CASE STUDY

Resolution of Laryngopharyngeal Reflux in a 9-Week-Old Infant Following Kale Specific Upper Cervical Care: A Case Study & Review of the Literature

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ABSTRACT

Objective: To describe the care of an infant medically diagnosed with laryngopharyngeal reflux aka silent acid reflux.

Clinical Presentation: A 9-week-old male medically diagnosed with laryngopharyngeal reflux was cared for with chiropractic. The infant's physical complaints were acid reflux and congestion since birth. As a result, the infant had difficulties with sleep and assuming certain positions such as sleeping on his back or being placed in his car seat without regurgitation. The infant's pediatrician prescribed Zantac but this did not help the infant.

Intervention and Outcome: The patient was cared for with Kale Upper Cervical Chiropractic Technique. The third night following his first adjustment the infant slept 9 hours without acid reflux issues. The infant by this time was able to sit in his car seat without agitation. His skin color returned to normal and the dark circles under his eyes resolved. He was more alert and less agitated. A two-week follow-up revealed the infant had continued resolution of symptoms with his mother choosing to eliminate the use of Zantac.

Conclusions: This case report provides supporting evidence on the effectiveness of chiropractic care in infants with bothersome gastroesophageal reflux (GER), silent or otherwise. We encourage further documentation of similar cases to inform clinical practice.

Key Words: *Chiropractic, specific, upper cervical, adjustment, manipulation, pediatric, silent reflux, vertebral subluxation*

Introduction

Acid reflux or gastroesophageal reflux (GER) is defined as the involuntary retrograde passage of gastric contents into the esophagus with or without regurgitation (i.e., non-projectile passage of gastric contents into the pharynx or mouth) or vomiting in infants. Regurgitation is a common phenomenon in infancy, occurring in approximately 70-85% of infants. In 509 healthy thriving infants aged 3 days to 1 year, their esophageal pH was measured in 24 hours and the investigators found that 73 reflux episodes per day was considered normal.[1-2] For the majority of infants (approximately 95%), the symptoms of GER will resolve without treatment by age 1 year.[3] However, for the remainder, GER progresses to GER disease or GERD. The prevalence of GERD has been placed at 20%.[4] In the United States, direct interviews of 615 children between 10-17 years and 566 children between 3-9 years of age by parent proxy, 1.8% of

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the 3-9 years age group and 3.5% in the 10 to 17 years age group reported pyrosis or heartburn. When compared to adults >18 years of age, 22% of adults reported similarly. Therefore, the prevalence of GERD is assumed to increase slowly with age during childhood and becomes more prevalent among young adults.[6] As we have observed in a number of case reports, GERD is associated with weight loss and failure to thrive and, as in the case presented, feeding or sleeping problems. Towards continuing efforts towards evidence-based practice, we describe the care of an infant presenting for chiropractic care with symptoms of GER and a medical diagnosis of "silent acid reflux."

Case Narrative

History

The mother of a 9-week-old male presented her son for chiropractic consultation and possible care with a diagnosis of silent acid reflux by the infant's pediatrician. According to the infant's mother, the infant's physical complaints were acid reflux and congestion since birth. The infant's complaints were such that he had difficulties sleeping on his back or being placed in his car seat without regurgitation. The infant's mother denied that her son spit up the full contents of his stomach but was barely able to keep down breast milk.

Overall, the infant could not sleep more than 4-5 hours a night and the infant's skin color was observed to be very pale with dark circles under his eyes. After 4-5 hours of sleep, congestion would become too severe and the infant would then regurgitate. In terms of the course of the infant's complaints, his mother indicated that the problem was slightly improving which she attributed to avoiding certain positions and/or situations that bring about her child's symptoms.

The infant's pediatrician prescribed Zantac but according to the infant's mother, no real improvements in her child's symptoms have been observed. Prior to chiropractic, the infant's mother considered the use of homeopathic remedies. No other type of self-care (i.e., over-the-counter medication) has been used for the child.

Examination

On physical examination, the infant presented with a noticeable left head tilt. Static digital palpation revealed hypertonic muscles on the left paraspinal muscles of the cervical spine. The infant's transverse process of the atlas palpated to be relatively superior on the left compared to the right. On motion palpation, the infant's atlas vertebra was determined to be restricted in motion on the left with decreased left rotation and lateral flexion relative to the occiput. No specific orthopedic test was performed.

