THE CARE OF A PREGNANT PATIENT WITH TRIPLETS: A CHIROPRACTOR'S EXPERIENCE

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ABSTRACT

Objective: To describe the care of a 28-year-old pregnant patient

Clinical Features: A 32-year-old female with a prior history of failed *in-vitro* fertilization (IVF) began chiropractic care 2 weeks prior to her second implantation. Upon confirmation of a successful implantation of triplets, the patient elected to receive regular chiropractic care at twice per week for 2 weeks and then once per week for the next 16 weeks thereafter.

Intervention and Outcome: The patient received care using Diversified Technique prior to a successful IVF implantation. Upon successful implantation, she received Logan Basic as her care protocol for 2 weeks followed by Webster Technique thereafter. Despite at risk for a number of morbidities due to a triplet pregnancy and suffering from pregnancy related low back pain, lower extremity swelling and acid reflux, the patient was able to carry her pregnancy into her 3rd trimester with the babies born by Caesarean. Patient satisfaction and quality of life as measured by the RAND VSQ9 and PROMIS-29 support the notion that chiropractic care was of benefit for this patient.

Conclusion: This case report provides supporting evidence on the benefits of chiropractic care throughout a triplet pregnancy. (*Chiropr J Australia 2017;45:324-337*)

Key Indexing Terms: Chiropractic; Pregnancy; PROMIS; Quality of Life

INTRODUCTION

According to the Centers for Disease Control and Prevention, the number of births in the United States for 2013 was 3,932,181 resulting in a birth rate of 12.4 per 1,000 population.[1] Of the number of births, 4,364 were from triplets. Triplet and higher-order multiple birth rate declined 4% from 2012 to 2013, to 119.5 per 100,000 births, down more than one-third from the 1998 peak. The rise in multiple birth rates has been associated with expanded use of fertility therapies (i.e., ovulation-inducing drugs and assisted reproductive technologies (ART)), and older maternal age at childbearing.[2] An estimated 1.5% of 2010 births are the result of ART therapies alone.[3]

Higher-order multiple births are associated with relatively- elevated risk of adverse perinatal and maternal outcomes.[4] With recent advances in both neonatal and obstetric care, the outcomes for triplet pregnancies have greatly improved.[5-8] However, in the realm of chiropractic care, we have little experience in the care of the pregnant woman with triplets. In the interest of evidence-informed practice, we describe the clinical experience in the care of a woman with triplets.

CASE REPORT

A 31-year-old woman reported a history of irregular menstrual periods, inability to naturally conceive for 2 years and an episode of failed *in vitro* fertilization with miscarriage. Maternal fetal medicine specialists had diagnosed her with likely polycystic ovarian syndrome. She started chiropractic care (October 4) a week before receiving a multiple embryo implantation procedure, and continued care through her pregnancy up to 4 days before the surgical delivery of her triplets at 31 weeks gestation (April 28 the following year versus June 30 as the expected delivery date). This 7½ month duration of care included 44 perinatal spinal adjustments. Visit frequency was twice a week for four weeks, then averaged weekly until 28 weeks when care necessitated twice a week to maintain the patient's comfort.

Initial postural assessment included Grade 1 (i.e., greater than 1 inch) forward hip, shoulder and head translation, with mild right head tilt, mild rib and pelvis translations. On the first visit post-implantation, the attending chiropractor changed chiropractic technique to Logan Basic from Diversified Technique, and after 7 patient visits over 3 weeks, the technique was resumed with adjustments to the sacrum with a Diversified drop. At approximately visit 11, ultrasound (US) imaging demonstrated 3 embryos (November 10). Approximately 8 weeks into the pregnancy, the patient started reporting indigestion and headaches. At 10 weeks gestation (December 13) the attending chiropractor began implementing the full Webster protocol for pregnancy (i.e., sacral analysis with round ligament palpation) and tracked the pre and post-Webster care pain numeric rating scale (NRS) (i.e., 0=no pain; 10=maximum pain) along with presenting complaints. At this time, postural analysis detected slight increases in head tilt and forward translations of the pelvis and head. On this visit the patient discussed feeling achy from a flu shot. Chiropractic re-assessment at 25 weeks gestation indicated improvements in head tilt, forward hip, shoulder and head translation from initial assessment, with exacerbation of pelvic un-leveling. Through the duration of her pregnancy the patient most commonly reported round ligament pain, low back pain, indigestion, neck pain, ankle soreness or swelling and knee pain.

