CASE SERIES

Female Infertility, Subluxation & Chiropractic Care: A Case Series and Selective Review of the Literature

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Abstract

Objective: To report on three infertile females with vertebral subluxation that responded to the introduction of chiropractic care and review the literature on the topic.

Clinical Features: Three females presenting with a chief complaint of infertility and vertebral subluxation.

Interventions and Outcomes: Chiropractic care included diversified spinal adjusting, dietary modification and nutritional supplements. All three women conceived following the introduction of chiropractic management.

Conclusion: We described three patients with infertility who were able to conceive following chiropractic care. Continued research in this area is strongly encouraged.

Key Words: *Infertility, vertebral subluxation, chiropractic, diversified technique*

Introduction

Observational studies continue to demonstrate that patients with morbidities mainly of musculoskeletal origin (i.e., neck pain and low back pain) present themselves commonly to the chiropractor.[1-3] However, since its inception, chiropractic was founded on a vitalistic and holistic philosophy to patient care.[4] As such, the care of the chiropractic patient was not dependent on the patient's presenting symptoms or medical diagnosis but rather the detection and elimination of spinal (and extraspinal subluxation.[5] In chiropractic's early years, patients with an array of disorders including both musculoskeletal and non-musculoskeletal origins were cared for.[6] In modern times, studies by Hawk et.al.[7] and LeBouef-Yde et.al.[8-9] document that chiropractic care of adult patients present with both types of disorders but primarily of the musculoskeletal type.

Of various non-musculoskeletal conditions amenable to chiropractic, anecdotes and testimonials abound on the positive effects of chiropractic care in patients with infertility. Infertility is simply defined as the inability to conceive after at least 1 year of unprotected intercourse.[10] Data from the Centers for Disease Control and Prevention indicate that there were 7.3 million infertile women in the U.S. in 2002[11] with 1.2

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million women having had an infertility-related medical appointment.[12] These data also indicate that from 30 years of age and on, rates of infertility increases with age. There are many reasons for both male and female infertility, which we will discuss more fully in this manuscript, but some of these factors include ovulatory, anatomic, immunologic and hormonal factors for the female and sperm count for the male.

The ability to conceive is an important aspect of the relationship between couples. There are societal and cultural/religious expectations for men and women to have a child, which places great psychological/emotional, physical and financial burdens on them in this pursuit. In keeping with evidence-based practice, we present in a case series presentation, the care of women with a history of unsuccessful attempts to conceive despite, in two of the cases, medical assistance.

Case Series

Case 1

A 33-yr-old female presented for chiropractic consultation and possible care following a referral from her acupuncturist to specifically address a complaint of infertility with one of the co-authors, Gregg Stern (GS). The patient and her husband attempted to conceive for the last 4 years without success despite assisted reproductive technology. According to the patient, she was prescribed infertility drugs that eventually resulted in 2 ectopic pregnancies. Each ectopic pregnancy was followed by laproscopic surgery. Furthermore, the patient indicated undergoing 2 failed in-vitro fertilization (IVF) procedures and at the time of chiropractic consultation, the patient was receiving acupuncture care to enhance the likelihood of conception.

At the initial consultation, the patient had complaints of restricted cervical spine range of motion, temporomandibular joint (TMJ) pain with abnormal jaw motion and clicking sounds, low back pain generalized to the right side at the L3-L5 paraspinal muscles and at the buttocks at both piriformis muscles with the right side worse than the left. Additionally, the patient described pain at the right inguinal region, which caused the patient to feel "off balance." Her low back and inguinal pain complaints may be described as "periodic" occurring 3-4 times per week with an onset after her medical infertility care began. The patient described her pain as "a shooting pain" from the inguinal region into the thigh and "throbbing pain" in the low back. She stated that the pain started-out as periodic, occurring 3-4 times per week, but, by the time of the initial consultation, it had become more constant and was worsened by menstruation and stress. The patient also indicated that this pain started after her medical infertility care began. The patient rated her pain complaints as a 2-2 ½ on the verbal pain scale of 1-10 (i.e., 0 = minimal pain while 10 = maximum pain). Notable past medical history included the 2 ectopic pregnancies, painful ovulation, digestive problems including "gassiness" and diarrhea, a cholecystectomy and high levels of emotional stress. The patient admitted to having a stressful career with poor stress management habits. The patient was experiencing menstrual cycle related problems of frequent urination which has affected her sleep by causing her to awaken "often" in the middle of the night. This further exacerbated her high stress levels.

