entire task.⁵ The second category covers additional therapies that the child may need such as speech, occupational, or physical therapies, and helping to improve social relationships.^{5,6}

There is limited research done on chiropractic and the management of children with ASD. In 2011, Alcantara, J et al published a systematic review on the topic of chiropractic care and ASD. Included were five articles, including three case reports, one cohort study, and one randomized comparison trial.⁷ This was followed by Kronau et al in 2016, whose systematic review revealed one uncontrolled, ran-

domized, clinical trial, one case series, and 11 case reports.⁸ This demonstrates the need for more research regarding the effectiveness of chiropractic care in the treatment and management of ASD, as the majority of the published literature on this topic consists of case reports.

The following case report discusses a three-year-old female patient diagnosed with ASD, who presented in the author's chiropractic office for a trial of subluxation-based chiropractic care. The patient's name was changed in this report in order to protect patient confidentiality.

Presenting Concerns

Maggie presented to the author's chiropractic practice with her mother. Maggie's mother explained that Maggie was previously diagnosed with Autism Spectrum Disorder. She could not communicate verbally and did not use non-verbal cues (i.e. pointing for basic needs or sign language). The only way that Maggie was able to communicate was through crying and occasionally a guttural sound. The patient's mother also reported that Maggie did not like to be touched. She stated that occasionally Maggie acted as though she did not notice that she was being touched, but other times, a temper tantrum ensued when someone touched her. It was also reported that Maggie would be "off balance" often when on her feet and would run into things when walking or running. Maggie's mother stated that Maggie walked on her toes 50% of the time.

Clinical Findings

Relevant History

This was the mother's first pregnancy. She reported that she was taking the anti-nausea drug, Zofran until she was into the third trimester, but discontinued it before she gave birth. Her labor was long, lasting over 24 hours. Her water broke spontaneously after she was admitted into the hospital. Meconium was present in the amniotic fluid. An epidural was administered for pain relief. Due to the inability to coordinate her pushes, both vacuum and forceps were applied during the vaginal delivery. Maggie's mother reported a large amount of swelling on Maggie's head after her birth due to the use of the vacuum. The baby presented with a nuchal chord and was cyanotic. Oxygen was immediately administered. The neonate was transported to NICU and retained for two days to monitor her urination, her bilirubin levels and pO₂. The hematoma on her head prompted frequent subsequent measurements of head circumference for her first year of life. By the time Maggie reached her first birthday, her doctor was comfortable with her measurements and progressive growth and discontinued the practice. All vaccinations were given on the schedule currently recommended by the American Academy of Pediatrics (AAP).

Maggie's mother reported that Maggie had a very healthy

childhood and had only been on two courses of antibiotics during her lifetime. Maggie had no known allergies and was breastfed until nine months of age. It was reported that Maggie had no issues sleeping and slept around 10 hours per night with minimal disturbances. Maggie had a good appetite and was only a picky eater "occasionally." Maggie's mother stated that the child had some repetitive or "stimming" behaviors, the most prevalent one being the flapping of her hands and arms. Maggie also still wore a diaper and was not "potty trained."

Relevant Co-morbidities and/or Interventions

Maggie was officially given her diagnosis of ASD at 18 months of age, with the official diagnosis coming before her fourth birthday. Maggie then began in-home speech therapy 1-2 times per week until she turned three years old. Concurrently, once Maggie turned two years old, she also attended private speech therapy once per week. Private speech therapy was still ongoing at the time of her first chiropractic appointment. In addition, Maggie started occupational therapy when she was two-and-one-half-years-old where she worked on activities of daily living (ADL's) such as dressing herself and brushing her teeth. She also started physical therapy at this time because Maggie was walking on her toes 100% of the time as well as running into walls when she walked (See Timeline/Table 1). At the time that the author saw Maggie for the first time at three years old, she was still predominantly toe-walking, but no longer consistently walking into walls. She was unable to independently dress herself or brush her teeth on her own. Her mother was hoping for a reduction of overall symptoms relating to ASD.

Physical Examination Findings

The physical exam was modified based on Maggie's co-

| Year | Treatment for ASD symptoms |
|---------------------|---|
| April 2015 | Concerns relating to ASD began |
| April 2015-Dec 2016 | In-home speech therapy 1-2x/week |
| April 2016 | Physical and Occupational Therapy started (still happening presently) |
| December 2016 | Private speech therapy 1x/week (still happening presently) |
| Spring 2017 | Aquatic Therapy started (8 weeks) |
| September 2017 | Chiropractic care was initiated |
| November 2017 | Official ASD diagnosis |
| Fall 2017 | Second session of Aquatic Therapy started (8 weeks) |
| Spring 2018 | Equine Therapy started (8 weeks) |
| In the Future | ABA (Applied Behavioral Analysis) Therapy planned |

Table 1. Timeline

operation. Upon observation, a right head tilt with anterior head carriage and a left rotated pelvis was noted. The patient had an elevated right shoulder when comparing the acromion processes bilaterally. Maggie presented with genu valgus, toeing out/foot flare of the left foot and toe walking. When testing eye movement, patient would not focus on the object that the author was using in order to test the patient's visual tracking ability. The patient would not allow the author to test any reflexes. The patient had a leg length difference that was noted both when lying supine as well as prone. The left leg was short by 1/2". This leg length was a functional one, meaning that the leg length difference, based on the position of the individual innominate and the change in the height of the acetabulum, was corrected once the adjustment was completed. An anatomical leg length difference means that there is an anatomical reason for the legs to be different lengths (previous fracture, growth plate issues, etc) and therefore cannot be influenced by a chiropractic adjustment. In Maggie's case, her leg length difference was functional. Maggie did not make eye contact with the author nor her mother at any time during the examination. In addition, she did not respond to her name being said or called at any point. Muscle hypertonicity was evaluated by the use of static palpation, with the highest tone being in the sub-occipital muscle group. Spinal segment misalignments were determined by the use of motion palpation. An anterior-superior occiput was noted, as well as a right laterality of atlas and a posterior inferior ilium on the left.

Diagnostic Focus and Assessment

Before Maggie's adjustment, the author had Maggie's mother fill out the Autism Treatment Evaluation Checklist (ATEC) form so that she could more adequately track Maggie's progress. The Autism Research Institute in San Diego, California developed the Autism Treatment Evaluation Checklist for the purpose of allowing caregivers to track changes in ASD symptoms over a period of time, which allows practitioners the ability to more easily track the effectiveness of any given treatment.⁹ The questionnaire is available online and it is free to access as well as score once it is completed. The ATEC measures four areas of the child's development, including Speech/Language/Communication, Sociability, Sensory/Cognitive Awareness, and Health/Physical/Behavior subscales by asking the parent 77 questions within these subscales. Each area is then given a score, which are then combined to calculate a total score which ranges from 0-180. The higher the total score, the more impairment the child is experiencing. A total score above 104 indicates that the child is severely autistic, scores between 50-104 indicate moderate symptoms, scores between 30-50 indicate that the child may lead a partially independent life, and scores of less than 30 indicate that the child could lead a normal and independent life.⁹

Therapeutic Focus and Assessment

Chiropractic care commenced with an anticipated treatment plan of 12 visits over a period of six weeks. One of Maggie's 12 visits was not completed due to a scheduling conflict and it was unable to be rescheduled. In that six week period, Maggie was given a spinal manipulation, also called a chiropractic adjustment, on 11 occasions using a spring-loaded instrument-assisted technique. As outlined above, Maggie's occiput, atlas, and left ilium were adjusted, if indicated, during each visit. In addition, other vertebral segments were found and corrected as needed.

Follow-up and Outcomes

The results of Maggie's first ATEC resulted in a total composite score of 105. Her speech/language communication score was 23 out of a possible 28. She scored a 23 in the sociability subscale out of a possible 40. In the sensory/cognitive awareness portion, she scored a 25 out of a possible 36 and in the health/physical/behavior section, she scored a 33 out of 75. After the fourth adjustment, Maggie held eye contact with her mom for five seconds. Her mother reported that this was the first time that Maggie made purposeful eye contact with her. At the sixth adjustment, her mother reported that Maggie verbalized what she thought was "dada" for the first time. At visit seven, Maggie's mother stated that there had been a "big change" in the amount of eye contact that Maggie does now as well as her demeanor or being much calmer when they are at home. By visit 10, Maggie started to smile and her mother reported that at home, she has responded much more when hearing voices. At visit 11, Maggie touched the author's face when the author adjusted her and she held the author's hand after the adjustment was completed. No adverse reactions to treatment were reported during this time. After six weeks of care, Maggie's mother completed another ATEC at which time her composite score dropped to a 63. The scores of the subscales consisted of a 23 in speech/language/communication, 13 in sociability, 9 in sensory/cognitive awareness, and 18 in health/physical/behavior.

After completing the follow-up ATEC and going over it with Maggie's mother, she stated that she was excited about the changes going on with Maggie and wanted to continue with care. At this point, we agreed upon a treatment plan that included Maggie being adjusted two times per week and we would track her progress with the ATEC monthly. Within this next month, there was one week that the author's did not see Maggie due to Maggie having a virus. The author hypothesized that this break in care could have been part of the reason that her score on the next ATEC increased by 5 points. For all of the following months, the patient was seen on schedule and was compliant following the prescribed treatment plan.

No adverse reactions were seen or reported, and positive

progress was documented per the results of the monthly tracking of the ATEC scores (Figures 1 & 2). Significant changes were observed as follows: In mid-December, Maggie's mother reported that she was laughing more at home. Sometimes the laughter was spontaneous, but other times, she was laughing appropriately at things that were funny. In early January, Maggie signed the word "want" appropriately without being prompted. In early February, it was reported that Maggie was starting to wave "bye-bye" to people more often. By late February, Maggie could recognize all the letters in her name and recognize numbers 1-5. In mid-March, Maggie started to point to things that she wanted and started to express more emotions, including giving hugs and blowing kisses. The patient's mother was extremely pleased with the progress and the changes that occurred in the patient from the time that she started her care until the present. At any point during the course of her treatment, Maggie's mother reported that she had no nega-

tive reactions to treatment. Maggie is still currently under care.

Discussion

A three-year old girl diagnosed with autism spectrum disorder saw significant improvements in almost all areas of development after six weeks of care. That improvement continued over time as her treatment continued. The only area that did not demonstrate significant improvement was her speech/language/communication. Improvement, although minimal, was seen in how she is now pointing at things which she was not doing at the start of Maggie's treatment. The improvement was noted subjectively, as reported by Maggie's mother, as well as tracked objectively from the scoring of the ATEC. Data for this report was tracked for a total of seven months, but improvement continues to be noted, as Maggie is still currently under care.

This case is similar to other case reports published on this topic in that it demonstrates improvements in ASD symptoms after a trial course of chiropractic care. This case is different than other reports that have been published in the literature because most cases only discuss results over a short period of time, whereas the author has tracked improvement over the course of seven months.

Patient perspective

The patient's mother was thrilled with the progress that Maggie had made with chiropractic care. She stated that her speech therapist, occupational therapist, and physical therapist all had noticed positive changes in Maggie when they worked with her since she had started chiropractic care. They also reported that she was calmer and had a longer attention span.

Conclusion

Current literature suggests that a relationship might be established between adjusting the spine and lessening of symptoms associated with ASD. This case is no exception. However, although promising results are seen, this does not prove a cause-effect correlation. This case study helps to strengthen the relationship between correcting subluxations and the improvements of symptoms of children diagnosed with ASD, however, further studies documenting this relationship are needed. Future studies could investigate whether the patient maintains their ATEC scores without treatment or if they regress after cessation of care.

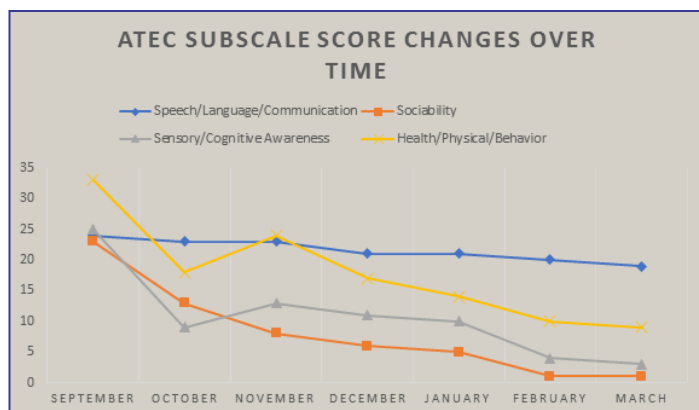


Figure 1.

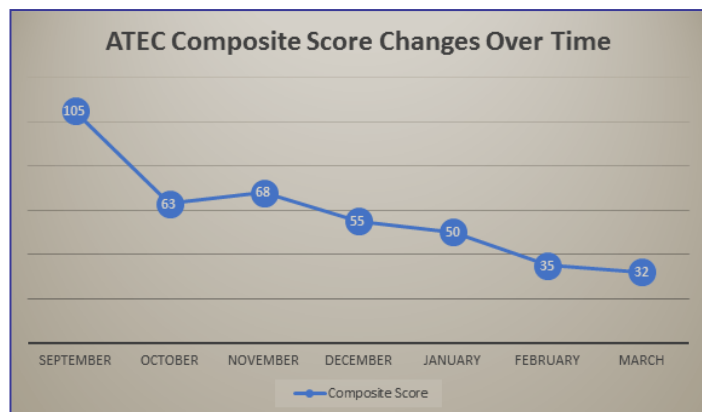


Figure 2.