Cervix shortening, internal os dilation and funneling are a concern with triplet pregnancies and the patient's cervix was monitored via transvaginal US by maternal fetal medicine providers. A review of the records demonstrated unremarkable cervix length averaging 33-36 mm that remained stable with Valsalva's maneuver until the 21st week of pregnancy. When attempting Valsalva's maneuver during this examination the cervix dropped from 33-36 mm to 19 mm. The next assessment a week later resulted in similar measurements, and her medical providers prescribed nightly 200 mg progesterone suppositories along with home rest. At 24 weeks, the cervix remained at a reassuring length until pushing, and at 26 weeks the resting and pushing length reduced to 16 mm. This improved after two weeks to 24 mm as each triplet weighed 3 lbs. However, at 30 weeks the cervical length had reduced back down to 10-14 mm at rest and pushing.

Within days of the determination of the initial cervix shortening with Valsalva's maneuver, the attending chiropractor made a unique observation about the patients' sacral subluxation pattern. At the 26th visit, the attending chiropractor noted that during the Webster post-check of bilateral leg resistance after sacral correction, the patient's previously non-resistant leg increased its resistance in a manner that equalized the two legs. Both legs were apparently equidistant from the ischial tuberosities, but neither heel could easily approximate the pelvis. The doctor examined the amount of tension in the Achilles tendons by alternating flexion of both prone feet and discovered a higher degree of tone in the side contralateral to the initial Webster sacral listing. The right leg had been considered the resistant leg, and now with both legs resistant the left heel tension was notable. The attending chiropractor palpated the L5 vertebral segment and identified a subluxation at L5 with the spinous left, toward the side of heel tension, and performed the appropriate adjustment to correct it. The heel tension resolved after the spinal correction, and both flexed legs were now able to easily approximate towards the ischial tuberosities. This modification to the Webster clearance was repeatable on 4 more visits before the pattern resolved. A retroactive review of subluxation listings since the beginning of the patient's care demonstrated this L5-sacral combination may have been present over 11 visits beginning around the time the babies were 16 weeks gestation.

As part of the attending chiropractor's office protocol, the PROMIS-29 was utilized to assess the patient's quality of life and the RAND VSQ9 to measure patient satisfaction. The scoring protocol for both the PROMIS-29 and VSQ9 are described elsewhere.[9] In terms of the VSQ-9, we find overall a patient with high patient satisfaction (i.e., poor rating =0; excellent rating =100) on a number of items determined to be important with respect to patients' visit-specific satisfaction (i.e., location office, time spent with the chiropractor, explanation of procedures, etc). The VSQ9 was utilized concomitantly with the use of the PROMIS-29. The average scoring at each monitoring was 91.67, 86.11 and 94.44 (see Table 1). Additionally, the attending chiropractor assessed the patient's pain based on a numerical rating scale (NRS) (i.e., 0= no pain; 10=worst pain imaginable) pre-treatment and comparative at various visits. This is provided in Figure 1. Overall, we observe effective chiropractic care in addressing/decreasing the patient's pain complaints on a visit-by-visit basis. Where the initial pain NRS is ≥1, we observe a decrease in pain NRS except for 1 visit. Non-parametric analysis (i.e., Wilcoxon-Signed Rank Test) of the NRS scores prior to and following chiropractic adjustments revealed statistical significance difference ($W_{calculated} = 0$; $W_{critical}$ (N=15) = 25 at $p \leq 0.05$).

At 31 weeks the patient underwent elective surgical delivery of her triplets, a boy weighing 3 lbs 6 oz, and two girls weighing 3 lbs 5 oz, and 3 lbs 2 oz respectively.