Lower extremity orthopedic testing with Hibb's Test was positive (bilaterally with the right side worse than the left). Neurological examination for the lower extremities was unremarkable. Thoracolumbar active range of motion (ROM) was full and pain-free based on patient feedback and direct observation. Digital palpation of the lower back demonstrated bilateral piriformis muscle hypertonicity and tenderness to palpation with greater symptomatology on the right. Full spine static and motion palpation findings indicated vertebral subluxations at C_{0-1} left (+θY), C_{3-4} left (+θY), C_{6-7} left (+θY), T_2 left (+θY), L_{3-5} right (-θY) and left sacroiliac joint subluxation as posterior inferior (-θX). Furthermore, the use of the Subluxation Station Millenium (Mahwah, New Jersey; 1988) demonstrated positive findings on the right side with respect to thermographic analysis: C_{2-3} vertebral level as severe, C6-T3 vertebral level as mild-moderate, T9-L1 vertebral level as moderate-severe and L2-3 vertebral level as mild. The sEMG instrumentation further demonstrated a reduced tone at the L1 vertebral level, bilaterally and notable left sided asymmetry at the C7-T1 vertebral level.[13]

Based on the history and examination findings, a radiological examination of the cervical and lumbosacral spine (anteroposterior (AP) and lateral (Lat) views) was performed. The radiologist's interpretation of the two view lumbar study revealed "pelvic unleveling low on the right by several millimeters with the lumbar spine well aligned above the L4 disc space. The sacroiliac joints appear normal. Noted in the right upper quadrant are several metallic densities most likely from the previous cholecystectomy. The visualized osseous components are well maintained and the soft tissue shadows all appear correct. The lateral projection reveals a mild invagination along the inferior L5 end plate with the remainder of the disc space heights and osseous vertebrae appearing normal. Radiological interpretation of the two view cervical study revealed a slightly reduced cervical lordosis with the disc spaces appearing well maintained.

There is perhaps minimal disc space narrowing at the C5/C6 level. The AP projection reveals the spine to be well aligned although there is rotation noted (LP) in the mid cervical region. The remainder of the osseous and soft tissue structures appeared otherwise unremarkable." The radiological impressions were: 1) Pelvic unlevelling with low on the right including L5; 2) Previous cholecystectomy; 3) Mild endplate invagination along the inferior endplate; 4) Mild reduction in the usual cervical lordosis and very early narrowing of the C5 –C6 disc space; and 5) No other evidence of recent fracture, dislocation or neoplastic changes.

Diversified full spine adjustments that are commonly described as high velocity low amplitude (HVLA) type thrusts to sites of vertebral subluxation were applied.[14] The patient was also counseled to reduce or eliminate from her diet refined carbohydrates and sugars, reduce/eliminate intake of "fast foods", increase intake of fresh vegetables and fruits with water hydration at a minimum of half her body weight in ounces of water per day. She was also provided a multivitamin (Bio Multi-Plus by Biotics) and omega-3 fatty acids (OrthoOmega by Ortho Molecular) to be taken daily.

Lifestyle modification counseling was provided to the patient on the use of stress management techniques, goal setting, affirmations, meditation, massage, and exercise. Additionally, it was recommended that the patient consider altering her work schedule and making overall paradigm shifts in her cognitive perspective in order to decrease her level of stress. The patient was resistant to incorporating these and was non-compliant. Therefore, the patient's care was limited to chiropractic adjustments, nutritional supplementation and dietary changes.