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Functional constipation in children: which treatment is effective and safe? An evidence-based case report

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ABSTRACT

Introduction: Constipation is a frequent childhood complaint. 90% to 95% of the time it is characterized as a functional type. Chiropractic is a natural alternative frequently chosen for children with constipation. The purpose of this case report is to evaluate the safety and efficacy of the chiropractic adjustment vs the use of laxatives in the treatment of functional constipation. **Case report:** A 21-month female infant presented at the clinic with chronic constipation for the past 15 months. She had been on laxatives for the last 14 months. After the first chiropractic adjustment, the bowel movement improved to once every day or second day. **Methods:** The search was done on Medline via Ovid and on Pubmed. **Discussion:** The evidence points to the conclusion that laxatives are insufficiently tested for childhood constipation for safety, efficacy and side effects. The majority of patients treated in chiropractic showed improvement immediately after the first visit. **Conclusion:** Chiropractic experience-based practice showed positive results in functional constipation. Children and infants with constipation as with other conditions should be treated regarding all aspects of their health.

Key Words: evidence based case report, chiropractic; manual therapy, constipation, children, laxative, safety, effective

Introduction

Constipation is a common gastrointestinal problem in children, with a prevalence of 3% in the Western world.¹ Constipation is functional up to 90% to 95% of the time, which means that there is no underlying pathological condition. In 2006, the criteria for functional constipation in children were updated in the new Rome III criteria (Table 1).² The first step of treatment may consist of parental education in terms of dietary advice and behavioral modifications. If there is no rapid change in the condition, common medical clinical practice to treat children with constipation is to prescribe drugs, such as laxatives.

A study of Vlieger et al. showed that 36,4% of children with functional constipation opted for alternatives like acupuncture,

homeopathy, osteopathic and chiropractic manipulations, or even spiritual and psychological therapies.³ The chronicity of this condition is debilitating, and should be prevented. It may lead to distress and repercussions on the family's quality of life. Moreover, it puts the growing child at risk of missing developmental milestones, and suffering emotional and physical disturbances that can have consequences later in childhood and adulthood. Therefore, it is important to help these children return to health and normal bowel movements as soon as possible.

This evidence based case report⁴ is related to the case of a child who suffers from constipation. The child was successfully treated using an overall health approach and chiropractic manipulations.

Case Report History

A female infant of 21 months presented at the clinic with episodes of constipation for the past 15 months. The problem coincided with the introduction of solid food at six months old. The child's bowel movement occurred at intervals of five to six days. Her mother described her child's feces as "hard to the touch." The child appeared to strain excessively during the expulsion phase, and would sometime cry out in pain. On two occasions the child had rectal bleeding attributed to the hardness of the fecal matter.

The child's birth history revealed that she was delivered vaginally after 12 hours of labor without drugs and complications. She was the mother's first-born child and was full term at 38 weeks weighing five pounds and 14 ounces.

Symptoms must be present for at least 2 months

Presence of 2 or more of the following:

- Two of fewer defecations in the toilet per week
- At least one episode of fecal incontinence per week
- Stool-retentive posturing
- Painful or hard bowel movements
- Presence of a large fecal mass in the rectum
- Large diameter stools that may obstruct the toilet

Additional criteria:

- No evidence of organic etiology
- Criteria insufficient to indicate irritable bowel syndrome

Table 1. Rome III criteria

Her APGAR scores were 9-9 at birth at one minute and five minutes respectively.

The child was breastfed until she was four months old and had been given formula until she was one year of age. She started drinking cow's milk at one year of age. The mother reports that her daughter started to be constipated following the introduction of solid food at six months old.

The family seemed to have generally healthy approach treating the child's constipation. They followed a series of recommendations for treating constipation, such as: increasing fluid intake, taking prune juice, increasing fiber and encouraging the child through movement of the lower limbs and physical activities. After an unsuccessful month (at the age of seven months), the pediatrician recommended oral laxatives (Lax-A-Day: polyethylene glycol 3350). After taking the laxatives daily, the bowel movement became somewhat normal in frequency. At 20 months old, the mother tried to stop the medication, but the constipation came back immediately, so she reinitiated administration of the laxatives.

Examination

During the visual inspection, the child appeared to be a healthy 21-month-old girl, with appropriate motor and verbal developments. The abdominal examination revealed a belly with no tenderness or obvious masses during palpation.

Upon visual examination, no anomalies were visible to the naked eye, either to the skin or the position of bony landmarks. Static and motion vertebral palpation revealed subluxations at various spinal levels. In the cervical spine, there was lack of mobility at C2 in left lateral flexion and right rotation. Palpation of the thoracic region revealed a subluxation in extension at T4. There was increased tonicity in the right quadratus lumborum and the right gluteal muscles. The mobility of the right sacroiliac was moderately decreased, suggesting a postero-inferior sacroiliac subluxation. The mobility of L5 in right rotation was diminished. The chiropractic diagnosis of vertebral subluxations associated with constipation was posed.

Treatment

Informed consent was obtained from parents before initiating the treatment plan. Vertebral adjustments were performed using chiropractic Diversified Technique using modifications appropriate for the child's age and development. The technique was applied to the C2, T4, L5 vertebral segments, and the sacroiliac joints. The frequency of treatment was two times a week for the first four weeks. The prognosis was 50% improvement of the symptoms after one month of treatments. Re-evaluation was conducted after 10 visits. The schedule of treatment was decreased

thereafter to a frequency of once a month considering that the condition and the vertebral function were normalized.

Reinforcing the family's current healthy habits, additional nutritional and health advice was given to the mother. The taking of probiotics supplement daily was recommended on the initial visit. However, the mother had not started giving probiotics to her daughter until one month after the first treatment. The mother stopped giving her daughter the laxatives immediately after the first visit.

Outcome

Following the first chiropractic treatment, and with no further laxatives, the bowel movement improved to once every day or second day. There was no adverse reaction to adjustment reported at this point.

The chronology of events is outlined in Table 2.

Formulating the question

Idiopathic constipation is the most common gastrointestinal complaint in children. One may question the efficacy of laxatives knowing that "[...] only 50% of all children [on medication] for 6 to 12 months are found to recover and are successfully taken off laxatives".¹ Moreover, it is likely that the underlying cause of constipation is not corrected

| Year | Milestone |
|--------------------------------------|---|
| June 2016, 6 months old | Introduction of solid foods: the mother noticed constipation/a reduction in bowel movement. |
| During the month of June | The mother tried dietary advice: increasing fiber, fluid and prune juice. |
| July 2016, 7 months old | Pediatrician prescribed laxative. |
| August 2017 at 20 months old | The mother discontinued laxatives for two weeks with reoccurrence of constipation; The mother resumed administering her daughter's laxatives. |
| 30th September 2017 at 21 months old | First chiropractic visit; The mother stopped laxatives after the first visit; Bowel movements improved to once a day or two days. |
| End of October 2017 at 22 months old | The child started taking probiotics on a daily basis. |
| December 2017 at 24 months old | The child was under chiropractic care once every 4 weeks with no symptoms of constipation. |
| February 2018 at 26 months old | The child is still under chiropractic care once every 4 weeks and no reoccurrence for 5 months. |

Table 2. Timeline

when children are prescribed drugs to promote bowel movement. Is the prescription of laxatives evidence-based or is it simply habitual clinical practice? The perpetuation of this intestinal condition and the parents' desire to find a better alternative to medical treatment brings them to consult other health professionals. The clinical question can be formulated as such: Which option between laxatives or the chiropractic approach would be a more effective and safe treatment for functional constipation?

Methods

The search was conducted on Medline via Ovid. The MeSH headings "constipation and laxatives" and "safety and laxatives" were used by selecting Map Term to Subject Heading. It resulted in 982 and 241 articles respectively. By combining the first search with the second one, it resulted in 60 articles. This combination resulted in many articles on different types of laxatives and on various profiles of patients. To narrow the search the MeSH heading "child and constipation" was used. In combination with the previous heading, this last search gave 14 articles. These articles were comprised of two meta-analysis, seven reviews of literature, one randomized controlled trial, one clinical trial, one single-center open-label study and one case report. Of the 14 retrieved articles, four were directly relevant to our study. We searched also on PubMed to see if there were other interesting papers about the safety of constipation medications. We used the MeSH heading "constipation drugs effectiveness AND safety AND children". It resulted in 17 articles. Only one literature review by Wering et al. and one survey by Vlieger et al. were relevant to our subject.

On Medline via Ovid, we used the MeSH heading "constipation and chiropractic". We used the parent term "exploding" to be sure that other subheading in the same tree, such as manipulation, manual therapy and chiropractic manipulation, would be included. It resulted in three papers. These consisted in one case-series, one case control and one review. Of which, the review of Alcantara et al. was relevant. Using PubMed with the MeSH heading "non pharmacologic treatments AND constipation", resulted in 16 articles, but only one was relevant to chiropractic: a systematic review by Tabbers et al.

The heading of "safety AND chiropractic AND children" on Medline resulted in one retrospective study that was relevant. The same MeSH heading used on PubMed resulted in 34 studies. Only the review of Todd et al. was relevant.

The Evidence

Laxatives

The literature review by Pijpers et al. looked at the currently recommended treatments of childhood constipation. The medical treatments proposed were laxatives (polyethylene glycol, lactulose, etc.) and dietary fibers. Only one study

compared the effect of laxatives to placebo on children in the literature: the study showed that laxatives (polyethylene glycol) more effectively increased defecation frequency in the short term than the placebo. However, the study concluded that laxatives are insufficiently tested against placebo and other alternatives. Pijpers et al. states, "[...] it should be considered unethical to treat children without prior evidence for a beneficial effect of this treatment [the laxatives]." The authors noted that there was a lack of understanding of childhood constipation. Additionally, there was a lack of clarity in the effects of the laxatives, making it hard for the reviewer to compare the various results.⁵

Another review by Wering et al., evaluated whether constipation drugs were effective and safe. The article cautions that the safety of medication is difficult to estimate because the side effects were similar to the symptoms of constipated children. The side effects of laxatives were diarrhea, bloating, flatulence, nausea and abdominal cramping. An additional problem was that, before the age of two, children were not able to report verbally any side effects. The authors noted that only a small number of infants (0 to 2 y. o.) were investigated. In regards to the effectiveness of laxatives, there was a lack of studies with placebo-controlled trials on children. The main reason was that parents did not want their child to be treated with a placebo. The authors concluded that there was insufficient data to use laxatives in clinical practice for children: "(...) there should be large placebo-controlled trials on children with constipation to look at the safety, efficacy and side effects".²

A literature review by Tabbers et al. and a meta-analysis by Chen showed that 50% of children using laxative therapy had side effects such as abdominal pain, bloating, flatulence, diarrhea, nausea and a foul odor. They explored the issue that there were no studies looking at the possible long-term adverse effects in using these drugs. The authors postulate that changes in electrolyte balance, damage of the gastro-intestinal system or habituation could be possible side effects of long-term laxatives usage.^{1,10}

Chiropractic approach

Alcantara et al. reviewed the literature on the chiropractic care of children with constipation. This consisted of 14 case reports, one case series and one review of literature. The studies totaled 17 children from two weeks to eight years old struggling with constipation. The medical treatments, consisting of laxatives, suppositories, increased fluid intake and high fiber diet, were reported to be ineffective by the parents. The studies showed improvement of constipation after chiropractic care. The majority of which showed improvement immediately after the first visit. The studies utilized a variety of chiropractic manipulative therapy, the most common of which was the Diversified Technique (N=9).⁶

Tabbers et al. systematic review concerning non-pharmacologic treatments for pediatric constipation summarized the evidence for treatments like fiber and fluid intake, physical movement, probiotics, behavioral and alternative therapy. They noticed the lack of double-blind randomized controlled trials (RCTs) involving alternative therapy like the chiropractic approach. The author expressed that it was difficult to blind patients to their treatments when assessing the efficacy of manipulation. The study stated that the recommendation of such treatment has not been evaluated.⁷

A retrospective study of 781 pediatric patients (three years old or younger) who presented at a clinic of the Anglo-European College of Chiropractic in the United Kingdom between 2002 to 2004 showed 1% of patients reporting mild adverse reactions to chiropractic treatment lasting <24 hours (none requiring hospitalization). The parents reported the side effects that could have been only “perceived” as such (for example, increased irritability and crying).⁸

Another literature review looked at adverse events due to chiropractic or other manual therapies for infants. No deaths were associated with the treatments and seven serious events can be explained by a preexisting pathology or the utilization of inappropriate techniques.⁹

Conclusion

The guidelines for the treatment with pharmaceutical laxatives concerning children’s constipation are medical experience-based rather than evidence-based as Wering mentioned.² The effectiveness of laxatives is not showed in placebo-controlled trials, and does not warrant the widely accepted usage. We observe that there are side effects in using laxatives for children. Furthermore, we have no data concerning the long-term adverse effects on these children. The overall evidence for safety and effectiveness of laxatives is lacking.

In light of the reviewed literature, the prescription of pharmaceutical laxatives to children does not appear justified when the use of alternative, non-invasive, effective and natural treatments appear safe and effective for one of the most prevalent and long-lasting pediatric gastrointestinal disorders.

The search revealed a sizeable retrospective study as well as individual chiropractors who reported on the subject of

children constipation in case reports. The children reacted positively with alleviation of their symptoms of constipation after chiropractic care. Chiropractic experience-based practice showed positive results in functional constipation. It is, therefore, a reasonable clinical guideline that chiropractic care should be tried as a first option. Moreover, chiropractors may also give lifestyle recommendations that can benefit the patient on the long-term.

Chiropractic care in children is safe. Adverse events are rare, and generally mild or non-related. Chiropractors are well trained to conduct extensive patient histories, perform thorough examinations that can rule out anatomical or neurological anomalies, and can diagnose to appropriately select a technique that will prevent the risk of adverse events. Children and infants with constipation should be treated with chiropractic care regarding all aspects of their health. The chiropractor is a health professional that can give relevant advice in global health to promote the wellbeing of all children.

The mother in this case was very satisfied to have tried a natural and effective alternative to laxatives. She experienced a natural approach with good result rather than the trialed pharmaceutical which did not have a satisfactory result. She also discovered that chiropractic care could help her daughter with her overall health. She understood that we were not treating only the symptoms of constipation but also the whole person while alleviating the interference on her daughter’s nervous system so that her body could function at its best.