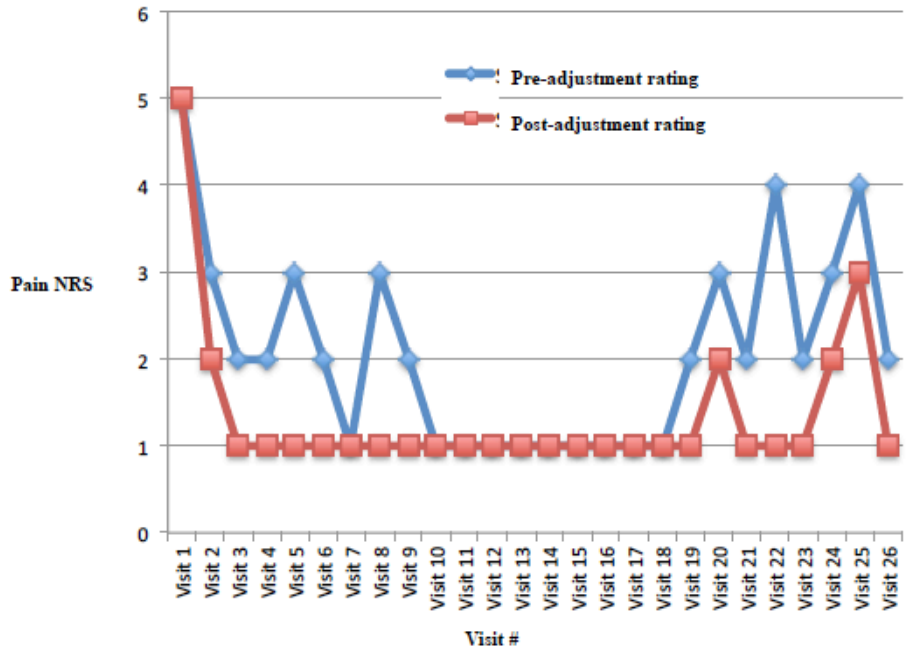

Figure 1. Graphical representation of pain NRS monitoring pre- and comparative spinal adjustment

DISCUSSION

A 2011 CDC report indicates a total of 151,923 ART procedures were performed in the United States at 451 fertility clinics.[10] These procedures resulted in 47,818 live-birth deliveries and 61,610 infants. Of interest in this case report are triplet pregnancies and births. According to Sunderam et al., multiple-birth infants regardless of whether they were conceived via ARTs or not were more likely to be preterm and have low birth-weight compared with singletons. The percentage of infants conceived with ART who were low birth-weight was 95.7% among triplets or higher-order multiples. The percentage of ART infants who were preterm was 97.1% among triplets or higher-order multiples.

Spontaneous triplets occur in about 1 in 7,000 deliveries, but this prevalence has increased over the past decades, primarily due to ARTs.[11] Depending on the type of placentation, triplet pregnancies can be trichorionic triplets (i.e. 3 fetuses with separate placentas and amniotic cavities), dichorionic triplets (i.e. monochorionic twins and a singleton with a separate placenta) and monochorionic triplets (i.e. three fetuses with one shared placenta and three amniotic cavities).[12, 13]

Triplets are disadvantaged from every perinatal perspective compared to twins and as previously discussed, are more likely to be of preterm birth, have low birth weight and a number of other morbidities given that the human uterus is not typically equipped to carry triplets. Although modern neonatal care has improved survival rates of preterm as

well as low-birth-weight triplets, other complications remain and are of great clinical importance.[14] Among mothers of triplets younger (< 20 years of age) and older mothers (≥ 40 years of age), the risk of stillbirth and of neonatal and perinatal mortality related to premature rupture of membranes is higher compared to age groups in between.[14] According to Revello et al.[15] triplets have a very high risk of maternal complications such as preeclampsia and anemia. Moreover, the presence of spontaneous preterm labor is more frequent in triplets conceived by ARTs than in those spontaneously conceived. In a retrospective chart review of multiple pregnancies, Chibber et al.[16] reviewed the maternal and fetal outcome of triplet, quadruplet and quintuplet gestations following ART in a hospital over an 11-year-period. The investigators found a mean maternal age of 30.2 years. The mean gestational age delivery was 32.2 weeks. Maternal complications included preterm labor, prematurity, anemia, gestational diabetes, preeclampsia, and post partum hemorrhage. Of the 438 fetuses born, 13% were stillbirths, 18% resulted in neonatal deaths, 7% were early neonatal deaths and 10% late neonatal deaths. The majority died due to extreme low birth weight with 17 % of the neonates having low Apgar score of <7 at 5 min. Five percent of the infants had congenital anomalies. To compare maternal and perinatal complications in triplet and twin pregnancies, Santema et al.[17] examined the pregnancy of a consecutive series of 40 triplet pregnancies of ≥20 weeks and matched for parity and maternal age with two sets of twins delivered in the same year. Eighty two percent of the triplets and 36% of the twins were a result of ART. Triplets had a significantly lower median birth-weight (1478 vs. 2030 g) and gestational age at delivery (32 vs. 35.5 weeks). We note also that breech presentations are associated with a significantly higher perinatal mortality rate than vertex presentation among triplets.[18] In addition to the aforementioned maternal complications (i.e., premature delivery), the woman carrying triplets is also at risk for antepartum anemia, postpartum hemorrhage, preeclampsia and premature spontaneous rupture of the membranes. Malpresentation was also common. Neonatal complications include respiratory distress syndrome, presumptive sepsis, hyperbilirubinemia, and neonatal death.[19] These complications emphasize the need for the attending chiropractor to share the responsibility of care and provide a safe and effective standard of care.

