Introduction

Failure to thrive (FTT) comprises approximately 3-10\% of children attending care in a hospital setting and 5-10\% of children attended to in a primary care setting.\textsuperscript{1,2} FTT is used to describe infants who cannot maintain growth or have inadequate growth, usually based on anthropometric criteria. The term should never be used as a diagnosis unto itself since failure to thrive may be due to an underlying disease resulting from inadequate caloric intake/absorption or excessive caloric expenditure.

Not surprisingly in cases such as this, a number of parents turn to an alternative practitioner for their child’s care. Of the various alternative therapies, chiropractic is the most popular and highly utilized.\textsuperscript{3} Despite its popularity and high utilization, very few publications describe the chiropractic care of infants with FTT. In the interest of evidence-informed practice, we describe the clinical scenario of an infant with a medical diagnosis of FTT cared for with chiropractic and successful outcomes.

Case Report

A 4-month old Caucasian female with a medical diagnosis of “failure to thrive” was presented for chiropractic consultation and possible care by her mother. The infant presented with inconsolable crying, chronic diarrhea and was dangerously underweight. The child’s mother related that her daughter’s problems began at two months of age and was taken to her pediatrician for a stomach virus, oral thrush and loose green stools. The infant’s pediatrician prescribed an anti-fungal,
Nystatin, for the thrush (i.e., oral candida infection). Despite this medical approach to patient care, the infant continued to suffer from green-colored diarrhea and weight loss for the next six weeks following her appointment with the pediatrician. Given the infant’s non-responsiveness to medical care, the pediatrician referred the child to both a pediatric gastroenterologist and pediatric endocrinologist. A panel of stool cultures and urinalysis were performed with no abnormalities detected. The infant was consequently medically diagnosed with FTT. As a means to address the child’s FTT, medical recommendation to the infant’s mother was surgical insertion of feeding tubes (i.e., gastrostomy) into her child’s stomach. It was then that the infant’s mother sought alternative care approaches.

The history examination revealed the following. The patient’s birth history was a normal full term vaginal birth. Her mother noted that the infant’s umbilical cord was wrapped around her neck at birth (i.e., a nuchal cord) with no other complications noted. The infant weighed 6 lbs. 10 oz. at birth. Upon her initial chiropractic examination, the infant weighed 9 lbs. 5 oz. According to the Centers for Disease Control (CDC) clinical growth chart, she fell far below a healthy 4-month old female, placing her in the lowest percentile for a 4-month old female infant. The CDC’s chart indicated that at her age, she should have weighed between 12-14 lbs. The infant’s mother stated that her daughter was waking up every hour crying. Her mother opined that her baby was only content 1-2 hours out of a 24-hour day. The child’s parents were extremely concerned about their baby’s health and wanted to avoid the gastrostomy surgery. Abuse or neglect did not appear to be the cause of the patient’s condition. The parent’s mental stability and concern for their child’s health ruled out non-organic FTT.

Upon examination, the infant’s physical body presented as a newborn with an extremely large head on a fragile body. When placed in a supine position, the infant arched her back into extension, threw both her arms out and screamed in pain. She appeared to be in distress and uncomfortable. Spinal palpation revealed subluxation and decreased range of motion at the C1-C2 and C2-C3 functional spinal units (FSUs) and at the T4-T7 FSU. The infant’s chiropractic care began with a trial of care set at a frequency of three times per week. Activator Methods and Diversified Technique adjustments characterized as high-velocity, low amplitude thrusts appropriate for the infant’s mass was the care approach. Adjustments with the Activator Instrument involved placing the tip of the instrument on the left lateral mass of C1 and the C3 vertebral bodies with the smallest amount of tension applied. In addition, a bilateral thumb contact was utilized to adjust the T3-T4 FSU with an inferior to superior and posterior to anterior gentle thrust. Adjunctive therapy in the way of probiotic acidophilus was recommended and given daily to help restore bacterial balance to her gastrointestinal tract.