It appears from the evidence provided that chiropractic and laxatives is more experientially based than randomized controlled trials based. Knowing that the entry level of evidence start with some clinical experience, we should accept this and look at all the evidence that we have. It is our opinion that the first intervention favored should always be less invasive with fewer adverse effect. In this view, the evidence showed that chiropractic should be the first option in the treatment of chronic constipation.

In this paper, an experienced based case report is considered the first level of evidence. However, we should note that for the time being all the reporting of both chiropractic and laxatives is experientially or clinically based information.

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Chiropractic care of a 10-year-old female with primary nocturnal enuresis: a case report

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ABSTRACT

Introduction: Nocturnal enuresis is a common pediatric condition with low scientific value in literature. Nocturnal enuresis is a frequent complaint of patients who present to chiropractic clinics. Early management can often avoid the development of socially disruptive and stressful conditions in the future. The purpose of this study is the resolution of nocturnal enuresis in a 10-year-old female patient after receiving chiropractic care. **Design architecture:** Case report. **Methods:** Databases searched were PubMed, Mantis, Cochrane, Index to Chiropractic Literature, CINAHL and google scholar. Keywords were nocturnal enuresis, bedwetting, chiropractic, child and conservative management. **Presenting concerns:** A 10-year-old female child presented to the chiropractor's office alleging constant night-time bedwetting. This condition affected the self-esteem of the patient. Behavioral and medical approaches were unsuccessful. **Interventions:** The outcome measures assessed were the amount of urination (little, moderate or full diapers) against dry nights and the patient's overall sense of well-being rated on a global well-being scale. The patient completed the initial questionnaire and responded to the diagnostic criteria for nocturnal enuresis. A chiropractor performed an exhaustive history and spinal examination. The patient was treated on 14 occasions over 10 weeks. Throughout the 10 weeks, the patient kept a diary to record the number of wet and/or dry nights per week and a global well-being scale was completed at every second week until the end of the treatment plan. **Outcomes:** Results show a decline in nocturnal enuresis and at the end, complete resolution. Also, there was a positive change in the global well-being scale score of 10/10 by the end of the treatment plan. **Conclusion:** It appears that chiropractic treatment may have a role in the improvement of nocturnal enuresis.

Keywords: nocturnal enuresis, bedwetting, chiropractic, child and conservative management.

Introduction

Musculoskeletal conditions represent the most common chiropractic care visits in private clinics according to Humphreys et al (2007)¹ while the National Center of Health Statistics found that in the United States (2007), a large variety of other pediatric health conditions are also presenting in chiropractic clinics.² Enuresis is one of the issues that leads parents to seek complementary and alternative medicine (CAM) practitioners.² Nocturnal enuresis (NE) can be defined by the involuntary loss of urine during sleep, without organic disease at a developmental age of 5 years or older.³ NE occurs in 15% to 20% of children of five years of age, 5% of children of 10 years of age and 1% to 2% of those 15 years and older.³ Numerous causes could be associated with NE but it is yet not clear.³ Some factors that could contribute to it include physiological, psychological, genetic, or neurological developmental delays and the consumption of a diet or drinks with diuretic effects. Without any treatment, about 15% of bedwetting children are cured each year.⁴ The most commonly used treatments are pharmacological interventions (e.g., desmopressin, tricyclic drugs and many other drugs)⁵⁻⁷ and behavioral interventions (reward systems and alarms).⁸⁻¹⁰ According to Maternik et al, alarm therapy

is curative in 60% of children through conditioning effects on arousal and/or increasing bladder volume and approximately 70% of patients respond to desmopressin, but a high recurrence rate is observed following cessation of this therapy.¹¹ Both methods are equivalent first-line treatment options which can be proposed by the general practitioner. Alternative treatments such as acupuncture, homeopathy, hypnosis and chiropractic also exist.³ Only two randomized controlled trials (RCTs) on chiropractic interventions have been published.^{12,13} These trials suggest that there is a weak evidence for its effectiveness due to a randomization bias, lack of a strict treatment protocol and small trial according to the most recent publication by Hang and all three who have performed a Cochrane Database System review of all complementary and miscellaneous interventions for nocturnal enuresis in children.

Bedwetting can lead to a social and emotional stigma and reduce the quality of life for the patient.³ It may consequently affect the self-esteem of those with NE and generate stress factors for them and their families.³ However, early management can often prevent the development of socially disruptive stressful conditions in the future. Chiro-

practitioners receive patients with this condition in their clinic, and each child requires an individualized approach using best evidence. Therefore, the aim of this study is to document the resolution of nocturnal enuresis in a 10-year-old female patient after receiving chiropractic care. The outcome measures assessed were the change in the factors that diagnostically define NE and the patient's overall sense of well-being.

Reviews of the literature

To help present the chiropractic management and care of children with NE, a review of the literature was performed on the field. Using PubMed, Mantis, Cochrane, Index to Chiropractic Literature, CINAHL and Google Scholar. No date limit for studies was applied. Using the following keyword search: nocturnal enuresis OR bedwetting AND chiropractic AND child AND conservative management. Selection criteria were publication published in a peer-reviewed with English or French language journal, the population was 18 years old or younger and the subject related to chiropractic care of patient with NE in relation to bedwetting. Also, studies with other main complaints were excluded for example incontinence or constipation. Our literature search resulted with six case reports,¹⁴⁻¹⁹ one literature review,²⁰ one cohort,¹² one case series,²¹ one clinical trial¹³ and five systematic reviews^{3,10,22-24} on the two randomized controlled trials (RCTs).

Only two trials have been published on enuresis involving 171 and 46 children respectively.¹²⁻¹³ Spinal manipulation was performed by chiropractors only. The first trial by Leboeuf and colleagues reported inconclusive evidence for the effectiveness of chiropractic intervention for NE over other common types of therapy. The second trial revealed that the study results strongly suggest the effectiveness of chiropractic treatment for primary nocturnal enuresis by reducing bedwetting by 50 in 25% of patients in the chiropractic adjustment group compared to the nonresponsive group who concluded no improvement. Our literature searches were limited on this topic to document the chiropractic care of children with NE.

Case Presentation

The design of the study was in the form of a case report. The subject was a 10-year-old, Caucasian female brought in by her mother for an initial chiropractic evaluation seeking a second opinion about her unsuccessfully treated night-time bedwetting. The patient reported never experiencing a dry night. The quantity of urine was more abundant when she would sleep outside the home or when she would experience stress factors at school and when she was sick or tired. The child had no history of traumas, accidents or other injuries. There was no family history of NE declared or other comorbidities or complaints regarding the spine. During the chiropractic consultation, the mother reported that she

was concerned for her daughter's self-esteem as well. Her daughter has slept with pull-up diapers on since she was five years old. As their first choice of treatment, the mother tried behavioral therapy for a couple of weeks, which included waking her daughter up twice per night to urinate and avoid drinking after dinner but this approach was ineffective. Her primary medical doctor treated her with 60 µg of desmopressin once per day for 12 weeks without, unfortunately, any change in her bedwetting. Prior to the prescription of medication, the doctor had ruled out any abnormalities and organic cause by performing an ultrasound and urine tests which include, urinalysis and urine culture.

Physical Examination

The chiropractic examination revealed an unremarkable neurological and orthopedic examination. Motion palpation revealed a fixation of the posterior sacral base on the right side. There was also a palpable hypertonicity of the psoas muscle bilaterally. Visual postural examination revealed hyperlordosis of the lumbar spine.

The timeline (Table 1) shows the different interventions that were initiated chronologically.

| Year | Interventions |
|------------|---|
| 2013 | Mother first became aware of enuresis. |
| 2013-2014 | Behavioral therapy was initiated. |
| 2014-2015 | Ultrasound and urine tests were requested. |
| 2015-2016 | Began desmopressin treatment; no change after 12 weeks, so discontinued. |
| 2016-2017 | Wait and see, investigation to find a second opinion. |
| 2017-2018 | Chiropractic manipulation was initiated, 14 visits in 10 weeks. |
| March 2018 | Follow-up once a month, no symptoms of enuresis during the past 3 months. |

Table 1. Timeline

Diagnostic Assessment

It is not necessarily difficult to diagnose enuresis for health professionals, however, evaluating structure and function is important for the chiropractor to formulate an effective treatment plan. Many classifications and definitions of NE exist in the literature seen in previous years. The classification systems differentiate enuresis happening during the day versus occurring only at night, whether there were any organic diseases involved and/or whether there was a period of time in which the patient experienced dry nights before the onset of bedwetting.²⁵ In this case, the patient's

history should distinguish daytime voiding symptoms, as well as the frequency and timing of enuresis to differentiate between monosymptomatic (bedwetting and nocturia being the only symptoms) and non-monosymptomatic enuresis (incontinence, frequency, urgency, low-voided volume).²⁵ A distinction must also be made between primary enuresis which is defined as a child that was never “dry” for longer than six consecutive months, whereas the term secondary enuresis is used for enuresis symptoms with new onset after a dry period of six months.²⁶

Urinary incontinence can be related to numerous renal or neurological pathologies and metabolic diseases.²⁵ Due to the complexity of the differential diagnosis, it requires a collaborative evaluation for ruling out pathology as well as any structural cause of enuresis. Urine tests can be useful, most common urine dipstick examination to rule out a urinary tract infection and provide important indications on glucosuria, a possible first sign of diabetes mellitus but x-ray imaging is not often helpful²⁵ whereas ultrasonography can be useful to evaluate the anatomy.²⁵ In children, neurological imaging of the spine is only needed if there is a suspicion of an abnormality in the pelvis or lumbar spine like a tethered cord or a lipoma.²⁷ Usually, NE in children has a high rate of self-resolution and does not often need an intervention compared to children with daytime wetting with/without night-time wetting who very often have bladder-sphincter dysfunctions, which is in turn correlated with recurrent urinary tract infections.²⁸ Historically, chiropractors have maintained that enuresis responds well to chiropractic adjustments, but scientific literature does not corroborate this.

Enuresis is problematic after the age of five years old.²⁵ According to Thiedke²⁹ the diagnosis of a child up to six years of age should have one or more wetting episodes per month. To explain the neuromusculoskeletal diagnosis, chiropractors theorize that a spinal subluxation of the lumbosacral spine which could affect the bladder and kidneys.⁸

In chiropractic, a vertebral subluxation is a biomechanical change in the spinal column that causes neurological dysfunction.³⁰ The urinary bladder is supplied by both autonomic and somatic nerves emerging from the lumbopelvic region of the spine.³¹ Control of the detrusor muscle, which causes bladder emptying, and the external urethral sphincter originates from the S2-S4 segments of the spine.³² Rodnick and Rodnick provide evidence that neurological deficits are restored to their normal function by performing subluxation correction in the areas of the sacral segments of the spine.³² Based on this hypothesis, the relation between the NE in this case and the range of motion of the sacral joints support this reasoning with sacral base joint dysfunction of the patient. The latter had also never recorded any dry nights, without day enuresis and no other possible in-

dicators for renal or neurological pathology and metabolic disease found that could explain her problem. NE has a better prognosis than daytime enuresis.²⁵ No factors such as time, cost and patient preference were reported for this case.

Interventions

The patient received chiropractic care after obtaining the mother's informed consent. The treatment was based on the diversified technique and consisted of the manipulation of the sacrum using a high-velocity, low-amplitude thrust.³³ A posterior-anterior impulse was delivered to the right sacral base in a left side posture position of the patient at each visit. A cavitation of the joint was accomplished by the chiropractor using a left-handed piriformis contact. Soft tissue trigger points were addressed in the psoas muscles, giving direct pressure on the lesser trochanter of the femur on both sides with patient in dorsal decubitus. The patient was scheduled for treatment with a frequency of twice a week for the following four weeks and once a week for six weeks with re-evaluation of the patient's response to treatment upon each visit. A total of 14 treatments were accomplished and the patient was compliant with the treatment plan. The patient was also asked to perform Kegel exercises during the day at home and/or at school three times a day when she goes to the bathroom. Kegel exercises are used to increase pelvic muscle strength to treat stress, urge, and mixed incontinence.³⁴ According to the chiropractor's advice, the instructions were to stop the flow of the urine three times and hold it five seconds. A recommendation was also made to change her sleeping position. The child had the habit of sleeping prone; it was suggested that she sleep on one side or on her back to help to maintain the normal lordotic curve of her lumbar spine.

Follow-up and Outcomes

Upon each visit, several outcome measures were collected. These consisted of the volume of urine in the diaper and dry nights and the patient's overall sense of well-being rated on a global well-being scale. The NE diary yielded some interesting results (Table 2). After the first visit, the child was asked to complete a bedwetting diary and to write in it the possible associated factors/events according to relevance (parties, stressful events and homework) in order to help monitor the number of wet nights.³⁵

After the first week of treatment, an improvement was noted with the patient reporting two consecutive dry days. A re-evaluation of the right sacral base revealed a greater joint motion and decreased tenderness of the psoas on palpation. Upon the third treatment, the diary reported that she was no longer waking with fully wet pull-up diapers. Upon the fifth treatment, the child had been sleeping without NE for the past four nights. The patient was very happy and proud to show her bedwetting evolution in her diary.

| Week | Number of dry* nights per week | Volume of urination on the other days | Factors |
|------|--------------------------------|--|--|
| 1 | 2 | Moderate ^a to full ^b wetness** | |
| 2 | 2 | Little ^c to moderate no full wetness | |
| 3 | 4 | Little | |
| 4 | 0 | Two days full Four days little | Family parties Going to bed late |
| 5 | 1 | Full | Stressed at school Homework Influenza Antibiotics |
| 6 | 4 | Little | |
| 7 | 5 | Little | |
| 8 | 7 | | |
| 9 | 7 | | |
| 10 | 7 | | |

Table 2. Diary of bedwetting

* Dry night is when you do not wet your bed or your diaper.