Chiropractic Care

Given the increased risk for adverse outcomes to the mother and fetus in triplet pregnancies, it is prudent for the attending chiropractor to be aware of this and provide the utmost care. In the case presented, we note that the patient received chiropractic care prior to IVF. It has been our experience that chiropractic care may have helped the woman become pregnant pregnant. This lends support to the growing body of literature documenting the facilitative nature of chiropractic care for women seeking pregnancy. In 2008, Bula[20] performed a review of the literature on infertility and chiropractic care. The author found case studies involving 11 female patients, ranging in age from 22 to 42, with a mean ago of 32. Their pregnancy histories included: 1 natural childbirth, 2 miscarriages, 2 failed in-vitro fertilizations, and 3 failed artificial inseminations. After receiving chiropractic care, all experienced successful pregnancies. In terms of technique, they involved: Torque Release Technique (N=4), Sacro-Occipital Technique

(N=2), diversified (N=1), Directional Non-Force Technique (N=1), and Network Spinal Analysis (N=1). Subsequently, Stern et al.[21] described a case series involving 3 infertile females presenting to a chiropractor with a chief complaint of infertility and vertebral subluxation. The patients received chiropractic care described as Diversified Technique augmented with dietary modification and nutritional supplements. All 3 women conceived following the introduction of chiropractic management. Thereafter, 5 other case reports[22-26] have been published providing empirical supporting evidence on chiropractic and infertility.

As we continue to share our clinical experience in the care of pregnant women, it will inform our ability to provide a safe and effective approach. With respect to pregnancy care, this case report suggests that chiropractic care for a pregnant woman can be safe and beneficial, particular for a pregnant woman and their unborn child that are at risk for a number of morbidities. For example, despite the patient at high risk for premature spontaneous rupture of the membranes or spontaneous preterm labor due to triplet pregnancies, no adverse events were experienced by the patient and her unborn child with chiropractic care. We are aware of the publication by Benizzi-DeMarco[27] in 2003 that outlined a number of contraindications to the chiropractic care of pregnant women. We respectfully disagree with her recommendations of contraindications as we find no supporting evidence or clinical justification for them beyond fear-based care. A systematic review of the literature by Stuber et al. [28] on adverse events associated with chiropractic care during pregnancy and the post-partum period found no clinical scenario to support Benizzi-DeMarco's list of contraindications. In fact, Stuber et al.[28] found one observational cohort documenting three mild and transient adverse events (soreness) among 78 participants following lumbar spinal manipulation and two case reports of serious adverse events following cervical spinal manipulation during pregnancy in a review spanning 31 years. We therefore caution the reader on the veracity of Benizzi-DeMarco's recommendations given that our clinical experience does not necessarily reflect these recommendations. Consider that there are published reports that places into question adverse outcome in the care of women with placenta previa[29-30] or ovarian cysts.[31] As with all high-risk pregnancies, we also acknowledge that in such situations, a prudent approach would be collaborative care with an obstetrician or midwife.

This patient presented with several co-morbidities that tend to make some clinicians nervous. First, miscarriage and infertility are complicated, poorly understood phenomena. The costs involved with hormone replacement therapy and in vitro fertilization can reach tens of thousands of dollars.[32] This isn't merely limited to the actual act of implanting a fetus. A Dutch study spanning assessing the records of nearly 5500 children born from IVF concluded that assisted reproductive technology multiple babies (twins or triplets) incur three times higher medical costs in their first 5 years compared to singleton IVF babies.[33] Understandably there is a lot riding on a good outcome, and that can be exceptionally stressful for a patient. German researchers found higher state and trait anxiety scores for women when compared to their partners during the course of the procedure, and a there was a significant increase in anxiety if they'd been through IVF more than once.[34] In fact, it's interesting to note that this

patient's score on the anxiety domain of the PROMIS-29 instrument improved from gestational week 10 to week 25 (see Table 1).