The attending clinician utilized the Kale Upper Cervical Specific Protocol utilizing radiographic analysis, the NeuroCaloMeter (NCM), NeuroCalograph (NCGH), and Chirometer readings as well as neurological testing. Asymmetric paraspinal measurements indicated a 3-point break to the left with the NCM and NCGH. Chirometer readings were 93.5 units on the left and 95.0 units on the right of the atlas vertebrae. Modified fencer/righting reflex test was performed.

The test was positive on the left side wherein the infant raised his head higher on the left indicative of possible atlas subluxation on the left. Rooting reflex was diminished on the left. Based on the history and examination findings, a 2 view cervical spine series (i.e., lateral and Anterior Posterior Open Mouth (APOM)) was performed. The lateral view indicated the atlas in a superior misalignment position with a positive 18^0 angle. Note that a positive $8\text{-}10^0$ angle is average. The APOM indicated the C1 vertebral body as measuring 2 mm to the left of the arc lines of the Foramen Magnum Line. The spinal subluxation listing of the first cervical vertebra was noted as Atlas Superior Left (i.e., ASL; -θY, -Y).

Intervention & Outcomes

Following the review of findings with the infant's mother, consent to a trial of care was given. The infant was adjusted on the first visit in the following manner. He was placed in the prone position with his head turned to the left on the knee chest solid headpiece table. The infant's left posterior arch of C1 was contacted with a modified pisiform contact (left hand) used specifically on infants. The modified contact point is found midway between the pisiform bone and the metacarpal-phalangeal joint of the 5^{th} digit.

A gentle thrust was made to utilize a body drop toggle torque with recoil adjustment. The line of drive was superior-to-inferior (S-I) and left to right. After the adjustment, the patient rested for 20 minutes before re-evaluation. Comparative scanning with the NCM and NCGH indicated 0.5 point break to the left. The Chirometer read 94.0 units on the left side and 93.5 units on the right side.

Over a one-week period, the infant was adjusted as described on two occasions. Thereafter, the infant's scans indicated the absence of abnormal neurophysiology.

According to the infant's mother, the evening following his first adjustment, the infant slept for 6 hours continuously without reflux symptoms. In addition to improvement in his sleep disturbance the infant rolled over from his back to his belly for the first time. The following night the infant was reported as sleeping 7 hours continuously without issue. The third night following his first adjustment the infant slept 9 hours without acid reflux issue.

By the third day, the infant had no acid reflux issues at all. The infant by this time was able to sit in his car seat without agitation. In addition to reported improvements in his acid reflux symptoms, the infant's skin color was more of a pinkish hue with no dark circles under his eyes. He was more alert and less agitated and the infant's mother felt his acid reflux symptoms had resolved and chose not to continue with care. A two-week follow-up revealed the infant experienced continued resolution of symptoms with his mother choosing to stop the use of Zantac.

Discussion

In the case reported, the infant had a history of a medical diagnosis of silent acid reflux, otherwise known as

laryngopharyngeal reflux. However, given the infants clinical presentation in the context of GERD or laryngopharyngeal reflux, our chiropractic approach here is one of deference in the medical diagnosis and focus on our approach to patient care. We will provide a discussion of GERD and to some extent laryngopharyngeal reflux for the benefit of the reader.

Epidemiology of GER and GERD

As indicated earlier, GER is frequently seen in early infancy and resolves by one year of age. The diagnostic criteria for GER according to the ROME III[7] are the following. In an otherwise healthy infant aged 3 weeks to 12 months of age, the infant demonstrates both: (a) regurgitation 2 or more times per day for ≥ 3 weeks; and (b) No retching, hematemesis, aspiration, apnea, failure to thrive, feeding or swallowing difficulties or abnormal posturing.

In a US study in 948 infants <13 months age, Nelson et al.[8] demonstrated that one bout of regurgitation per day had a prevalence of 50% for those between 0 to 3 months of age, 67% at 4-6 months of age but thereafter, a sharp decline is observed with a prevalence of 21% at 7-9 months of age and by 10-12 months, 5% babies continued to have regurgitation. For those with a more significant regurgitation (i.e., >4 times/ day), the prevalence was much less but the prevalence followed a similar pattern.