**Wet night is when you wet your bed or your diaper.

a. Moderate: when the diaper is half wet.

b. Full: when the diaper is all wet.

c. Little: when there are a few drops of urine.

According to this information, the most important observation for the chiropractor is the number of dry nights. The volume of urination is subjective as identified by the patient.

Upon the eighth treatment, she reported that the week before, she had regressed and had woken on two consecutive mornings with full diapers followed by a smaller amount of voided night-time urine for four days in a row. Her mother reported that she had actively participated in family parties and that she had gone to bed late on the weekend previous to the regression. On the ninth visit, the mother claimed that the child had resumed night-time voiding frequently that week because she had been stressed by a heavy homework load for school. She had also succumbed to influenza and had been prescribed 10 days of antibiotics. On the 12th to 14th visits, it was reported that the child had been enuresis-free. This had been the longest dry period in the patient's lifetime. A positive change was noticed in the child whose mood had improved. There was also a resolution of the restriction in the joints of the sacrum upon chiropractic motion palpation. The psoas was completely relaxed, and there was no tension or tenderness noted on palpation.

The data collected from the patient's questionnaire was presented in tabular and graph form in order to track the

patient's progress with each outcome measure over time. The global well-being scale showed a gradual, progressive increase in well-being, with the patient feeling "great" by the end of the treatment (see Figure 1). Throughout the treatment plan, the patient was compliant with self-care recommendations and was doing regular Kegel exercises and was able to sleep on her back. The long-term follow-up at three months displayed continued resolution of NE and the patient's social life had improved including more frequent sleepovers with friends without the stress and fear of wetting the bed. No adverse events associated with her chiropractic treatments or recommendations were reported by the mother, and the child was always happy to come to the office for her treatment.

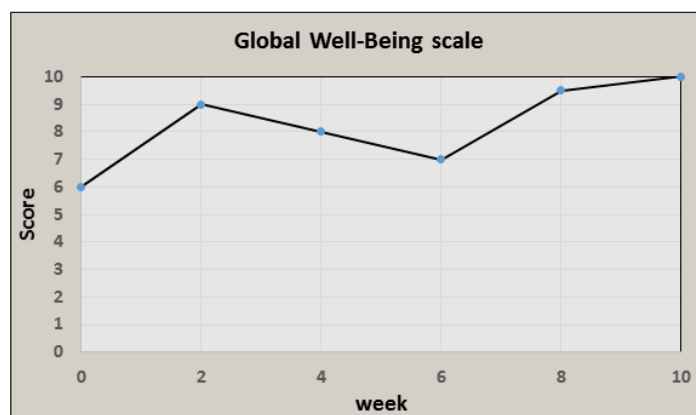


Figure 1. Results of global well-being for the duration of treatment

The objective of this study was to resolve NE in a 10-year-old female after chiropractic care. The interest in presenting this case report was based on previous studies that evaluated the enuresis care among health care professionals. The chiropractors who are most likely to encounter patients with NE should have basic knowledge of the condition and the ability to recognize those who got the diagnosis.

Children consult to treat the inconvenience of socially disruptive and emotional stress associated with NE.^{36,37} When chiropractors receive these patients, they should include conditions like bedwetting in their system survey. When discovered in the written intake or in the interview process, they should take the proper measures to ensure appropriate management. This is the reason why an integrative approach for a child who wets the bed with the inclusion of chiropractic care is encourage.

In this case, a diary was used to evaluate the quantity of bedwetting by using dry, little, moderate and full wetness. Table 2 gives a general indication of the degree of NE experienced by the patient throughout the study period. A decrease in the quantity of wet nights were noted after the first visits and the resolution of bedwetting came about af-

ter the 14th visit. We noted that multiples factors affected the pattern of NE with the patient's response to treatment such as stress factors. Another interesting result was the global sense of well-being. After the entire treatment plan, there was a significant improvement (Figure 1). The patient reported a global feeling of wellness of almost ten on ten, however many life factors can contribute to this. Sleep, social, emotional and chemical disorders can lead to a change in global comfort life too. Future studies may attempt to include these when assessing outcome measures by the use of a variety of additional questionnaires.

Limitations

The strongest limitation of this study is the small sample size because this is the only case. Causality cannot be established in case reports, the reader should not generalize from the presentation of the case. Multiple explanations could explain the beneficial effects reported in the case. Many factors are uncontrolled for this case report, for instance, lifestyle may interfere with the results. These successful outcomes contributing factors may include: placebo

effect, natural history, statistical regression and subjective validation. If the assessment of the outcomes following chiropractic care were not documented in the form of diary, then quantifiable improvements would be more difficult. Any events such as homework, holidays and diseases may affect the global sense of well-being around that time of treatment. The author is aware of the low level of evidence that a case report provides, but it is a platform from which to encourage further research and a good tool for the healthcare population to be aware of different approaches for the management of this condition.

Conclusion

Finally, it appears that chiropractic treatment may have a role in the improvement of NE. It is not appropriate to generalize the results to a larger population as this report is a trial based on findings in one person, however suggests the necessity of carrying out a more rigorous and further-designed study which includes control groups in order to sufficiently determine the efficiency of chiropractic treatment for patients with NE.

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Pediatric osteosarcoma of the knee: a case-report

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ABSTRACT

Introduction: The aim of this study is to help chiropractors and other healthcare professionals recognize the signs and symptoms that can lead to the identification of a malignant condition like an osteosarcoma, especially in cases where atypical pain presents in pediatric patients. **Clinical features:** A 13-year-old boy presented with severe knee pain resulting in the inability to bear weight. There were no obvious causes for the pain that had first developed 24 hours prior to the patient's visit to the chiropractor. Treatment primarily consisted of administering an x-ray that lead to the discovery of a malignant tumor on the right proximal tibia. **Interventions and outcomes:** The patient was sent to a pediatric hospital for further investigation which resulted in a diagnosis of primary metastatic osteosarcoma. Treatment consisted of total resection of the tumor, prosthetic reconstruction, and chemotherapy to eradicate the cancer. The patient is not yet in remission; however, there is no visible trace of malignancy. **Conclusion:** Pediatric malignant tumors are typically very aggressive; therefore, early detection of clinical presentations and timely intervention are crucial to improve the outcomes in pediatric patients with primary metastatic osteosarcoma. This particular patient was seen at the right time and a later diagnosis would have likely impacted his prognosis. This case report provides a good example of when to refer a patient. Articular manipulation in this case would have harmed the patient.¹

Key words: case report, osteosarcoma, pediatric cancer, osteogenic sarcoma, pediatric tumor

Introduction

Despite its rarity, osteosarcoma (OS) represents the second most common primary malignancy of bone, with approximately 800 new cases reported in the United States each year. Of these 800 cases, half of them involve the pediatric population,² and is therefore considered the most common primary malignancy tumor of bone affecting children.³ Chances are that a chiropractor or a healthcare professional will never encounter a case of OS. Nonetheless, it is important that these professionals can properly recognize the signs and symptoms since, in the rare instances where a diagnosis of OS is made, early detection will provide the patient with the best chance of survival. For this reason, this case report will be of particular interest to those professionals who specialize in pediatric care.

An osteogenic sarcoma is characterized by the production of malignant osteoid arising from primitive mesenchymal bone-forming cells.² 42% of OS are reported in the femur (75% distal), 19% in the tibia (80% proximal) and 10% in the humerus (90% proximal). On rare occasions, especially in older adults, OS can develop in the proximal bones like the pelvis (8%) or the skull and jaw (8%). Rapid bone growth appears to be a predisposing factor, which could explain why it is most commonly found in the metaphyseal area, adjacent to the growth plate of long bones and why it happens during the adolescent growth spurt (15-17 years for males and 13 years for females).⁴ A study, consisting of 962 patients that developed OS between 1981 and 2000, suggested that taller stature is possibly a risk factor for indi-

viduals who are 18 years and younger. This is most likely because of their rapid growth velocity, increasing cellular division and resulting in a higher probability of dysfunctional cells.⁵ Additionally, approximately 1% of people with Paget's disease will develop an osteosarcoma as a result of the abnormal bone remodeling.⁶ Other rare genetic disease like the germ-line form of retinoblastoma, Li-Fraumeni syndrome (Germ-line TP53 mutation),⁷ Rothmund Thomson syndrome, Werner syndrome, Diamond Blackfan anemia and Bloom syndrome will predispose patients to OS. Finally, ionizing radiation exposure is an environmental risk factor that can cause secondary osteosarcoma.⁸ In United States, the incidence of OS in individuals 20 years and younger is slightly higher in males (5.1 million per year) than in females (4.5 per million per year) as well as a little higher in African American than in Caucasians.⁴

After confirming a diagnosis of OS by X-ray, magnetic resonance imaging (MRI), blood tests, radionuclide bone scan, biopsy and computed tomography (CT) or DNA testing if necessary,⁹ a treatment plan is established depending on the grade and stage of the tumor.¹⁰ For a high-grade osteosarcoma such as the one being presented in this case study, chemotherapy is generally administered before and after the reconstructive surgery that is carried out to salvage the limb.¹¹ In total, the patient goes through six to 10 months of treatment.¹² The survival outlined in the United States SEER database between 1973 and 2004 demonstrated that the relative five year survival rate for young-onset osteosarcoma was 61.6%. Overall, osteosarcoma survival rates

improved with each decade up until the 1990s, and then little thereafter.¹³

Clinical features

A 13-year-old Caucasian boy presented to a chiropractor with right knee pain after playing soccer the previous evening. No obvious trauma was sustained during the soccer game that could easily explain the onset of pain. The source of the pain was located on the proximal tibiofibular articulation and on the patella, and radiated caudally to the ankle. The patient characterized it as deep and intense pain that felt like electric shocks. In the weeks leading to the onset of pain, the patient felt normal and experienced no nausea, loss of appetite or fatigue. Additionally, the pain was not waking him at night.

Clinical findings

Relevant history, comorbidities and/or Interventions

With the exception of suffering from immune thrombocytopenic purpura at the age of one and being gluten intolerant, the patient led a very healthy lifestyle. In the year leading up to his diagnosis, the patient was seen four times by the same chiropractor for a mild concussion and for fat pad syndrome on the right foot. Both conditions were resolved.

Physical examination findings

Upon physical examination, the patient could not bear weight on the affected leg, and consequently presented with a limp. The extension, internal and external rotation of the knee were normal, however he could not flex more than 30 degrees actively and passively. The patient was also unable to perform resisted flexion or extensions and the active or passive range of motion of the right ankle all caused pain (flexion, extension, inversion and eversion). Finally, when asked to resist extension of the toes and ankle, the patient was unable to complete the task. The neurological exam, including fine touch and pain of L1 to S1, found nothing abnormal. Patellar and achille reflexes were normal. Vibration on the proximal tibiofibular articulation was painful. Upon further observation, minor edema was noted with no bruising. When examining the patient using light palpation, any contact of the proximal fibula and tibia resulted in severe pain. The palpation of the patella, quadriceps (including the patellar tendon), hamstrings and gastrocnemius were not painful.

Diagnostic focus and assessment

The two first working differential diagnosis were a sprain of the right proximal interosseous membrane by overuse of the articulation and a fracture of the lateral tibial plateau. Kinesiotaping was done to help drain the swelling and to stabilize the knee joint. No articular manipulation was carried out on the knee, ankle or spine. The patient was sent for X-rays, as the symptoms were too severe, to eliminate

a fracture possibility. The chiropractor recommended the patient be fitted for crutches to avoid weight bearing until a firm diagnosis was reached. The X-rays showed a 5x4x4 cm lesion in the proximal metaphyseal area of the right tibia. It was mixed (lytic and blastic) with cortical destruction, accompanied by an interrupted periosteal reaction. Based on the results, the radiologist suspected a tumor (Figs 1-2), and immediately recommend the chiropractor to refer the patient to a children's hospital for further testing. The patient's family physician was also notified.



Figure 1. First lateral X-rays



Figure 2. First anterior X-rays

That same week, an MRI (Figs 3-4), a pulmonary X-ray (Fig 5), a biopsy and a radionuclide bone scan (Fig 6) were carried out. The pulmonary x-ray showed little blastic spots on the four lobes and the other tests confirmed the first hypothesis. The diagnosis of primary metastatic osteosarcoma came two weeks following the patient's initial x-ray. The orthopedic surgeon would not provide a prognosis due to the highly variable responses to chemotherapy and limb surgery among patients.