As a chiropractor it is prudent to be empathetic to these financial and emotional costs, but there was a clear benefit to providing care to the mother during IVF implantation in the first trimester and beyond. While the force of a drop is mild, it's important to emphasize that it's possible to adapt a technique protocol in order to be as conservative with the delivery of an adjustment as possible and still achieve measurable results. Second, multiparous mothers typically have much shorter gestational times before birth. According to the National Vital Statistics System, "Shorter gestation is associated with poorer birth outcomes, long-term morbidity, and higher infant mortality rates." The average gestational age of triplets in the U.S. is 31.9 weeks.[35] One of the primary reasons for these early deliveries is a combination of simple physics and physiology; as the babies grow they expand the uterus, which draws the cervix up and forces a degree of os dilation and funneling. Romero et al.[36] discussed the effectiveness of progesterone to prevent a preterm birth in women with a sonographically confirmed short cervix. In this report an expecting mother taking medication designed to prevent preterm birth was still able to receive 17 more chiropractic adjustment visits over 2 months after being ordered on bed rest.

Table 1. PROMIS scores.

	Mean T Score			
	6th week of gestation	10th week of gestation	25 weeks of gestation	Rothrock et al.[xx]
Physical Functioning	43.4	56.9	35.6	51
Anxiety	55.8	53.7	40.3	48
Depression	41	41	41	48
Fatigue	48.6	60.7	53.1	47
Sleep disturbance	59.8	52.4	50.5	----
Satisfaction in Social Role	43.2	53.5	33.6	52
Pain Interference	65.2	49.6	52	49
RAND VSQ-9	91.67	86.11	94.44	N/A
Table 1 PROMIS Mean T scores and VSQ9 scores for the patient presented				

Considering there was a period of reduced shortening once the patient removed herself from work, it seems in this case that the desk chair she sat in daily was a larger factor in the cervical shortening than the chiropractic adjustments were. It is also noteworthy that the patient's VAS scores increased the most during the final 4 weeks preceding the births, yet almost always returned to a 1 or 2 baseline after the adjustment. This may indicate that not only was chiropractic a safe intervention, but a necessary and effective means to address this mother's physical discomfort. Third, this case report details the

visit frequency appropriate for the subluxation correction of a mother through the duration of her pregnancy. Active care patients are generally prescribed a program of care that requires 2-3 visits per week until the patient achieves short term functional, pain, or Activities of Daily Living goals. Many times third party payers focus on these short and medium term goals and do not reimburse for long term "wellness" services they consider beyond that. However, pregnancy has its own set of mitigating factors that necessitate a bimodal visit frequency. The patient presented with fairly mild and similar pain complaints through her second trimester which eventually ramped up in the four weeks preceding the births. However other aspects of her quality of life such as physical functioning, the aforementioned anxiety, fatigue, and patient satisfaction improved while the pain intensity remained constant. This demonstrates an instance where the impact of consistent subluxation detection and correction served not to resolve an essentially absent musculoskeletal pain complaint, but rather built the somatic and mental health of a patient in congruence with a salutogenic model. It is worth investigating if pain reduction was the only goal dictating visit frequency whether or not these gains would have been achieved.

This represents the third case study to observe a possible modification to the Webster sacral analysis involving the lowest lumbar segment, presumably L5.[30-31] This is the most detailed account of the both the frequency and the resolution of the phenomena to date. t appears that creating unilateral leg resistance is only a portion of the neuropathology detected by Webster analysis in some gravid pelvises. The presence of heel tension is not a novel finding in chiropractic. Both Thompson and SOT Category I utilize heel tension as an indicator within their technique protocol. Likewise, checking for uniform heel tension and improved bilateral approximation of the heels to the ischial tuberosities may make the difference between reduction and correction. The frequency of this finding in pregnancy and its relationship to clinical outcomes warrants further study.