Subjective reports following chiropractic care include increased cervical spine ROM as measured by her ability to turn her head when driving, which she was unable to perform before initiating care, improvement in her TMJ pain with the patient indicating that her jaw felt "more balanced" since she started care. By the 9th visit, after 4 weeks of chiropractic care, the patient reported that she felt that her pelvis was more level and noticed that she walked straighter no longer veering off to the side. Six and one-half weeks after the start of care, the patient started a pre-planned course of IVF with fertilization medications. The harvesting of the patient's eggs for IVF took place after her 16th chiropractic treatment. The outcome of her IVF was a full term pregnancy and the delivery of a happy healthy baby. The patient attributed the success of the IVF as partly due to the chiropractic care stating in a letter: "*We got really good news that our tests were positive… I honestly believe that my appointments with you have had a significant positive impact on this round of IVF. Everything at the transfer went so smoothly this time and it never has before. I think the fact that most of the tension in that area has been treated was a large contributing factor."* The patient continued under chiropractic care throughout the pregnancy and post-partum.

Case 2

A 33-yr-old female presented to the clinic of one of the co-authors (GS) for chiropractic consultation and possible care with a chief complaint of infertility. The patient was referred to the clinic by a friend who had a history of infertility and was able to conceive while under the care of one of the attending clinician (GS).

At the initial consultation, the patient stated that she had been attempting to conceive for 2 years without success. In the past, she attended the services/care of a fertility center, received 2 rounds of the fertility drug Clomid but without success. She was at the time of chiropractic consultation considering artificial insemination. The fertility center found no medical problems with the patient or her husband to attribute the couple's inability to conceive. The patient stated at the time of chiropractic consultation that she was motivated "to try" chiropractic in part by desperation and, "Now I want to work on my mind-body connection." Additional medical history included a history of heavy menstrual flow and issues with excessive hair growth (i.e., hirsutism).

Upon physical examination, the patient was noticeably overweight. A chiropractic examination incorporating inspection, static and dynamic spinal palpation incorporating global and intersegmental ROM examination revealed the following subluxations: C_1 body right (-θY), C_7 body right (-θY), $_{T1\text{-}4}$ body right (-θY), T_7 body left (+θY), T_9 body left (+θY), and $L_{1\text{-}3}$ body left (+θY).

Spinal thermography scanning using the Millenium Subluxation Station (Mahwah, New Jersey; 1988) demonstrated the following: $C_{3\text{-}5}$ right-sided mild-moderate thermal response and T_{11}-L_1 left-sided mild-moderate thermal response, L_3 left-sided mild thermal response and L_4 right-sided mild thermal response. Paraspinal sEMG analysis demonstrated the following: T_{12}-L_1 reduced tone with mild asymmetries.

Based on the history and physical examination findings, a radiographic examination consisting of cervical and lumbar spine anteroposterior and lateral views revealed the following:

"Flat cervical contour below C2 with anterior carriage of the head and neck is seen. Right convexity apex at C2/C3 is seen. Mild left lower thoracic convexity apex at T10/T11 is present. Spina Bifida Occulta is noted at C1. Remaining osseous integrity appears intact. Subchondral sclerotic degenerative change is seen involving the lower cervical, C7 through T2 and lower lumbar facet joints. Slight lipping is seen involving the anterosuperior L4 and L5 segments. Remaining osseous and articular relationships appear maintained. Nuchal bones are incidentally noted in the lower cervical posterior soft tissues." The radiological impression as per the radiology report was: 1. Mild Spondylosis deformans: $L_{3\text{-}5}$; 2) Facet arthrosis: lower cervical spine, from C_7–T_2 and lower lumbar spine; 3) Spina bifida occulta is noted at C_1 as normal variation; 4) Postural comments and biomechanical alterations as noted and described above; and 5) No other gross evidence of bone or joint pathology.

The initial clinical impression with this patient by the attending clinician was, in addition to the presence of spinal subluxation, the significant role of stress in her health and possibly in her infertility. Chiropractic care recommendations consisted of chiropractic adjustments, exercise, nutritional supplementation (i.e., multi-vitamin and omega 3 fish oils 2160 mg EPA/DHA per day), increase water intake and initiation of stress management techniques. Chiropractic HVLA adjustments addressed sites of vertebral subluxations. The patient's response to care was measured using thermography, sEMG and the presence of subluxation as well as her subjective reports. The patient did not implement the stress management techniques taught to her but did comply with the dietary recommendations.