Figure 3. MRI

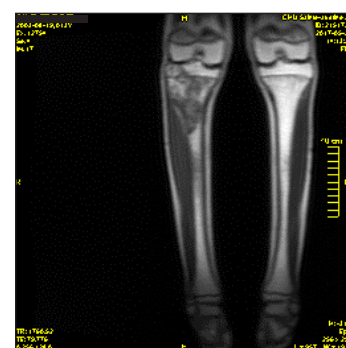


Figure 4. MRI

Therapeutic Focus and Assessment

An implantable venous access device (IVAD) was inserted to allow multiple doses of medication to be administered as needed. Subsequently, the patient experienced an infection caused by the catheter and two other surgeries were performed in order to resect the original catheter and reinstall a new one. A month and a half after the diagnosis, the patient started pre-adjuvant chemotherapy. A combination of

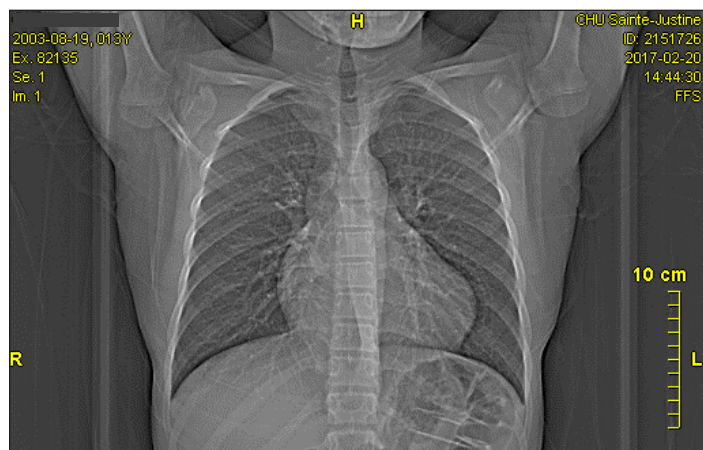


Fig 5. Reconstruction pulmonary CT: presence of little calcified nodules

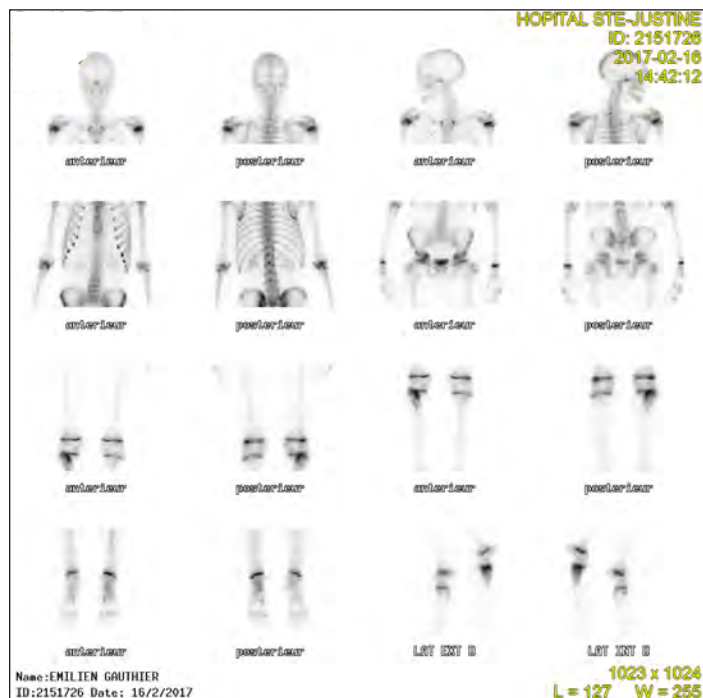


Fig 6. First radionuclide bone scan

Doxorubicin, Cisplatin and Methotraxte were used over a period of 29 weeks (Fig 7). While the literature has yet to reflect the hypothesis that neoadjuvant chemotherapy results in better survival rates over postoperative chemotherapy alone,¹¹ chemotherapy combine with surgery increase survival probabilities from 10-20% for a surgery alone to more than 60% for a multimodal treatment.³ The chemotherapy was very difficult, as the young patient developed oral mucositis that led to further complications associated with the patient's ability to eat and drink. Three months later, the pediatric orthopedist resected the primary tumour and installed a prosthesis, which is the treatment of choice for optimizing the balance between preservation of form and function of the limb and adequate oncological clearance.¹⁴

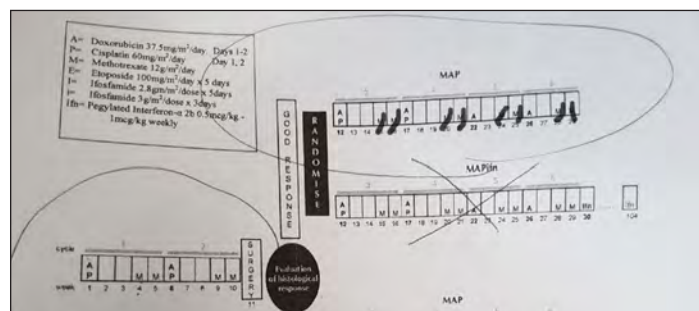


Fig 7. Chemotherapy treatment plan

This megaprosthesis, designed by Stanmore Implants, was a cemented femoral and tibial stem with a standard SMILES rotating hinge knee for the joint (Figs 8-12).

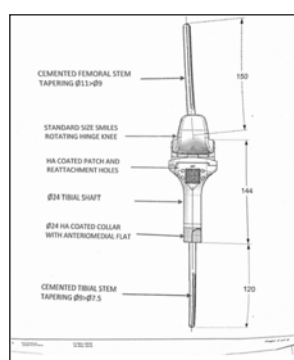


Fig 8. Prosthetic



Fig 9. Lateral X-rays after surgery

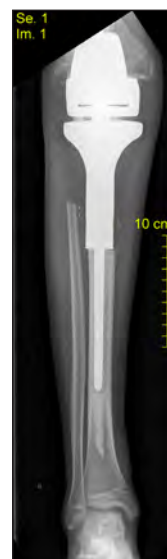


Fig 10. Anterior X-rays



Fig 11. Scar after first knee surgery



Fig 12. Scar after second knee surgery

Fortunately, they were able to resect 13 cm, constituting 97% of the tumour. According to the orthopedist, these are exceptional surgery result, as her goal was 90%. However,

they had to reopen two months later because he developed an infection. This time, they used a PICO negative pressure wound therapy to be sure that the wound would heal without oxygen, decreasing the risks of infection. A patient is at the highest risk for infection after proximal tibia resection due to the poor soft tissue coverage. Furthermore, the large exposure of tissues and extensive dissection across vascular distributions also contributes to a high risk of infection.¹⁵ The second part of chemotherapy started less than a month after the first limb surgery and finished four months later (fig 7). This time, they waited that the buccal mucositis healed properly before giving another round of medication. Physiotherapy was carried out at the hospital two times a week and consisted of passive extension of the knee. No chiropractic treatment or manipulations were performed, as the patient was usually at the hospital or at home for chemotherapy recovery. In addition, as Clar et al reported, clinical effectiveness of manual therapy for osteosarcoma is negative.^{1,16}

Follow-up and outcomes

Nearly a year after the first consultation, the patient's surgeons performed a thoracotomy on the left lung for the resection of pulmonary metastasis.¹⁷ They found no metastasis, only ossified granulomas. They did a thoracoscopy for the other lung a month later and found the same thing. Overall, the response to the chemotherapy was good and

because they succeed in retrieving the vast majority of the primary tumour, the prognosis of the young boy was better than expected. The literature outlines that a patient's prognosis is dependent upon several factors. Based on a 10 years survival, factors include the patient's age (40 years and more: 41,6% and less than 40 years 60,2%), the tumor site (axial: 29,2%, limb: 61,7%), primary metastases (yes: 26,7% no: 64,4%), size of the tumor (more than one third: 52,5%, less: 66,7%) and the location on the limb (proximal: 49,3%, other: 52,5%). The response to chemotherapy (poor: 47,2% good: 73,4%) and surgical outcomes (incomplete: 14,6% complete: 64,8%) are other good prognostic factors.¹⁸⁻²¹ Given this data, one can conclude that there is more than 60% chance there will not be a recurrence of cancer over the next 10 years of his life.

The patient is now regaining function of the knee and healing from everything. There is no visible trace of cancer in his system. He has lost high frequencies in his audition but it is not significant. He will still go to physiotherapy two or three times a week for at least a year. He will have follow-up every months for the first six months, then each three months for the next two years. Then, he will be seen every six months for the following two years. After five years, he will be transferred for an adult follow up and, hopefully, will be in remission by then.

| | |
|-----------|--|
| Week 1 | First visit for knee pain at the chiropractic office, x-rays were taken and patient referred to hospital |
| Week 2 | MRI, pulmonary X-rays, radionuclide bone scan, biopsy and other tests. |
| Week 3 | Diagnosis of metastatic osteosarcoma |
| Week 4 | Surgery to put the IVAD |
| Week 4-16 | Preadjuvant chemotherapy |
| Week 16 | Surgery to put the prosthesis |
| Week 19 | Postadjuvant chemotherapy |
| Week 22 | First treatment of physiotherapy |
| Week 24 | Second surgery for the tibia (infection) |
| Week 38 | End of chemotherapy |
| Week 48 | Pulmonary surgery no.1 |
| Week 52 | Pulmonary surgery no. 2 |
| Week 56 | First follow-up |
| Week 56 | Patient return to school |

Table 1. Chronological timeline of therapeutic assessment in a year

Discussion and limitations

This case report is not a chiropractic case per se and is not meant to augment or improve treatment options for osteosarcoma. Survival rate has been the same since 1990 and more research should be done in this direction to improve the overall prognosis for these patients.¹³ It is also limited because it is a single case, so it cannot be generalized.²²

That said, this case study can help provide valuable information on a condition that, while rare, could present to a chiropractor's office. It could be especially useful to those professionals who specialize in the care of pediatric patients.

To reiterate, this primary osteogenic sarcoma commonly appears as sporadic intense pain in a long bone, with a predilection for the knee, usually caused by stretching of the periosteum. Pain, when severe and sudden, could also result from weakening of the bone and development of stress fractures. Up to 15% of pediatric patients will present a pathological fracture.²³ Pain may worsen at night or with activity and can present local tenderness and a warm palpable mass. Increased skin vascularity may be palpable and pulsations may be detectable too.²⁴ There is a decreased range of motion of the joint and it can lead to a limp if the lower extremities are affected. As we saw in this case, it can affect also the nearest articulations by decreasing their range of motion or their muscle resistance. Risk factors like age (15-19) or a recent grow spurt, when putted together with the previous symptoms should flag the need for extensive testing.³ It is also important for chiropractors that administer X-rays in their office to familiarize themselves with the radiological traits of OS. X-ray results should be examined for one or more of the following indications: medullary destruction and cortical bone interruption, aggressive periosteal reaction (e.g., codman triangle), a sunburst or a lamellated reaction (more seen in Ewing's sar-

coma) and a soft tissue mass. The tumour will appear fluffy or cloudy and reflects a combination of bone production and calcified matrix.²⁵⁻²⁶ The differential diagnoses to consider are other malignant tumor like Ewing's sarcoma (differentiated by radionuclide bone scan),²⁷ chondrosarcoma, rhabdomyosarcoma, leiomyosarcoma, osteogenesis lymphoma, bone metastasis (generally 40 yo and older) and other conditions like eosinophilic granuloma (histiocytosis), big cells tumour, aneurysmal bone cyst and osteomyelitis.²⁸ The radiological appearance of a low-grade osteosarcoma may also be confused with fibrous lesions like fibromatosis and fibrous dysplasia and, in certain circumstances, can only be differentiated by DNA testing (MDM2 and CDK4).²⁹ OS can also be mistaken with other diagnosis like Paget's disease, non-ossifying fibroma, myositis ossificans, fracture callus, ossifying hematoma, osteochondroma, desmoplastic fibroma, osteoma and giant bone island.³⁰⁻³¹ On a clinical plan, a study of 102 patients diagnosed with OS showed that there was a broad spectrum of misdiagnoses by medical doctor. The most common diagnosis was tendinitis, which was the case for 32 patients.²⁴ According to Robert Grimer, who studied 1,460 patients with newly diagnosed sarcomas, the median duration of symptoms from first patient-identifiable abnormality to diagnosis is 16 weeks.²⁸ Fortunately, in this particular case study, the severity of the knee pain experienced by the patient led to the immediate decision to order X-rays.

Conclusion

Because 18% of OS had already spread at the time of diagnosis³² and that the metastasis had a very poor prognosis, as seen above¹⁸, early diagnosis is incredibly important.³³ It is hoped that this case study will help contribute to the clinical practice guidelines of when not to manipulate an articulation of a pediatric patient and rather refer for extensive testing.

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Does breastfeeding lower the risk for childhood obesity: what is the evidence?

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ABSTRACT

Background: Investigate the evidence to determine what the association is between exclusive breastfeeding and childhood obesity. **Method:** Systematic reviews, meta-analysis and cohort studies were used to determine the impact of breastfeeding on childhood obesity. **Results:** Five studies consisting of the highest quality research possible; two systematic reviews and meta-analysis, one systematic review and a cohort study. A total number of 110 papers were included in the analysis of the above. Twenty of the 110 papers focused specifically on exclusive breastfeeding and childhood obesity, but valuable information was obtained from the other papers. **Conclusion:** Research suggests that early breastfeeding especially of longer duration, helps to protect against childhood obesity. Higher quality studies must be undertaken to determine whether this association is absolute or confused by confounding factors.

Keywords: breastfeeding, childhood obesity,

Introduction

Overweight and obesity in children is on the increase, despite European Union (EU) level action to reverse this trend.¹ Rates throughout Europe have rapidly increased in the last 20 years with a marked increase in recent years. England and Poland demonstrate the steepest increases. Annually a staggering additional 400,000 children across Europe are becoming overweight or obese. The evidence suggests that overweight children remain so into adult life and put themselves at a high risk of comorbidity diseases.¹ This has significant consequences for health; estimates show that in the EU around 2.8 million deaths per year result from obesity associated disease.²

The causes and consequences of childhood obesity (CO) have been investigated.³ The authors state that associated co-morbid conditions include metabolic, cardiovascular, orthopaedic, neurological, hepatic, pulmonary and renal disorders. They also explain that CO profoundly and adversely affects children's physical health, academic performance, social and emotional well-being, self-esteem and quality of life experience.

Overweight and obesity are caused by excessive fat accumulation throughout the body. Generally, it is known that weight increases when there is an imbalance of energy intake verses energy expended. Lifestyle activity rates and dietary choices are the prevailing factors, however there is some evidence that the genetic background may also be important.³

The overall view is that CO has a broad, diverse range of serious health and social implications that are avoidable

with the correct dietary intake of energy. This is a seemingly simple solution to the numerous serious physical and mental health complications affecting quality and longevity of life. However, the implementation of correct dietary intake is complex.

Several high quality studies indicate that breastfed children have a lower risk of childhood obesity.^{4,5,6,7,8,9,10} It is known that there is a breastfeeding crisis worldwide, with the UK having one of the lowest breastfeeding rates in Europe.¹¹ It is extensively acknowledged that infants should be nourished with nothing other than breastmilk for the first six months of life and that breastfeeding should continue with the addition of complementary foods for up to and beyond two years of age.¹² It is important to contemplate how the lower rates of both exclusive breastfeeding and combination of breastfeeding and formula feeding might be affecting the increasing overweight and obesity problem in children.