Following the child’s first chiropractic visit, the infant’s mother reported that her child slept a few hours continuously, without waking up and crying. After three patient visits, the patient stopped arching in extension and screaming as initially described. In addition, the patient’s stools were becoming a normal color and well-formed. Following the first week of chiropractic care, the infant weighed 9 lbs. 10 oz resulting in a gain of 2 ounces. The second week, the infant gained 2 more ounces, weighing 9 lbs. 12 oz. Eventually, the infant was reported as sleeping through the night and was notably a happier baby. Her color returned to a healthy pink and she was consistently gaining in strength and health each week. At seven weeks after her first chiropractic visit, the infant weighed 11 lbs and 2 oz. Since birth, the patient’s weight gain averaged 2 ounces per week following the initiation of chiropractic care. During the seven weeks of treatment, the infant more than doubled her rate of weight gain to 4.4 ounces per week. Given the positive response to chiropractic care, the infant’s parents elected to not have their child undergo the gastrostomy surgery. Long-term follow-up revealed a healthy developing 5-year old who has met all developmental milestones and is enjoying good health.

**Discussion**

Early childhood is a critical period for growth and development and with pathological processes in place, an early diagnosis and treatment is crucial for improved outcomes. No more is this true than in infants and children diagnosed with FTT. FTT is commonly defined as either a weight for age that falls below the 5th percentile on multiple occasions or a weight deceleration that crosses two major percentile lines on a growth chart. Although this simplified assessment for FTT has advantages in the clinical setting, the use of any single criteria has been shown to have a low positive predictive value (i.e., the proportions of positive results that are true positive results) for true under-nutrition. Olsen et al. found that no single measurement on its own seems to be adequate for identifying nutritional growth delay since most single criteria identified either less than half the cases of children with significant under-nutrition or included far too many, thus having a low positive predictive value. Regardless of this evaluation conundrum, a detailed evaluation by the attending provider, taking into account any possible organic and nonorganic causes as well as normal variants of growth, is essential for determining the contributing factors to the diagnosis of FTT.

For the history and physical examination, take note of the child’s eating habits, caloric intake, and parent-child interactions for possible indicators to the child’s low caloric intake. For example, asking the mother on how they prepare their child’s formula may indicate poor formula preparation or requesting the mother accurately measures the volume of milk (i.e., breastmilk or formula) her child is feeding on for a period of three days to assess if this is the cause of adequate or inadequate caloric intake. Observe the infant breastfeeding and note for problems with latching. If the attending chiropractor so chooses, he/she may perform anthropomorphic measures on the child at each visit or defer such measurements to the child’s medical providers. However, we strongly recommend that the chiropractor perform both a spinal and cranial examination (including the TMJ) for signs indicative of breastfeeding difficulties. In addition, the chiropractor should take note of the psychosocial history of the mother for possible clinical depression. A number of screening or cage questionnaires are available online for this purpose.

Although the child with FTT may present with normal physical examination findings, the attending chiropractor should be cognizant for signs of physical abuse such as
This diagnosis of FTT is based on serial monitoring of the child's anthropometric parameters such as weight for age and/or height and compared to expected values. A number of common anthropomorphic criteria for the diagnosis of FTT has been summarized by Cole and Lanham and include: body mass index or length for age less than the 5th percentile; weight deceleration crossing two major percentile lines; weight for age less than the 5th percentile; weight less than 75 percent of median weight for age or length and weight velocity less than the 5th percentile (see Table 1).

According to Cole and Lanham, no consensus exists as to which anthropomorphic criteria should be used. The World Health Organization have anthropomorphic charts based on data from six countries and set breastfeeding as the biological norm. Unlike WHO, the CDC have growth charts that include formula-fed infants and reflect norms for heavier children.

The attending chiropractor in the case presented utilized the CDC criteria as described. Given these difficulties associated with the use of anthropomorphic data, a practical approach to the child with FTT is to determine the basis of their under-nutrition (see Table 2). For infants with early weight faltering at the 6-8-week of age, McDougal et al. found that these infants had more feeding problems and showed some developmental delay while their families were not significantly different from those of controls on any economic or educational measure. This is consistent with the findings by Wright et al. that social and maternal characteristics had little influence on infants' weight gain, except for the transient effect of postnatal depression. Drewett et al. found that preterm births are specifically associated with high maternal depression scores in the postpartum period, and with a higher prevalence of failure to thrive.