This patient required 5 weeks after the initial report of findings and initial treatment to decide to commit to chiropractic care. On her 11th visit, exactly 2 months after her 1st adjustment and following 4 weeks of continuous chiropractic care, the patient reported she had conceived. Upon re-examination on the 12th visit, the following were notable. The thermography scans demonstrated the following: T9 right side and T_{11}-L_2 left side mild-severe thermal response. Paraspinal sEMG demonstrated reduced tone at the T10-L3 vertebral levels with moderate increase in tonicty on the left at C3. The patient was capable of carrying her pregnancy to full term with the delivery of a healthy baby. The patient attributed much of the success of "getting pregnant" with the chiropractic care she received. The patient therefore

continued under chiropractic care throughout her pregnancy.

Case 3

A 35-yr-old white female presented to one of us (GS) based on a referral from a friend for the chief complaint of irregular menstrual cycles, the inability to conceive, neck stiffness and right wrist pain. At the initial consultation, the patient reported an inability to conceive over the last 7 months and had concerns about her fertility based on a history of irregular menstrual cycles.

Upon physical examination, this patient was an otherwise healthy female. Cervical spine active ROM demonstrated global restriction with flexion limited to 15° due to stiffness and "tightness" in the cervical spine. Orthopedic examination for the cervical spine was unremarkable.

Cervical spine static and dynamic digital palpation revealed subluxations at: $C_{2\text{-}7}$ body left (+θY), $T_{3\text{-}4}$ body right (-θY), T_9 body right (-θY), and subluxated left lower sacroiliac joint. Spinal thermography scanning using the Millenium Subluxation Station (Mahwah, New Jersey; 1988) demonstrated mild thermal response on the left side of C_1, on the right side of T_5 and T_7. Paraspinal sEMG demonstrated all measurements within normal limits except for increased tonal response at C_1, T_{12} and L_3 on the right side.

Based on the history and physical examination procedures, cervical and lumbosacral anteroposterior and lateral radiological views were obtained for spinographic examination. The radiology report provided the following interpretations: "Flat contour from C2 through C4 with an overall flattening of the lordosis below this level with anterior shift in cervical weight bearing is seen. There is a left thoracolumbar convexity apex at T12/L1 with +1 rotational component. Overall flattening of the lumbar lordosis with a mild posterior shift in Ferguson's L3 gravitational line is seen. Left lateral list of the upper thoracic and cervical spine is seen. Small limbus bone is seen involving the anterosuperior L5 segment. Small Schmorl's nodes are seen involving the superior L1 and L4 and inferior L4 segment. Remaining osseous integrity appears intact. There is minuscule spur formation involving the anteroinferior C4 and superior C5 vertebral body and the anteroinferior L3 and superior L5 segment at its discovertebral junction. Subchondral sclerotic change is seen involving the cervicothoracic and lumbosacral facet joints. Remaining osseous and articular relationships appear maintained. Cervical prevertebral soft tissue spaces are within normal limits." The radiological impressions were: 1) Mild spondylosis: C4/5 and from L3 through L5; 2) Mild spondylosis: c4/c5 and from L3 through L5; 3) Facet arthrosis: C7/T1 and L5/S1; 4) Old Schmorl's nodes: L1 and L4; 5) Limbus bone: anterosuperior L5 segment; 6) Postural comments and biomechanical alterations noted and described above. clinical correlation is recommended; and 7) No other gross evidence of bone or joint pathology.

The patient consented to Diversified full spine adjusting (HVLA-type), nutritional counseling and supplementation (multi-vitamin and omega 3 fish oils 2160 mg EPA/DHA per day) and counseling on stress management. The patient's progress and response to chiropractic care was monitored using thermography, SEMG, chiropractic examination and subjective reports. Similarly to patient #2, the stress management techniques were presented to the patient throughout her care but she never implemented them in her daily life.