The focus of this report is therefore to investigate what the association is between breastfeeding and childhood obesity. The research question addressed by this paper is: In infants exclusively breastfed, what is the risk of childhood obesity?

Background

There are different ways of measuring and understanding overweight and obesity. It is routinely defined by abnormal or excessive fat accumulation that may impair health.¹³ Body mass index (BMI) is a recognized index and is defined in metric as a person's weight in kilograms divided by the square of their height in meters (Kg/m²). The WHO (2018) states that for children under the age of five, the following

guidelines identify overweight and obesity:

- overweight is weight-for-height greater than two standard deviations above the WHO Child Growth Standards median;
- obesity is weight-for-height greater than three standard deviations above the WHO Child Growth Standards median.

The Center for Disease Control and Prevention defined overweight as at or above the 95th percentile of BMI for age and at risk for overweight as between the 85th and 95th percentile of BMI for age.¹⁴ However BMI is an indirect measurement of adiposity and is influenced by lean muscle or bone density mass. Skin folds and body fat percentage measurements are more direct measurements of subcutaneous, central and total adiposity.⁶ Therefore BMI may not be the most accurate way of measuring infants and toddlers.

As part of the UK governmental push to evaluate this problem, the National Child Measurement Program was launched in 2006. Overseen by Public Health England and analyzed by NHS Digital, they report that there is an increase in the prevalence of obesity in children of four to five years old.¹⁵ Rates have risen for the second successive year, and it rose from 9.3% in 2015¹⁶ to 9.6% in 2016¹⁷. In that year almost one in four children in first year of school were overweight or obese and more than one in three by year six were overweight or obese. These shocking statistics are overwhelming and highlight this growing epidemic as a serious cause for concern.

There is a plethora of social and biological factors that influence a child's exposure to the risk of obesity. These include but are not limited to parent overweight, mother's pre-pregnancy weight, socioeconomic status (SES), single parent family, introduction to solid foods (what and when), ethnicity, genetics and the microbiome. The relationship between maternal feeding practices and child eating behaviours are also worthy of consideration with regards to childhood overweight and obesity. These are all important but confounding factors and beyond the scope of this paper. While it is important to acknowledge these processes and understand the possibility of their involvement in CO, the main focus herein is on the duration and exclusivity of breastfeeding as a risk factor for overweight and obesity in children.

Human mammals have larger adipose deposits at birth than any other species.¹⁷ One theory is that this is because of the hairless neonate's need for warmth. The other and perhaps more likely theory is to compensate for the normal onset of lactogenesis II during three to eight days post-partum. The large neonatal brain requires an energy supply during this period and relies on its adipose deposits.

However, research suggests that the energy supply right after birth can be affected by the birth process itself. Birth interventions are known to compromise breastfeeding initiation by interfering with the natural cascade of biological events that are essential for ongoing success.¹⁸ Suppression of breastfeeding along with suboptimal feeding patterns may result from an assisted birth.¹⁸ Recent growth in the number of caesarean, induction labor, and assisted (forceps) births also put the infant at risk of physiological birth injury.^{19,20} These often undiagnosed, non-life threatening but quality-of-life changing, musculoskeletal imbalances occurred in 83% of patients attending the Interdisciplinary Breastfeeding Clinic (IBC).²¹ With this in mind, there is no wonder that formula is introduced, often before the mother would have wished in eight out of ten women according to the United Nations Children's Fund.²² It is worth noting that natural, un-medicated vaginal birth can also lead to suboptimal feeding problems.

Breastfed and formula fed infants have different hormonal responses to feeding.⁷ One plausible biological explanation is that formula fed infants have increased plasma insulin levels, due to the higher protein content of formula, that stimulate fat deposition and increase the number of adipocytes.^{6,23} Early growth of adipose cells during infancy can increase the risk of obesity in adulthood.

Methods

To investigate if exclusive breastfeeding affects the risk of childhood obesity, a literature search was undertaken from February 2018. The literature search and strategy included the following electronic databases: PubMed, Medline, Cumulative Index to Nursing and Allied Health (CINAHL) and Cochrane.

The search terms used were 'breastfeeding' AND 'paediatric/pediatric or children', 'obesity' and 'overweight' with the appropriate Boolean terms. The PubMed search included MeSH terms "breast feeding" AND "paediatric/pediatric obesity/ prevention and control" and "BMI". Each search had a combination of terms that always included breastfeeding to focus the search on this broad topic. The exclusion criteria included the age of the paper, no earlier than 2004 due to the recent advancement and interest in this area and because good quality systematic reviews included searches prior to this date. Low quality studies were also excluded. Inclusion criteria included high quality papers and only those written in the English language.

Results

The final selection consisted of three systematic reviews, one meta-analysis and a cohort study. Yan et al. (2014) confirmed a dose-response effect of breastfeeding on the risk of childhood obesity. Twenty-five studies with 226,508 subjects met the meta-analysis criteria. They reported that

if breastfed for seven months or longer, children were significantly less likely to be obese; the risk of CO was 22% lower in breastfed children than with those who had never breastfed.

Weng et al. (2012) investigated the risk factors for childhood overweight identifiable during infancy. Their meta-analysis looked at 30 prospective studies, ten of which compared breastfeeding with other types of feeding in the first year of life. There was mixed evidence for the protective quality of breastfeeding. 'Ever breastfed' was compared with 'never breastfed' so exclusivity was not measured. Overall the findings were that breastfeeding anytime in the first year of life reduced the adjusted odds of overweight in childhood by 15% compared with not breastfeeding.

Lefebvre et al. (2012) systematic review studied 21 articles with a total of 107,177 subjects. Their predominant primary outcome was the duration of breastfeeding and its effect on BMI. Ten studies reported that breastfeeding had no significant effect on CO. Nine studies found duration of breastfeeding had a protective effect. Limitations included inability to control for all confounders.

Horta et al. (2013) updated their original 2007 review on the effect of breastfeeding on the prevalence of overweight and/or obesity and 33 new manuscripts were reviewed. A small-study effect was an issue raised, tending to overestimate the benefits of breastfeeding. Residual confounding was another concern because most studies were carried out in high-income countries where breastfeeding may have been the norm. They concluded that studies suggest a small reduction in obesity of about 10%, in the prevalence of overweight or obesity in children exposed to longer durations of breastfeeding.

Finally, a large Chinese cohort study by Zheng et al. 2014 reported that longer duration of exclusive breastfeeding was associated with lower risk of becoming overweight.²⁶

Discussion

The goal of this research was to determine whether breastfeeding was protective against childhood obesity. There are mixed views on the risk for child obesity relative to the type of initial feeding. This debate has been going on for some time, with the first suggestion of the protective effect of breastfeeding against childhood obesity published by Kramer in 1981.²⁴ However, this early study was fraught with biases, relying on recall, when he conducted telephone interviews of mothers of children in 1,172 school aged children. His results concluded that breastfeeding does protect against later obesity. Despite the considerable biases in that type of study, several large-scale epidemiological studies conducted during the following twenty years confirmed

his findings. There seemed to be a tendency to simply duplicate the findings. It took until 2004 for the first systematic review that focused on breastfeeding and childhood obesity. Their study attempted to address publication bias and potential heterogeneity by careful adjustment of confounders. It concluded that breastfeeding seems to have a small but consistent protective effect against CO. However publication bias cannot be totally excluded as some studies found no significant effect in a crude analysis, did not report adjusted estimates and consequently had to be excluded from the meta-analysis.

The biggest problem with epidemiological research is the confounding factors that cannot always be accurately assessed, randomized, or statistically reduced. Socioeconomic strata is a particularly difficult confounder in many studies.⁵ It is well known that higher SES mothers are more likely to breastfeed and higher SES children are less likely to be obese. Further, breastfeeding mothers are likely to be more health-conscious, and, therefore, to promote healthy habits, which are likely to prevent overweight and obesity later in childhood. Whether there is an association between these factors or not is not conclusive. However, Harder et al. (2005) suggested that there is a strong dose-dependent association between longer duration of breastfeeding and decrease in risk of overweight.

Further, physiological factors support an association. Breast milk contains bioactive substance such as leptin and ghrelin which can influence the proliferation and differentiation of the infant's adipocytes.^{25,4} Breastfed children tend to have slower growth patterns when compared with synthesised formula.²⁷ The early days of growth could be key in determining the number of adipocytes laid down. This is a significant factor in change in weight later in life as adipocyte can only shrink or grow in size and not reduce in number.

The problem with most studies is that they did not look at exclusive breastfeeding and often categorized different amounts of breastfeeding together, when there is probably a significant difference between exclusive breastfeeding and any breastfeeding. Many studies did not fully consider the heterogeneity in classification of feeding.

Further, it must be recognized that some caution should be taken because a difference in BMI or overweight risk may not only be attributed to a change in body fat, but also to lean tissue and bone mass.²⁶ It is well known that lean muscle tissue weighs more than fat.

It is a concern that positive results may be more likely to be published and that early findings that show "ideal" associations may be corroborated by successive studies without complete reflection. Nevertheless, there is fairly consistent,

if low-level, association between early breastfeeding and later reduced childhood obesity. The answer to the research question is that breastfeeding appears to reduce the risk for childhood obesity, at least to some extent.

Conclusion

Research suggests that early breastfeeding is protective against childhood obesity. Higher quality studies must be undertaken to determine whether this association is real or riddled by confounding factors.

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Vitamin D Supplementation in Infants, Children, and Adolescents.

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Am Fam Physician, 2010;81(6):745-748, 750.
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ABSTRACT

Vitamin D deficiency in children can have adverse health consequences, such as growth failure and rickets. In 2008, the American Academy of Pediatrics increased its recommended daily intake of vitamin D in infants, children, and adolescents to 400 IU. Infants who are breastfed and children and adolescents who consume less than 1 L of vitamin D—fortified milk per day will likely need supplementation to reach 400 IU of vitamin D per day. This recommendation is based on expert opinion and recent clinical trials measuring biomarkers of vitamin D status. It is also based on the precedent of preventing and treating rickets with 400 IU of vitamin D. In addition to dietary sources, exposure to ultraviolet B sunlight provides children and adults with additional vitamin D. Although the American Academy of Pediatrics recommends keeping infants out of direct sunlight, decreased sunlight exposure may increase children's risk of vitamin D deficiency. No randomized controlled trials assessing patient-oriented outcomes have been performed on universal vitamin D supplementation. However, vitamin D may reduce the risk of certain infections and chronic diseases. Physicians should help parents choose the appropriate vitamin D supplement for their child.

(FULL TEXT ACCESSED AT: <https://www.aafp.org/afp/2010/0315/p745.pdf>)

Vitamin D: Current Guidelines and Future Outlook.

Pilz S¹, Trummer C², Pandis M², Schwetz V², Aberer F², Gröbler M^{2,3}, Verheyen N⁴, Tomaschitz A^{5,6}, März W^{6,7,8}.
Anticancer Res. 2018 Feb;38(2):1145-1151.

ABSTRACT

Vitamin D is of public health interest because its deficiency is common and is associated with musculoskeletal diseases, as well as extraskeletal diseases, such as cancer, cardiovascular diseases, and infections. Several health authorities have reviewed the existing literature and published nutritional vitamin D guidelines for the general population. There was a wide consensus that serum 25-hydroxyvitamin D [25(OH)D] concentration should be used to assess vitamin D status and intake, and that musculoskeletal, and not extraskeletal, effects of vitamin D should be the basis for nutritional vitamin D guidelines. Recommended target levels for 25(OH)D range from 25 to 50 nmol/l (10 to 20 ng/ml), corresponding to a vitamin D intake of 400 to 800 International Units (10 to 20 µg) per day. It is of concern that significant sections of the general population do not meet these recommended vitamin D levels. This definitely requires action from a public health perspective.

Keywords: 25(OH)D, Vitamin D, epidemiology, guidelines, review, supplementation.

Improving Vitamin D Administration to Breastfeeding Newborns Using a Quality Improvement Model.

Suhagi Kadakia, Alan Cabasso, Anita Siu, Rose St. Fleur
Pediatrics, January 2018, Volume 141 / Issue 1
Meeting Abstract Section on Breastfeeding Program

ABSTRACT

Introduction: In November 2008, the American Academy of Pediatrics (AAP) doubled the recommended daily intake of vitamin D for infants and children, from 200 IU/day (2003 recommendation) to 400 IU/day. Vitamin D should also be offered to any mother giving less than 500 mL of breast milk per day. Although breast milk is the best source of food for infants, it only contains 25 to 50 IU/L of vitamin D and, thus, is insufficient by itself. Vitamin D deficiency can cause nutritional rickets in severe cases but can also cause impaired growth, developmental delays and lethargy.

National Trends in Hospitalizations for Opioid Poisonings Among Children and Adolescents, 1997 to 2012.