Twenty percent of babies 0-3 months of age have significant regurgitation and 3% at age 7-9 months and by 12 months, a prevalence of 2%. In a similar study of 863 Australian children, the prevalence of GER was 41 % at 3-4 months and then declines to less than <5% in infants 13-14 months of age and by 19 months of age, the prevalence is negligible.[9] In 2642 Italian patients aged 0-12 months, the investigators found a lower prevalence of infant regurgitation at 12%). The natural history based on these studies indicate similarities. That is, regurgitation subsides in 88% of infants by 12 months of age and by 24 months, the prevalence increases.[10] The prevailing thinking is that GERD in infancy has a prevalence of 5%-9% for those with regurgitation.[8,11]

The diagnosis of GERD in children consists of a history and physical examination in those >8 years of age. Choking, gagging, coughing with feedings or irritability can be warning signs for GERD in younger children. If forceful vomiting is reported, referral by the chiropractor for laboratory and radiographic investigation (i.e., upper gastrointestinal series) is warranted to exclude other causes of vomiting. We note for the reader that in 42–58 % of infants, cow's milk protein allergy overlaps with GERD and both conditions may co-exist.[2]

According to Czinn and Blanchard,[2] there are no symptom that is diagnostic of GERD in infants. Therefore, the medical approach is one of empiric management. The infant is placed on proton pump inhibitors (PPIs) for 2 to 4 weeks and observe how they respond.[12] The review by Vakil[13] commented that a recent meta-analysis found the use of PPIs had limited value as a diagnostic test. Likelihood ratios for a positive test ranged from 0.45 to 1.86. The positive predictive value of the test ranged from 0.17 to 0.90 and the negative predictive value from 0.17 to 1, depending on the gold standard against which comparisons were made. They found from their review that PPI testing is not an accurate test for the diagnosis of GERD. Furthermore, as we will discuss shortly, this approach is not without adverse consequences.

Silent GERD

According to Fass and Dickman,[14] silent GERD is advanced GERD without clearly identifiable symptoms and is poorly understood. This is primarily due to a lack of recognition of this important phenomenon. Silent GERD is very common and include incidental findings such as erosive esophagitis, Barrett's esophagus, and esophageal adenocarcinoma in asymptomatic patients. Consider that up to 24% of asthmatics may have silent GER without the classic reflux symptoms such as heartburn, acid regurgitation, and dysphagia.[15] In general, it is estimated that 50% of children with chronic respiratory disorders[16] and 25–30% of adults have so-called silent GER.[17]

Silent GERD is sometimes referred to as laryngopharyngeal reflux (LPR). This is the phenomenon wherein stomach contents flow back above the upper esophageal sphincter, causing symptoms related to the pharynx and larynx. Individuals with LPR have normal esophageal acid clearance, and as a result the amount of acid found in the esophagus is below the level required for the diagnosis of GERD to be made. Hence the reference to this phenomenon as "silent reflux."

Unfortunately, the mucosa of the larynx is fragile and poorly structured to provide protection against gastric acid and the activation of pepsin to respond to chemical trauma is not optimum. The larynx and pharynx are incapable of acid clearance and more liable to peptic injury.[18-20] It has also been proposed that acid stimulates vagally-mediated reflexes in the distal esophagus, leading to laryngopharyngeal changes resulting in chronic cough and throat clearing sensation.[21]

Chiropractic care

The publication by Ferranti and colleagues[22] performed a follow-up systematic review of the literature (2016-present) on patients under chiropractic care presenting with presumed or realized diagnosis of GERD. In a more recent review of the subject, we also performed an updated review. We utilized Pubmed (2008-2018), MANTIS (2008-2018) and Index to Chiropractic Literature (2008-2018). Inclusion criteria for our review are: (1) Chiropractic care (spinal adjustments and adjunctive therapies) was utilized in the care of a patient with suspected or realized diagnosis of GERD; (2) The patient is ≤ 17 years of age and (3) the publication is in the English language.

Ferranti and colleagues[22] found an additional 7 papers[23-30] since the review by Alcantara and Anderson[32] in 2008. We found an additional 2 papers.[33-34] Since the publication by Lacroix,[34] we are only aware of our previous publication[35] and those of Egan and Alcantara[36] and Bryant and Alcantara.[37] To the best of our knowledge, this is the 2nd publication describing the care of an infant with GER/GERD symptoms using the Kale Upper Cervical Technique.