At the 5th visit, 12 days following the initiation of care, the patient reported that she was pregnant. On the following visit (6th visit), the patient reported a confirmed pregnancy based on a home pregnancy test kit. Two months later, the patient suffered an idiopathic miscarriage. One and ½ weeks after her miscarriage, the patient was re-examined. A thermography scan with the Millenium Subluxation Station (Mahwah, New Jersey; 1988) demonstrated a C1 right moderate & L3 right mild thermal response. Paraspinal sEMG demonstrated all measurements within normal limits with only mild asymmetry at C1 and T6. The patient elected to continue chiropractic care with the intention of conceiving again.

Approximately 12 weeks after her miscarriage and with continued chiropractic care, the patient reported conceiving. The outcome was a full term pregnancy and delivery of a healthy baby. The patient received chiropractic care throughout her pregnancy.

Discussion

It was Sir James Young Simpson in the 19th century who first addressed the issue of impaired fertility when he commented upon 495 British peers, with marriages "which had lasted five years or more, and in which the husbands were under 75 years of age, [. . .] one marriage in 6.5 was unproductive."[15-16]

Infertility Defined

Although described in the case report that the patients presented to the treating clinician with complaints of "infertility", the true definition of the complaints described may be more correctly termed sub-fertility. Sub-fertility refers to those situations in which there is reduced fertility despite wanting to conceive for a prolonged period of time. Infertility on the other hand refers to sterility with the possibility of attaining sporadically spontaneous pregnancies. Despite the implications of the chiropractic cases presented with respect to possibly affecting the natural history of subfertility or true infertility, the definitions as defined above remain for our discussion.

Epidemiology of Infertility

Hull and colleagues, in an assessment of 708 couples in a health district on England, determined that approximately 1 in 6 couples require the assistance of a fertility specialist to conceive their first child (primary subfertility) or conceive the number of children they wanted (secondary subfertility). These findings were independently confirmed by two studies in the Netherlands. Beurskens et. al.[17] found an incidence of 10.4% while Snick and colleagues[18] determined that for women between the ages of 15-45 years, approximately 9.9% require a specialist for their fertility needs sometime in their life.

Diagnosis of Infertility

Inherent in all diagnostic criteria, the diagnosis of unexplained infertility requires a thorough physical examination of both partners. Based on the European Society for Human Reproduction and Human Embryology (ESHRE), the criteria are complex and many and beyond the scope of this manuscript. These include the laboratory examination of the normal ovulation and the luteal phase, evaluation of tubal patency and semen (see Table 1).[19] The diagnosis of infertility is one of exclusion and since the basic recommended evaluation protocols are dependent on the individual practitioner and no consensus exists on the most appropriate tests, the criteria should also include findings from examination procedures such as endometrial biopsy, a post-coital test and serum prolactin estimations.[20-22] The possible pathophysiology of unexplained infertility are many and complex. In addition to hormonal factors from altered pituitary or follicular dysfunction, unexplained infertility may be attributed to gamete dysfunction, altered endometrial function, altered uterine or spiral artery blood flow, and immunological factors (see Table 2).[23]

Review of Medical Approaches to Infertility

Although outside the scope of this writing, it would seem prudent to comment superficially on the medical approach to the patient with unexplained infertility. The treatment options include expectant management; clomiphene citrate (CC), or gonadotropins used for ovulation induction; intrauterine insemination (IUI) alone or combined with ovulation induction; and in-vitro fertilization and its modifications.[23] The success rates vary dependent on the type of treatment used, the age of the woman and the duration of the infertility.