Gaither JR; Leventhal JM; Ryan SA; Camenga DR
JAMA Pediatr. 2016; 170(12):1195-1201 (ISSN: 2168-6211)

ABSTRACT

Importance: National data show a parallel relationship between recent trends in opioid prescribing practices and hospitalizations for opioid poisonings in adults. No similar estimates exist describing hospitalizations for opioid poisonings in children and adolescents. **Objective:** To describe the incidence and characteristics of hospitalizations attributed to opioid poisonings in children and adolescents. **Design, Setting, and Participants:** Retrospective analysis of serial cross-sectional data from a nationally representative sample of US pediatric hospital discharge records collected every 3 years from January 1, 1997, through December 31, 2012. The Kids' Inpatient Database was used to identify 13 052 discharge records for patients aged 1 to 19 years who were hospitalized for opioid poisonings. Data were analyzed within the collection time frame. **Main Outcomes and Measures:** Poisonings attributed to prescription opioids were identified by codes from the International Classification of Diseases, Ninth Revision, Clinical Modification. In adolescents aged 15 to 19 years, poisonings attributed to heroin were also identified. Census estimates were used to calculate incidence per 100 000 population. The Cochran-Armitage test for trend was used to assess for changes in incidence over time. **Results:** From 1997 to 2012, a total of 13,052 (95% CI, 12,500-13,604) hospitalizations for prescription opioid poisonings were identified. The annual incidence of hospitalizations for opioid poisonings per 100,000 children aged 1 to 19 years rose from 1.40 (95% CI, 1.24-1.56) to 3.71 (95% CI, 3.44-3.98), an increase of 165% (P for trend, <.001). Among children 1 to 4 years of age, the incidence increased from 0.86 (95% CI, 0.60-1.12) to 2.62 (95% CI, 2.17-3.08), an increase of 205% (P for trend, <.001). For adolescents aged 15 to 19 years, the incidence increased from 3.69 (95% CI, 3.20-4.17) to 10.17 (95% CI, 9.48-10.85), an increase of 176% (P for trend, <.001). In this age group, poisonings from heroin increased from 0.96 (95% CI, 0.75-1.18) to 2.51 (95% CI, 2.21-2.80), an increase of 161% (P for trend, <.001); poisonings involving methadone increased from 0.10 (95% CI, 0.03-0.16) to 1.05 (95% CI, 0.87-1.23), an increase of 950% (P for trend, <.001). **Conclusions and Relevance:** During the course of 16 years, hospitalizations attributed to opioid poisonings rose nearly 2-fold in the pediatric population. Hospitalizations increased across all age groups, yet young children and older adolescents were most vulnerable to the risks of opioid exposure. Mitigating these risks will require comprehensive strategies that target opioid storage, packaging, and misuse.

Twenty-Year Trends in Diagnosed Attention-Deficit/Hyperactivity Disorder Among US Children and Adolescents, 1997-2016.

Original Investigation
Pediatrics August 31, 2018
JAMA Network Open. 2018;1(4):e181471. [doi:10.1001/jamanetworkopen.2018.1471](https://doi.org/10.1001/jamanetworkopen.2018.1471)

ABSTRACT

Importance: Attention-deficit/hyperactivity disorder (ADHD) is common in US children and adolescents. It is important to understand the most recent prevalence of ADHD and its long-term trends over the past decades. **Objective:** To estimate the prevalence of diagnosed ADHD and 20-year trends from 1997 to 2016 among US children and adolescents using nationally representative data. **Design, Setting, and Participants:** In this population-based, cross-sectional survey study (National Health Interview Survey), surveys were conducted annually from 1997 to 2016. A total of 186,457 children and adolescents aged 4 to 17 years from 1997 to 2016 were included in this analysis. Data were collected through in-person household interviews with a parent or guardian. The data analysis was performed in January 2018. **Main Outcomes and Measures:** Attention-deficit/hyperactivity disorder diagnosed by a physician or other health care professional. **Results:** Among the included 186,457 children and adolescents (96 017 boys [51.5%], 51 350 Hispanic [27.5%], 91 374 non-Hispanic white [49.0%], 28,808 non-Hispanic black [15.5%], 14 925 non-Hispanic other race [8.0%]), 14,704 children and adolescents (7.9%; 10 536 boys [71.7%], 2,497 Hispanic [17.0%], 9,010 non-Hispanic white [61.3%], 2,328 non-Hispanic black [15.8%], and 869 non-Hispanic other race [5.9%]) were reported to have ever been diagnosed with ADHD. The weighted prevalence of diagnosed ADHD was 10.2% (95% CI, 9.6%-10.8%) in 2015-2016. There were significant sex and racial/ethnic disparities in the prevalence of diagnosed ADHD. The prevalence was 14.0% (95% CI, 13.1%-15.0%) in boys and 6.3% (95% CI, 5.6%-7.0%) in girls, 6.1% (95% CI, 5.2%-7.0%) in Hispanic individuals, 12.0% (95% CI, 11.1%-12.9%) in non-Hispanic white individuals, and 12.8% (95% CI, 11.0%-14.5%) in non-Hispanic black individuals. Over the 20-year period, the estimated prevalence of diagnosed ADHD in US children and adolescents increased from 6.1% in 1997-1998 to 10.2% in 2015-2016 (P for trend <.001). All subgroups by age, sex, race/ethnicity, family income, and geographic regions showed a significant increase in the prevalence from 1997-1998 to 2015-2016. **Conclusions and Relevance:** This study's findings suggest that among US children and adolescents, the estimated prevalence of diagnosed ADHD increased significantly between 1997-1998 and 2015-2016. This study suggests that additional research is needed to better understand the cause of this apparent rise in prevalence.

Association of Prenatal Maternal Depression and Anxiety Symptoms with Infant White Matter Microstructure

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ABSTRACT

Importance: Maternal: Depression and anxiety can have deleterious and lifelong consequences on child development. However, many aspects of the association of early brain development with maternal symptoms remain unclear. Understanding the timing of potential neurobiological alterations holds inherent value for the development and evaluation of future therapies and interventions. **Objective:** To examine the association between exposure to prenatal maternal depression and anxiety symptoms and offspring white matter microstructure at 1 month of age. **Design, Setting, and Participants:** This cohort study of 101 mother-infant dyads used a composite of depression and anxiety symptoms measured in mothers during the third trimester of pregnancy and measures of white matter microstructure characterized in the mothers' 1-month offspring using diffusion tensor imaging and neurite orientation dispersion and density imaging performed from October 1, 2014, to November 30, 2016. Magnetic resonance imaging was performed at an academic research facility during natural, nonsedated sleep. **Main Outcomes and Measures:** Brain mapping algorithms and statistical models were used to evaluate the association between maternal depression and anxiety and 1-month infant white matter microstructure as measured by diffusion tensor imaging and neurite orientation dispersion and density imaging findings. **Results:** In the 101 mother-infant dyads (mean [SD] age of mothers, 33.22 [3.99] years; mean age of infants at magnetic resonance imaging, 33.07 days [range, 18-50 days]; 92 white mothers [91.1%]; 53 male infants [52.5%]), lower 1-month white matter microstructure (decreased neurite density and increased mean, radial, and axial diffusivity) was associated in right frontal white matter microstructure with higher prenatal maternal symptoms of depression and anxiety. Significant sex \times symptom interactions with measures of white matter microstructure were also observed, suggesting that white matter development may be differentially sensitive to maternal depression and anxiety symptoms in males and females during the prenatal period. **Conclusions and Relevance:** These data highlight the importance of the prenatal period to early brain development and suggest that the underlying white matter microstructure is associated with the continuum of prenatal maternal depression and anxiety symptoms.

Infant Analgesia with a Combination of Breast Milk, Glucose, or Maternal Holding

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ABSTRACT

Objectives: We studied neonatal cortical brain response to 4 types of nonpharmacological analgesia (oral glucose, expressed breast milk, maternal holding plus oral glucose, breastfeeding). We aimed to assess the differential effect of oral solutions (glucose, breast milk) given alone or combined with the maternal-infant relationship (holding, breastfeeding). **Methods:** Eighty healthy term newborns undergoing a heel stick were randomly assigned to 4 parallel groups of 20 infants each: group 1, infants received a glucose solution on a changing table; group 2, infants received expressed breast milk on a changing table; group 3, infants received a glucose solution in their mothers' arms; and group 4, infants were breastfed by their mothers. Cortical activation in parietal, temporal, and frontal cortices was assessed by multichannel near-infrared spectroscopy. Pain expression was also evaluated. **Results:** Oral glucose alone or combined with maternal holding was associated with no cortical activation during heel stick. Expressed breast milk was associated with localized bilateral activation of somatosensory and motor cortices ($P < .01$). Breastfeeding was associated with extensive bilateral activation of somatomotor, somatosensory, and right parietal cortices ($P < .01$). Pain expression was lower with the maternal-infant relationship ($P = .007$). **Conclusions:** Oral glucose, either alone or combined with maternal holding, appears to block or weaken cortical pain processing. Breast milk alone is associated with localized cortical activation. Breastfeeding is associated with extensive activation and may act by extending cortical processing. Maternal relationship, both combined with oral glucose and in breastfeeding, shows the greatest analgesic effect, although the neural patterns involved are distributed differently.

Association of Maternal Insecticide Levels with Autism in Offspring From a National Birth Cohort.

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The American Journal of Psychiatry

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ABSTRACT

Objective: Autism is a complex neurodevelopmental disorder with a largely unknown etiology. To date, few studies have investigated prenatal exposure to toxins and risk of autism by using maternal biomarkers of exposure. Persistent organic pollutants are lipophilic halogenated organic compounds and include the insecticide dichlorodiphenyltrichloroethane (DDT), as well as its metabolite p,p'-dichlorodiphenyl dichloroethylene (p,p'-DDE), and polychlorinated biphenyls (PCBs). The objective of this study was to test whether elevated maternal levels of persistent organic pollutants are associated with autism among offspring. **Method:** The investigation was derived from the Finnish Prenatal Study of Autism, a national birth cohort study based on a nested case-control design. Cases of autism among children born between 1987 and 2005 were ascertained by national registry linkages. In cases of childhood autism and matched control subjects (778 matched case-control pairs), maternal serum specimens from early pregnancy were assayed for levels of p,p'-DDE and total levels of PCBs. **Results:** The odds of autism among offspring were significantly increased with maternal p,p'-DDE levels that were in the highest 75th percentile, with adjustment for maternal age, parity, and history of psychiatric disorders (odds ratio=1.32, 95% CI=1.02, 1.71). The odds of autism with intellectual disability were increased by greater than twofold with maternal p,p'-DDE levels above this threshold (odds ratio=2.21, 95% CI=1.32, 3.69). There was no association between total levels of maternal PCBs and autism. **Conclusions:** These findings provide the first biomarker-based evidence that maternal exposure to insecticides is associated with autism among offspring. Although further research is necessary to replicate this finding, this study has implications for the prevention of autism and may provide a better understanding of its pathogenesis.

Gestalt Breastfeeding: Helping Mothers and Infants Optimize Positional Stability and Intraoral Breast Tissue Volume for Effective, Pain-Free Milk Transfer.

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ABSTRACT

In the past decade, biological nurturing and activation of maternal and infant instincts after birth have constituted a major advance in clinical breastfeeding support. Yet, physiologic breastfeeding initiation is not enough to ensure ongoing pain-free and effective breastfeeding for many pairs. Current interventions, including “hands-off” mammalian approaches, do not improve breastfeeding outcomes, including in randomized controlled trials. Back-arching, difficulty latching or staying on the breast, and fussing at the breast are common signs of infant positional instability during breastfeeding. These cues are, however, often misdiagnosed as signs of medical conditions or oral connective tissue abnormalities, and underlying positional instability is not addressed. New clinical approaches are urgently required. This article offers a clinical approach to fit and hold (or latch and positioning)–gestalt breastfeeding, which aims to optimize positional stability and intraoral breast tissue volumes for pain-free effective breastfeeding. The word gestalt (pronounced “ger-shtolt”) means a whole that is more than the sum of its parts. Gestalt breastfeeding builds on the theoretical foundations of complexity science, physiologic breastfeeding initiation, and new understandings of the biomechanics of infant suck elucidated in ultrasound studies. It also integrates simple psychological strategies from applied functional contextualism, popularly known as Acceptance and Commitment Therapy, empowering women to attend mindfully to breast sensations and their infant’s cues. Gestalt breastfeeding can be reproduced for research purposes, including in comparison studies with oral surgery, and has the potential to improve breastfeeding outcomes.

Keywords: breastfeeding, breastfeeding difficulties, breast pain, infant behavior, lactation management, latch-on.

Interventions to Improve Breastfeeding Self-Efficacy and Resultant Breastfeeding Rates: A Systematic Review and Meta-Analysis.

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ABSTRACT

Background: Maternal breastfeeding self-efficacy (BSE) is reflective of a mother's confidence in breastfeeding and is a modifiable factor that may improve breastfeeding rates. Breastfeeding self-efficacy theory purports that women with higher BSE will have better breastfeeding outcomes. **Research aim:** The aim of this systematic review was to explore the theoretical link between BSE and breastfeeding outcomes by investigating (a) if interventions to improve BSE were successful and (b) if improvements in BSE resulted in improved breastfeeding rates. **Methods:** The authors performed a systematic search of 10 databases for studies that investigated the effect of interventions for mothers of full-term infants on BSE and breastfeeding rates. They used an inverse-variance, random-effects meta-analysis. **Results:** Of 1,366 titles and abstracts identified, 58 full-text articles were screened and 11 met the study criteria. Compared with mothers in control groups, mothers in intervention groups had significantly higher BSE, scoring 4.86 points higher, 95% confidence interval [3.11, 6.61], at 2 months postpartum. Mothers in the intervention groups were 1.56 and 1.66 times more likely to be breastfeeding at 1 month and 2 months postpartum, respectively. Interventions that were implemented in the postpartum period, used combined delivery settings, or were informed by BSE theory had the greatest influence on breastfeeding outcomes. Meta-regression indicated that for each 1-point increase in the mean BSE score between the intervention and control groups, the odds of exclusive breastfeeding increased by 10% in the intervention group. **Conclusion:** Breastfeeding self-efficacy is a modifiable factor that practitioners can target to improve breastfeeding rates in mothers of full-term infants.

Keywords: breastfeeding, breastfeeding duration, breastfeeding promotion, breastfeeding rates, breastfeeding support, exclusive breastfeeding

Efficacy of an Osteopathic Treatment Coupled With Lactation Consultations for Infants' Biomechanical Sucking Difficulties A Randomized Controlled Trial.