As noted by one of the authors in a previous publication on GERD and chiropractic care, every healthcare intervention must address risk benefit of chiropractic care versus medical care. To the best of our knowledge, the prevalence of adverse events in the chiropractic care of children has been found to be 3 adverse events per 5,438 office visits from the treatment of 577 children based on chiropractor responders and two adverse events from 1,735 office visits involving the care of 239 children. In this study on safety by Alcantara and colleagues,[38] parents and chiropractors alike indicated a high rate of improvement with respect to their children's presenting complaints, in addition to salutary effects (i.e., improved sleep, improved demeanor, improved immune system) unrelated to the children's initial clinical presentations.[37]

As reviewed in our previous publication[35] and Bryant and Alcantara[37] in this *Journal*, the medications for GERD as applied to infants have serious adverse events. We encourage the reader to access the referenced articles but for their benefit, we provide the Table summarizing the adverse events associated with prescription medications for GERD in children (see Table 1) for the benefit of the reader.[39]

Caveats/Encouragement

We would be remiss if we did not acknowledge the customary caveat as it pertains to case reports from the post positivist perspective. Due to an epistemology of objectivity, a number of confounders exist (i.e., lack of control, natural history, placebo effect) in case reports that challenge us to make comments of effectiveness of care due to these confounding biases. However, our framework and motivation for case reports is based on the research paradigm of constructivism.

This framework has an ontology based on individual experiences and epistemology is not one of objectivity. Case reports, in addition to showcasing our clinical expertise and provide some foundation for higher level research designs, is congruent with evidence-informed practice where human experience or clinical experience is taken into account when making clinical decision-making. Individually and collectively as clinicians, we learn from our clinical experience in informing patients with similar clinical presentations that they can benefit from chiropractic care. We therefore encourage others to take note of this case report to inform their clinical practice in the care of children presenting similarly.

Conclusion

This case report provides supporting evidence on the benefits of chiropractic care with the Kale Upper Cervical Technique for infants with silent acid reflux. We encourage further documentation in the care of similar cases to inform research and clinical practice.

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Drug		Adverse Events
Proton pump inhibitors (PPIs)	Esomeprazole: Based on 12 studies involving children, the cumulative sample size was 764 children (age 0-17 years) with five studies involving patients less than 1 year.	The prevalence of at least one adverse event (AE) was 34.8% (i.e., 266/764). These included: diarrhea in 3.2% (N=25); abdominal pain in 2.7% (N=21); fever in 2.2% (N=17); eczema in one (0.1%); nausea, vomiting or regurgitation in 4% (N=31); pharyngitis in 2.2% (N=17); irritability in 4% (N=3); flatulence in one (0.1%); somnolence in 0.4% (N=3); constipation in 0.8% (N=6); arthralgia in 0.4% (N=3); and headache in 4.4% (N=34). In one study of 57 patients who received esomeprazole parenterally, 10% (N=6) suffered from catheter-related infection.
	Omeprazole: Based on 10 studies with a cumulative sample size of 318 children (age 0-16 years) with 4 studies involving infants < 1 year of age.	The prevalence rate of at least one AE was 34% (N=108). These included: abdominal pain in 0.6% (N=2); eczema in one (0.3%); nausea, vomiting or regurgitation in 9.7% (N=31); pharyngitis in 5.3% (N=17); irritability in 0.9% (N=3); flatulence in 0.3% (N=1); somnolence in 0.9% (N=3); constipation in 1.9% (N=6); arthralgia in 0.9% (N=3) and headache in one patient (0.3%).
	Lansoprazole : The cumulative sample size from 9 studies involved 620 children (age 0-18 years) with three studies involving infants < 1 year.	The prevalence of at least one AE was 43.7% (N= 271). Serious AEs were reported in 2.3% (N=14) of patients. Ten children had asthma exacerbations and four had pneumonia that was diagnosed as serious. Other AEs include: upper respiratory tract infection (URTI) in15% (N=93); pharyngeal pain in 12% (N=77); sinusitis in 2.6% (N=16); otitis media in 1.9% (N=12); bronchitis in 1.6% (N=10); asthma exacerbation in 1.6% (N=10); abdominal pain in 1.5% (N=9); pneumonia in 1,5% (N=9); headache in 1.1% (N=7); pharyngitis in 1% (N=6); nausea, vomiting or regurgitation in 1% (N=6); diarrhea in 0.5% (N=3); dizziness in0.5% (N=3); liver enzyme elevation in 0.3% (N=2); flushing in 0.3% (N=2); and anorexia, anemia, chest tightness, hair loss or constipation in 0.2% (N=1).
	Pantoprazole: Based on 6 studies involving 340 children (age 0 to 16 years) with 4 studies having patients <1 year.	The prevalence of patients experiencing at least one AE was 40% (N=135). More like an underestimate given that one large study of 128 children did not report AEs. For all the other studies combined, the prevalence of AEs was 63.7%, ranging from 44% (N = 43) and 100% (n = 1). In addition to pancreatitis, all other reported AEs were; abdominal pain in 10% (N=13); diarrhea or gastroenteritis in 19% (N=26); headache in 9% (N=12); nausea, vomiting or regurgitation in 15% (N=20); pharyngeal pain or pharyngitis in 5% (N=7); eczema or rash in 9% (N=12); viral infection in 4.5% (N=6); constipation in 4% (N=5); URTI in 55% (N=74; anemia in 3% (N=4); and tooth discoloration in 1.5% (N=2). Overall, there were 8% (N=11) of cases of "accidental injuries" reported.
	Rabeprazole: This is based on 2 pediatric RCTs with a cumulative sample size of 52 children age 1-16 years.	The prevalence of patients experiencing at least one AE was 61.5% (N=32). Reported AEs were: diarrhea in 5.7% (N=3); abdominal pain in 5.7% (N=3); fever in 3.8% (N=2); pharyngitis and pharyngolaryngeal pain in 5.7% (N=3); headache in 7.7% (N=4); cough in 5.7% (N=3) and asthma exacerbation in 3.8% (N=2). The following AEs were each reported once (1.9%): URTI, proteinuria, dysmenorrhoea, fatigue, periorbital oedema, increase in urine output, mild hypergastrinaemia, increase in blood uric acid, heart murmur, chills, toothache and pancreatitis. Nausea, vomiting or regurgitation was reported by 13.4% of patients (N=7). Considered a serious AE, one patient (1.9%) suffered from moderate viral gastritis and severe intestinal volvulus and moderate hepatitis.