Implications of Chiropractic Care

As a basis of commentary on the implications of this case series in patients with infertility/subfertility, we performed a selective review of the literature using Pubmed (1966-2007) and MANTIS (1965-2007). Pubmed was searched with the subject headings "chiropractic AND infertility" and found no articles cited. MANTIS (1965-2007) was searched with the subject heading "infertility", specific to the English language and the chiropractic discipline. The results of our review are provided in Table 3.[24-34] This builds upon the review/commentary performed by Behrendt.[35]

In the case series presented, the approach to patient care was the detection and removal of spinal subluxation.[5] Additionally, nutritional intervention and counseling on stress management was provided to the patients involving goal setting, affirmations, meditation, massage, exercise, alteration of work schedule and overall paradigm shifts in lifestyle modification. The contention of this case series is that, through this approach to patient care, the patients benefited with improvements of their presenting symptoms as well as possibly improving upon the patients' condition of infertility/subfertility. The same contention may also be said for the case reports/case series previously reported.

On first impression, due to the close temporal association with the care provided and the patients' ability to conceive, one may infer a cause and effect situation. However, to fully address this issue of cause and effect, we turn to Hill's criteria of causation[36] wherein temporal association is only one of many variables that need to be address. Not all of Hill's criteria will be addressed in the context of this case series due to the need for higher-level research designs with the appropriate statistical tests. However, for our discussion, we will address the issue of temporal association, consistency, biological plausibility, specificity, coherence and the consideration of alternative explanations/confounders.

Barring the lack of higher level designed studies (i.e., studies performed with controls and randomization to make inferences on strength of association), the case reports/series thus far published would seem to be consistent with temporal association that women with fertility problems may benefit from chiropractic care. However, this is made with the full understanding that the type of care described is under the auspices of "chiropractic care." Although this case series presented data from the clinical experience of one of the co-authors (GS), previous studies provide for a heterogeneity of care approaches. One need only examine the brand-named techniques utilized in previous cases to comprehend the complexity that must be considered. This heterogeneity in clinical approach provides, on the one hand, support for the notion that the detection and removal of vertebral subluxation (regardless of the type of technique employed) may be an alternative approach to usual medical care.

However, many confounders exist in such situations and challenge the chiropractic profession to search for the "active ingredient" that is the causative variable for a salutary effect. Herein lies the challenge in reporting cases of this nature. The third patient in our case series became pregnant after 12 days of chiropractic care despite 7 months of unsuccessful attempts to conceive. The second patient became pregnant approximately 3 months after initiating chiropractic care despite 2 years of unsuccessful medical reproductive assistance. The first patient was able to conceive after 4 months of initiating chiropractic care and had a 4-year history of unsuccessful medical approaches (i.e., reproductive assistance and IVF). The timelines are consistent with the findings of previous reports with even longer periods of infertility (i.e., 9 years of unsuccessful pregnancy prior to initiating chiropractic care) having been reported prior to chiropractic care. This temporal association should also be compared with what we know of the natural history of infertility/sub-fertility.

According to the medical literature, spontaneous pregnancy rates in couples with unexplained infertility have been reported as high[37] and life tables indicate that women with unexplained infertility will eventually conceive without medical treatment[38]. About 14% of all couples with unexplained infertility will conceive without treatment within 1 year and 35% within 2 years[39]. The cumulative 3-year pregnancy rate without treatment is 30–80% and the 5-year cumulative pregnancy rate without treatment is 80% .[40-41] When the female is >35 years old, the pregnancy rates are much lower.[42] The range of spontaneous pregnancy rate have been reported as low as 1–2% per cycle among couples with unexplained infertility[43] but may be as high as 4.1%.[44] Higher-level research designs are required to address the confounder

of natural history.

What of biological plausibility? Various explanatory mechanisms have been proposed regarding the effects of the chiropractic intervention in patients with infertility. To this end, we comment upon the paper by Anderson-Peacock.[25] Similar to Anderson-Peacock and others, we espouse to the pathophysiology that infertility and sub-fertility are the consequences of traumas, thoughts and toxins – the three Ts of chiropractic. Trauma resulting in vertebral subluxations and its role in the pathophysiology of infertility/sub-fertility may seem plausible but "thoughts" (i.e., stress) and "toxins" (i.e. poor diet) may be considered too implausible. However, consider the studies examining the long-term impact of war and post-war exposure. In a case control study, Kobeissi et.al.[45] demonstrated an association between the Lebanese civil war and male infertility. According to these authors, reproductive risk factors - including toxins, injuries, and stress - was believed to be the main factors leading to their findings.