In a study to determine the influences of child and maternal feeding behavior on weight gain and failure to thrive in the first year of life, Wright et al. found that a child's appetite characteristics may be an important risk factor for weight faltering and FTT and conversely, promotion of feeding on the part of the mother may also have an adverse influence. For example, the investigators found that weight gain up to 6 weeks of age was independently related to appetite and oromotor dysfunction, while appetite rated at 6 weeks of age and 12 months of age both independently predicted weight gain to 12 months. Furthermore, the extent to which caregivers responded to food refusal was a significant inverse predictor of weight gain, regardless of appetite. For the chiropractor, we note here that breastfeeding difficulties may be the most common culprit. Chiropractic has been shown to address infants with breastfeeding difficulties quite successfully.

As a starting point and to provide context to these discussions on the chiropractic care of infants with FTT, we performed a review of the literature using MANTIS (1964-2015), Index to Chiropractic Literature (1984-2015) and Pubmed (1966-2015) using the search terms “failure to thrive.” Our review of the literature found five articles in both peer-reviewed and non-peer-reviewed journals. In a commentary, Swaim et al. lamented that chiropractors must have the knowledge necessary to recognize FTT and to initiate the investigation into its cause. The authors discussed the diagnosis of FTT – specifically the non-organic type due to the beliefs and concerns of the parents on what constitutes proper nutrition.

Blum described the care of a 13-month-old male with Down’s Syndrome and suffered from FTT, history of chronic pneumonia, tachypnea, fever, and possible atrial septal defect. The child was cared for with SOT and nutritional intervention, resulting in alleviating many of the symptoms that the patient suffered. Medical professionals recommended surgery to the parents of the 13-month-old which was not followed following the positive outcomes with chiropractic care. Anderson described the care of a 7-week-old male with poor sucking during breastfeeding and with little weight gain, torticollis and cephalohematoma. The child was cared for with Craniosacral therapy and Diversified Technique with adjustments to the C1, C2, T9, and L5 vertebral bodies and to the sacrum. Chiropractic Biophysics was also utilized to correct for postural deviations.

Kuperus et al. described the care of a 6-day-old female infant with maternal concerns of failure to gain weight and thrive, as well as dysfunctional breastfeeding. The child was cared for with full-spine chiropractic adjustments, cranial-sacral therapy, and kinesiotaping. Following one year of care, the child had achieved her developmental milestones on the higher range of predicted normal for Down Syndrome infants. Her height and weight were consistently around the 50th percentile for infants with Down Syndrome. Wittman described the care of a 10-month-old male child with FTT, chronic cough, malabsorption, and discon tent along with a diagnosis of cystic fibrosis. The child’s care consisted of full spine chiropractic adjustments and craniosacral therapy along with dietary interventions. Improvements in his demeanor, his developmental milestones, digestion and weight gain were documented by the parents and chiropractor over the course of six to eight months. In the case report presented; to the best of our knowledge, this is the first to describe the care of an infant with FTT without a pre-existing condition (i.e., Down’s Syndrome or Cystic Fibrosis). Organic or non-organic causes of FTT were not discerned or determined by her medical providers despite the obvious FTT. The child was cared for with chiropractic adjustments augmented with nutritional supplements (i.e., probiotics) with successful results.

Based on the post-positivist perspective where objectivity is the key to understanding the world around us, we caution the reader on the generalizing of the case reported due to the presence of bias. Bias stems from the lack of a control group, spontaneous remission, self-limiting course and natural history of the disorder, subjective validation, and expectations for clinical resolution on the part of the parents. However, from a constructivist point of view wherein we generate knowledge and meaning from our clinical experiences and our ideas as chiropractors, we would argue that the success of this case report may form the basis for our generalization in caring for similar patients.
Conclusion

This case report provides supporting evidence on the effectiveness of chiropractic care in infants with a failure to thrive. We encourage further research and theoretical development on this approach to patient care vis a vis the detection and removal of spinal subluxation.

References

### Tables

- The body mass index for child’s age is < 5th percentile
- Body length for child’s age is < 5th percentile
- Child’s weight deceleration crosses two major percentile lines
- Weight for child’s age <5th percentile
- Weight < 75% of median weight for child’s age
- Weight < 75% of median weight for body length
- Weight velocity less < 5th percentile

**Table 1. Common Anthropometric Criteria for Diagnosing Failure to Thrive.**

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