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ABSTRACT

Background: Despite well-known recommendations from national and international bodies including the World Health Organization, few mothers achieve the goal of breastfeeding exclusively for 6 months. Half of mothers stop breastfeeding due to biomechanical issues in the first month, despite increasing support from lactation consultants. Osteopaths worldwide work with these babies, but there is little empirical evidence for this type of treatment. **Research aim:** This study aimed to determine the efficacy of an osteopathic treatment coupled with usual lactation consultations on infants' ability to latch. Secondary objectives included assessment of nipple pain and mothers' perceptions of the effect of treatment. **Methods:** We conducted a single blind, randomized controlled trial at a mother-to-mother support group between January and December 2015. Data were collected at four different times over a 10-day period (T0-T10) from 97 mother—infant dyads using the LATCH assessment tool, a visual analog scale (VAS) to document mothers' nipple pain, and a de novo questionnaire for breastfeeding management and potential treatment side effects. **Results:** There were consistent statistical and clinical differences in the mean LATCH scores between the treatment and the control groups ($p < .001$). However, no significant differences in the VAS scores were reported over time ($p = .713$). Mothers reported no serious or unexpected side effects during the follow-up period. **Conclusion:** This study is one of the first to bring together lactation consultants and osteopaths to address infants with biomechanical sucking difficulties. Findings support the hypothesis that the addition of osteopathy to regular lactation consultations is beneficial and safe.

Keywords: breastfeeding, dysfunctional suck, lactation consultant, LATCH assessment tool, mother—infant dyad, sucking difficulties, osteopathic treatment

Association of Nausea and Vomiting in Pregnancy with Prenatal Marijuana Use

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ABSTRACT

Use of marijuana, an antiemetic, is increasing among pregnant women,^{1,2} and data from two small surveys indicate that women self-report using marijuana to alleviate nausea and vomiting in pregnancy (NVP).^{3,4} To date, only one epidemiologic study has examined whether women with NVP are at elevated risk of using marijuana. A study of 4,735 pregnant women in Hawaii from 2009-2011 found that self-reported prenatal marijuana use was more prevalent among those with (3.7%) versus without (2.3%) self-reported severe nausea during pregnancy.⁵ We used data from a large California healthcare system with gold-standard universal screening for prenatal marijuana use via self-report and urine toxicology from 2009-2016 to test whether prenatal marijuana use is elevated among females with a diagnosis of NVP. **Methods:** Kaiser Permanente Northern California (KPNC) is a multispecialty healthcare system serving >4 million members representative of the Northern California area. The sample comprised KPNC pregnant females aged >12 who completed a self-reported substance use questionnaire and urine toxicology test in the first trimester (at ~8 weeks gestation) from 2009-2016 during standard prenatal care. The KPNC Institutional Review Board approved and waived consent for this study. NVP in the first trimester was based on ICD diagnoses in the electronic health record and categorized into: severe (hyperemesis gravidarum), mild (other NVP diagnoses), or no NVP. We estimated the adjusted odds of prenatal marijuana use among females with NVP using multi-level logistic regression in SAS 9.3, controlling for age, race/ethnicity, median neighborhood household income, year, and self-reported marijuana use in the year before pregnancy. Two-sided P-values <.05 were considered statistically significant. **Results:** Of 279,457 screened pregnancies from 2009-2016, 220,510 (78.9%) received the screening in the first trimester. The sample was 36.7% white, 27.1% Hispanic, 16.8% Asian, 5.7% black, and 13.7% other; 1.2% were aged 12-17, 15.3% 18-24, 62.7% 25-34 and 20.9% >35; 17.9% had >1 pregnancy from 2009-2016. The average median neighborhood household income was \$74,651 (SD=\$30,650) and 8.3% self-reported marijuana use in the year before pregnancy. The prevalence of severe and mild NVP was 2.3% and 15.3%, respectively. The prevalence of prenatal marijuana use by self-report or toxicology was 5.3%, and was greater among females with severe (11.3%) and mild (8.4%) versus no NVP (4.5%). Relative to females without NVP, those with severe (aOR=3.80, 95%CI, 3.19-4.52, P<.0001) and mild (aOR=2.37, 95%CI 2.17-2.59, P<.0001) NVP had increased odds of marijuana use (Table). **Discussion:** In a large sample of diverse California pregnant females from 2009-2016 with universal gold-standard marijuana screening, those with severe NVP had nearly 4 times greater odds of prenatal marijuana use, and those with mild NVP had more than 2 times greater odds of prenatal marijuana use than females without NVP. While results are consistent with the hypothesis that women use marijuana to self-medicate NVP, it is also possible that marijuana use contributes to NVP, or that providers diagnose NVP more frequently among women who report using marijuana to treat it. This study was limited to KPNC pregnant females screened for marijuana use at ~8 weeks gestation and results may not generalize to females without healthcare or those who enter prenatal care late. Providers may not diagnose very mild NVP, and our sample may reflect a more severe subset of NVP patients. We could not distinguish prenatal marijuana use before versus after females knew they were pregnant, and misclassification is possible given variability in the duration that marijuana is detectable in urine. The health effects of prenatal marijuana use are unclear and national guidelines recommend that pregnant women discontinue use.⁶ Patients with NVP should be screened for marijuana use and educated about effective and safe NVP treatments.

PREPUBLICATION MANUSCRIPT WITH REFERENCES AVAILABLE AT --<https://share.kaiserpermanente.org/article/nausea-and-vomiting-in-pregnancy-is-associated-with-prenatal-marijuana-use-research-letter/>

Obesity as a Predictor of Delayed Lactogenesis II.

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ABSTRACT

Background: Lactogenesis II is the onset of copious milk production. A delay in this has been associated with an increased risk of formula supplementation and early cessation of breastfeeding. Prepregnancy obesity has also been associated with decreased breastfeeding rates and early cessation. **Research aim:** This study aimed to evaluate the effect of prepregnancy obesity on self-reported delayed lactogenesis II. **Methods:** We conducted a prospective observational cohort study of 216 women with a singleton pregnancy and who planned to breastfeed. We compared the onset of lactogenesis II between women with a body mass index (BMI) < 30 kg/m² and women with a BMI ≥ 30 kg/m². Using multivariate logistic regression analyses, we assessed the relationship between maternal BMI and delay of lactogenesis II. **Results:** The prevalence of delayed lactogenesis II among women with prepregnancy BMI < 30 kg/m² and BMI ≥ 30 kg/m² was 46.4% and 57.9%, respectively. Delayed lactogenesis II occurred more frequently among women who were obese at the time of delivery ($p < .05$). After controlling for the covariates, age, prepregnancy BMI, and gestational weight gain were positively associated with delayed lactogenesis II. **Conclusion:** Prepregnancy obesity and excessive gestational weight gain are associated with an increased risk of delayed lactogenesis II. Women who are at risk for delay in lactogenesis II and early breastfeeding cessation will need targeted interventions and support for them to achieve their personal breastfeeding goals.

Keywords: breastfeeding, breastfeeding duration, breastfeeding initiation, breastfeeding rates, lactation, lactogenesis.

Human milk oligosaccharides in premature infants: absorption, excretion, and influence on the intestinal microbiota.

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ABSTRACT

Background: Human milk oligosaccharides (HMOs) shape the intestinal microbiota in term infants. In premature infants, alterations in the intestinal microbiota (dysbiosis) are associated with risk of necrotizing enterocolitis (NEC) and sepsis, and the influence of HMOs on the microbiota is unclear. **Methods:** Milk, urine, and stool specimens from 14 mother-premature infant dyads were investigated by mass spectrometry for HMO composition. The stools were analyzed by next-generation sequencing to complement a previous analysis. **Results:** Percentages of fucosylated and sialylated HMOs were highly variable between individuals but similar in urine, feces, and milk within dyads. Differences in urine and fecal HMO composition suggest variability in absorption. Secretor status of the mother correlated with the urine and fecal content of specific HMO structures. Trends toward higher levels of Proteobacteria and lower levels of Firmicutes were noted in premature infants of nonsecretor mothers. Specific HMO structures in the milk, urine, and feces were associated with alterations in fecal Proteobacteria and Firmicutes. **Conclusion:** HMOs may influence the intestinal microbiota in premature infants. Specific HMOs, for example those associated with secretor mothers, may have a protective effect by decreasing pathogens associated with sepsis and NEC, while other HMOs may increase dysbiosis in this population.

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Pediatric ADHD Medication Exposures Reported to US Poison Control Centers.

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ABSTRACT

Objectives: To describe the characteristics and trends of exposures to attention-deficit/hyperactivity disorder (ADHD) medications among individuals 0 to 19 years old reported to US poison control centers. **Methods:** National Poison Data System data from 2000 through 2014 were retrospectively analyzed to examine pediatric ADHD medication exposures. **Results:** From 2000 through 2014, there were 156,365 exposures reported to US poison control centers related to ADHD medications. The overall rate of reported exposures increased 71.2% from 2000 to 2011, followed by a 6.2% decrease from 2011 to 2014. Three-fourths (76.0%) of exposures involved children ≤12 years old. Methylphenidate and amphetamine medications accounted for 46.2% and 44.5% of exposures, respectively. The most common reason for exposure was therapeutic error (41.6%). Intentional medication exposures (including suspected suicide and medication abuse and/or misuse) were reported most often among adolescents (13–19 years old), accounting for 50.2% of exposures in this age group. Overall, the majority of exposed individuals (60.4%) did not receive health care facility treatment; however, 6.2% were admitted to a hospital for medical treatment, and there were 3 deaths. The increasing number and rate of reported ADHD medication exposures during the study period is consistent with increasing trends in ADHD diagnosis and medication prescribing. Exposures associated with suspected suicide or medication abuse and/or misuse among adolescents are of particular concern. **Conclusions:** Unintentional and intentional pediatric exposures to ADHD medications are an increasing problem in the United States, affecting children of all ages.

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Intriguing findings regarding the association between asthma and ADHD.

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ABSTRACT

Attention deficit hyperactivity disorder (ADHD) is one of the most common childhood neurodevelopmental disorders and asthma the most common chronic disease in children; diagnosis of both disorders has increased in the past few decades. Given their high prevalence and associated morbidity and mortality, insights that improve diagnosis and lead to better understanding of the mechanisms underlying these disorders are crucial.

Additional commentary from Medscape write up (https://www.medscape.com/viewarticle/900856?nlid=124647_2045&src=WNL_mdplsnews_180824_mscpedit_peds&uac=39819EY&spon=9&impID=1721145&faf=1): Researchers examined data from 49 smaller studies that included a total of 210,363 people with ADHD and more than 3.1 million individuals without ADHD. Almost 17 percent of people with ADHD had asthma, compared with 11.5 percent of those without ADHD, the analysis found. And, 8.8 percent of people with asthma had ADHD, compared with 5.6 percent of people without asthma. The study team also did a separate analysis of almost 1.6 million individuals in the Swedish population, including 259,253 with asthma and 57,957 with ADHD. In this analysis 24.8 percent of people with ADHD had asthma, compared with 16.1 percent of people without ADHD. And, 5.5 percent of people with asthma had ADHD, compared with 3.3 percent of people without asthma. Overall, the two analyses found that having either asthma or ADHD increased the risk of having the other condition by about 45 percent to 53 percent.

Vitamin D in adolescents: Are current recommendations enough?

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ABSTRACT

Vitamin D is essential for bone development during adolescence and low vitamin D status during this critical period of growth may impact bone mineralization, potentially reducing peak bone mass and consequently increasing the risk of osteoporosis in adulthood. Therefore, the high prevalence of vitamin D inadequacy and deficiency in adolescent populations is of great concern. However, there is currently a lack of consensus on the 25-hydroxyvitamin D [25(OH)D] concentration, the widely accepted biomarker of vitamin D status, that defines adequacy, and the vitamin D intake requirements to maintain various 25(OH)D thresholds are not well established. While the current intake recommendations of 10-15µg/day may be sufficient to prevent vitamin D deficiency (25(OH)D<25-30nmol/l), greater intakes may be needed to achieve the higher threshold levels proposed to represent adequacy (25(OH)D>50nmol/l). This review will address these concerns and consider if the current dietary recommendations for vitamin D in adolescents are sufficient.

Keywords: adolescents, recommendations, requirements, Vitamin D.

US Emergency Department Visits for Adverse Drug Events From Antibiotics in Children, 2011—2015.

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ABSTRACT

Background: Antibiotics are among the most commonly prescribed medications for children; however, at least one-third of pediatric antibiotic prescriptions are unnecessary. National data on short-term antibiotic-related harms could inform efforts to reduce overprescribing and to supplement interventions that focus on the long-term benefits of reducing antibiotic resistance. **Methods:** Frequencies and rates of emergency department (ED) visits for antibiotic adverse drug events (ADEs) in children were estimated using adverse event data from the National Electronic Injury Surveillance System—Cooperative Adverse Drug Event Surveillance project and retail pharmacy dispensing data from QuintilesIMS (2011—2015). **Results:** On the basis of 6542 surveillance cases, an estimated 69,464 ED visits (95% confidence interval, 53,488—85,441) were made annually for antibiotic ADEs among children aged ≤19 years from 2011 to 2015, which accounts for 46.2% of ED visits for ADEs that results from systemic medication. Two-fifths (40.7%) of ED visits for antibiotic ADEs involved a child aged ≤2 years, and 86.1% involved an allergic reaction. Amoxicillin was the most commonly implicated antibiotic among children aged ≤9 years. When we accounted for dispensed prescriptions, the rates of ED visits for antibiotic ADEs declined with increasing age for all antibiotics except sulfamethoxazole-trimethoprim. Amoxicillin had the highest rate of ED visits for antibiotic ADEs among children aged ≤2 years, whereas sulfamethoxazole-trimethoprim resulted in the highest rate among children aged 10 to 19 years (29.9 and 24.2 ED visits per 10000 dispensed prescriptions, respectively). **Conclusions:** Antibiotic ADEs lead to many ED visits, particularly among young children. Communicating the risks of antibiotic ADEs could help reduce unnecessary prescribing. Prevention efforts could target pediatric patients who are at the greatest risk of harm.

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