What of the specific effects of the chiropractic adjustment? Only two patients (see case 1) had presenting complaints associated with the low back - low back and inguinal pain and a patient with irregular menstrual flow (see case 3). However, based on the radiographic findings, all patients had positive spinographic findings in the lumbosacral spine as well as in the cervical spine. These findings were concomitant with objective (i.e., thermographic and sEMG) and subjective (i.e., presenting complaints) findings leading to a diagnosis of spinal subluxations. There are reports in the scientific literature demonstrating an association between chronic pelvic pain and infertility[46-47] . Furthermore, there provides for the possibility that pelvic adhesions (with or without the presence of pelvic pain) may be associated with infertility.[48-49]

Given the above findings, we would like to expound and postulate that the presence of lumbopelvic subluxation (i.e., lumbopelvic dysfunction) may lead to intra-abdominal adhesions as well as adhesion formation between intra-abdominal structures and the surrounding osseous structures and between the articulations of the pelvic bowl itself. Support of this theory comes from the work of Burns who found an association between infertility and vertebral lesion.[50] What of specificity? Based on the case series provided and the type of care employed, it is difficult to establish a one-to-one cause and effect phenomenon. The care of the patients presented involved a multiple treatment approach combining chiropractic adjustments augmented with nutritional/dietary intervention and stress counseling. This approach would seem prudent given the multiple causality of infertility or subfertility within the framework of a holistic/vitalistic approach to patient care.

With respect to coherence; as set forth above, the detection and elimination of vertebral subluxation seems compatible with existing theory and knowledge within chiropractic and in the scientific field. What of alternative explanations to the results described in this case series? Herein lies the limitation of the case series. We addressed the issue of natural history indicating a favorable pregnancy. Due to their research design (i.e., lack of controls), case series lack generalizability. Thus the findings of the case series presented and the case reports/series reviewed must be viewed with caution, particularly in terms of the cause and effect discussion above. Inherent in their research designs, the benefits of care attributed in the case series presented may be attributed in addition to a favorable natural history to the following: (a) regression to the mean and (b) the result of placebo. Furthermore, both the healthcare provider and the patient may make incorrect inferences from the chiropractic treatment due to (c) the demand characteristics of the therapeutic encounter and (d) subjective validation. The use of appropriate controls, randomization and manipulation of the independent variable (i.e., the care employed) must be applied in higher-level designed studies to fully determine the role and salutatory effects of chiropractic care in similar patients. Despite their lack of generalizability and bias, case reports/case series do provide an important aspect of evidence-based practice.[51]

Conclusion

We described in a case series presentation patients with "fertility problems" who, following chiropractic care, were able to conceive. We support and encourage continued research incorporating higher level designs in this field for the benefit of patients.

References

1. Coulter ID, Hurwitz EL, Adams AH, Genovese BJ, Hays R, Shekelle PG. Patients using chiropractors in North America: who are they, and why are they in chiropractic care? Spine 2002;27(3):291-6.
2. Hurwitz EL, Chiang LM . A comparative analysis of chiropractic and general practitioner patients in North America: findings from the joint Canada/United States Survey of Health, 2002-03. BMC Health Serv Res. 2006 ;6:49.
3. Côté P, Cassidy JD, Carroll L. The treatment of neck and low back pain: who seeks care? who goes where? Med Care. 2001;39(9):956-67.
4. Palmer DD, The Science, Art and Philosophy of Chiropractic, Portland Oregon. Portland Printing House Co.:1910
5. Gatterman M (ed). Foundations of Chiropractic: Subluxation. St. Louis, MO: Mosby, 1995.
6. Masarsky CS and Todres-Masarsky. Somato-visceral aspects of Chiropractic: An evidence-based approach. Philadelphia,PA: Churchill Livingstone, 2001:1-5, 37-49,109-138.
7. Hawk C, Long CR, Boulanger KT. Prevalence of nonmusculoskeletal complaints in chiropractic practice: report from a practice-based research program. J Manipulative Physiol Ther 2001;24(3):157-69.
8. Leboeuf-Yde C, Pedersen EN, Bryner P, Cosman D, Hayek R, Meeker WC, Shaik J, Terrazas O, Tucker J, Walsh M . Self-reported nonmusculoskeletal responses to chiropractic intervention: a multination survey. J Manipulative Physiol Ther 2005;28(5):294-302.
9. Leboeuf-Yde C, Axén I, Ahlefeldt G, Lidefelt P, Rosenbaum A, Thurnherr T. The types and frequencies of improved nonmusculoskeletal symptoms reported after chiropractic spinal manipulative therapy. J Manipulative Physiol Ther1999;22(9):559-64.
10. http://www.medterms.com/script/main/art.asp?articlekey=3977