In addition to established chiropractic outcome measures (i.e., postural, palpation and ROM examination), the attending chiropractor in this case report instituted within his practice the use of a patient satisfaction (i.e., RAND VSQ9) and quality of life (i.e., PROMIS-29) questionnaires (see Table 1). The RAND VSQ9[37] is a 9-item questionnaire adapted by the American Medical Group[38] from the Visit Rating Questionnaire used in the RAND Medical Outcomes Study. [39] The responses to the VSQ9 survey utilized a 5-level scale that were linearly transformed (i.e., poor=0%; fair=25%; good=50%; very good=75%; excellent=100%). Note the varying patient satisfaction scoring provided by the patient with subsequent visits. The lowest scoring on the baseline and subsequent visit was the convenience of the location of the clinic while on the last evaluation, the convenience of the location increased in satisfaction. Despite this mild variation in VSQ9 scoring; overall, the patient was highly satisfied with her chiropractic visits. The attending clinician's use of the VSQ9 follows the principles of evidence-based practice in that such surveys identify patients' preferences and values and means to monitor quality improvement. Patient satisfaction has been positively correlated with their involvement in and compliance with their care. Satisfaction with care and the chiropractor also results in increased utilization of chiropractic and increased trust in

their chiropractor and are less likely to change their provider.[40] Future research should examine the factors associated with these changes among chiropractic patients.

The inter-relationship between health needs, patient satisfaction with their care and their quality of life is complex. It is beyond the scope of this paper to address this complexity and recommend the article by Asadi-Lari et al.[41] on this subject. Our study has demonstrated contemporaneous findings of high ratings of visit-specific satisfaction along with clinical effectiveness and improved quality of life. These findings are consistent with findings on the association of healthcare needs and HRQOL as well as satisfaction with health services and clinical effectiveness.[41-42] From a chiropractic perspective, this approach to assessing a patient's quality of life beyond pain is coherent with the a patient-centered, holistic, salutogenic model of chiropractic health.[43] Funded by the National Institute of Health, PROMIS provides researchers and clinicians with psychometrically sound and clinically meaningful measurement system of a patient's reported outcome. In addition to their reliability and validity, the PROMIS instruments have comparability (i.e., the measures have been standardized so there are common domains and metrics across conditions that facilitate comparisons across domains and diseases), flexibility (i.e., PROMIS can be administered in a variety of ways, in a different forms) and inclusiveness (i.e., PROMIS encompasses all people, regardless of literacy, language, physical function or life course). Additionally, the PROMIS instruments are independent of the patient's presenting complaint. The PROMIS-29 data was analyzed using the PROMIS Assessment Center[44] scoring manual. For each PROMIS short form (i.e., anxiety, physical functioning, pain interference), a scoring table was developed to associate the raw scores to a T score metric, which is referenced to and centered upon the US General population[45] with a mean of 50 and standard deviation of 1. The greater the T score, the greater the measured quality of life domain. Based on the patient's PROMIS scores from the 1st trimester to her 2nd trimester, we note some unexpected trends in terms of quality of life. The patient's depression scores maintained similarly throughout her monitoring. We observe physical functioning, fatigue and satisfaction with social role mean T scores increasing and then decreasing from the 1st to the second trimester. Anxiety, sleep disturbance and to some extent pain interference decreased as the patient's pregnancy progressed. Overall, we see an improvement in quality of life given that all these domains are expected to worsen with increasing weeks of gestation.[46] In comparison to a representative sample of the US population living with one chronic condition[47] we observe overall a more compromised quality of life in the chiropractic patient (i.e., lower physical functioning, greater fatigue and pain interference scores and lower satisfaction in social role). In terms of mental health, our chiropractic patient had lower mean T scores in anxiety and depression. Future research should examine the beneficial aspect of chiropractic care in terms of improving the quality of life of pregnant women.

To the best of our knowledge, this is one of few case reports utilizing and describing changes in pregnancy-related pain complaints as well as the use of validated patient reported outcome measures. Alcantara et al.[48] published their review of the literature on the use of valid patient-centered outcomes in the chiropractic care of pregnant patients. In addition to the use of the VSQ9 and PROMIS questionnaires, this case report

contributes to the literature on the meaningful use of the 11-point NRS to assess improvements in pain with chiropractic care.[49-54]

We wish to acknowledge the post-positivist paradigm that case reports lack generalizability due to the confounding effects of placebo, the natural history and patient bias (i.e., subjective validation and expectations for clinical resolution on the part of the patient). However, it should also be acknowledged that case reports are epistemologically in harmony with our patient and clinical experiences and therefore forms a basis for generalization in clinical practice. Continued empirical observations such as in the case reported increases our conviction on the safety and effectiveness of chiropractic care in pregnant patients.

CONCLUSION

This case report provides supporting evidence on the effectiveness of chiropractic in the care of pregnant patients with triplets.

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