H_2 receptor antagonists (H_2RAs)	Ranitidine: Four studies with cumulative sample size of 245 children (0-15 years) with 2 studies involving patients <1 year.	The prevalence of patients experiencing at one AE was 23.7% (N=58) but this may be an underestimate since in one large study of 91 children, the prevalence of one AE was 59%, while in another large study of 102 patients the proportion was 4%. Reported AEs were: abdominal pain in 1.7% (N=1); diarrhea or gastroenteritis in 74% (N=43); headache in 3.4% (N=2); somnolence in 1.7% (N=1) and pneumonia in 19% (N=11).
	Cimetidine: No prospective studies of pediatric patients with GERD exposed to cimetidine reporting AEs.	Cimetidine is rarely used clinically as there are concerns about its effect on cytochrome P450 and possible multiple drug interactions and interference with vitamin D metabolism and endocrine function
	Famotidine: The medication is not licensed for use in children in the United Kingdom but is licensed in the United States.	One study involving pediatric patients with GERD but no AEs were reported systematically as the focus of the study was on the pharmacokinetics of famotidine.
	Nizatidine: One study involving pediatric patients (N= 210) ranging in age from 0 to 18 years.	The prevalence of one AE was 54.7% (N=115). A total of 292 AEs occurred in 115 patients. The AEs reported were: fever in 4% (N=12), diarrhea in 3% (N=9), pharyngitis in 4% (N=12), cough or URTI in 14% (N=40), vomiting in 3% (N=9), somnolence in 03% (N=1) and eczema in 0.3% (N=1).
Prokinetics	Metoclopramide:	AEs were reported in only 4 of 12 studies. The AEs consisted of dystonic reactions, oculogyric crisis, irritability, drowsiness, emesis and apnea in 9–15% of the patients. Two single case reports reported dystonia (N=1) and galactorrhoea (N=1).
	Betanechol: No pediatric studies were found involving this compound during the review.	----------
	Domperidone: Based on 4 studies with a cumulative sample size of 120 infants (0-12 months).	None of the four studies systematically addressed AEs. The studies focused on whether or not domperidone prolonged the QT interval based on electrocardiogram studies. Two of the studies reported no change in the QT interval (N = 43 and 45, respectively) while the other two reported an increase in the QT interval (N=31 and N=1, respectively).
	Cisapride: As of 14 July 2000, the medication was withdrawn from the market	With this medication, at least 341 reports of heart rhythm abnormalities, including 80 deaths.
	Baclofen: Two studies with a cumulative sample size of 38 infants aged 0.2–17.4 years.	No AEs were reported.

Table 1. Summary of adverse events associated with prescription medications for GERD in children.[37]