11. CDC Fertility, Family Planning, and Reproductive health of U.S Women: Data From the 2002 National Survey of Family Growth.
12. CDC 2003 Assisted Reproductive Technology Success Rates, National Summary and Fertility Clinic Reports
13. Kent C, Gentempo P. Normative data for paraspinal surface electromyographic scanning using a 25-500HZ bandpass. Vertebral Subluxation Research 1996;1(1):43.
14. Bergmann TF, Peterson DH, Lawrence DJ. Chiropractic Technique: Principles and Procedures. New York:Churchill Livingstone, 1993.
15. Gibbons RA. A lecture on sterility, its etiology and treatment. London: J&A Churchill, 1911.
16. Evers JLH. Female subfertility The Lancet 2002;360:151-159.
17. Beurskens MP, Maas JW, Evers JL. Subfertility in South Limburg: calculation of incidence and appeal for specialist care. Ned Tijdschr Geneeskd 1995; 139: 235-38.
18. Snick HK, Snick TS, Evers JL, Collins JA. The spontaneous pregnancy prognosis in untreated subfertile couples: the Walcheren primary care study. Hum Reprod 1997; 12: 1582–88.
19. Crosignani PG, Collins J, Cooke ID, et al. Unexplained infertility. Hum Reprod 1993;8:977–80.
20. Donderwinkel PF, van der Vaart, Wolters VM, et al. Treatment of patients with longstanding unexplained infertility with in vitro fertilization. FertilSteril 2000;73:334–7.
21. Kelly SM, Sladkevicius P, Campbell S, et al. Investigation of the infertile couple: a one-stop ultrasound-based approach. Hum Reprod 2001;16:2481-4.
22. Collins JA, Rowe TC. Age of the female partner is a prognostic factor in prolonged unexplained infertility: a multicenter study. Fertil Steril 1989;52:15–20.
23. Isaksson R, Tiitinen A. Present concept of unexplained infertility. Gynecol Endocrinol. 2004;18(5):278-90.
24. Adams JP. Chiropractic and nutritional management and its effect on the fertility of a diabetic amenorrheal patient: a case report. J Vertebral Subluxation Res 2003(1): 1-2.
25. Anderson-Peacock E. Reduction of vertebral subluxation using Torque Release Technique with changes in fertility: two cases. J Vertebral Subluxation Res 2003(1): 1-6.
26. Bedell L. Successful pregnancy following diagnosis of infertility and miscarriage: a chiropractic case report. J Vertebral Subluxation Res., December 2, 2003
27. Blum CL. The resolution of chronic colitis with chiropractic care leading to increased fertility. J Vertebral Subluxation Res 2003(1): 1-5.
28. Kaminski TM. Female infertility and chiropractic wellness care: a case study on the autonomic nervous system response while under subluxation-based chiropractic care and subsequent fertility. J Vertebral Subluxation Res 2003(1): 1-10.
29. Lyons DD. Response to Gonstead chiropractic care in a 27-year old athletic female with a 5 year history of infertility. J. Vertebral Subluxation Res, November 9, 2003
30. Nadler A. Torque Release Technique™ in the clinical management of infertility related to cultural or religious-based lifestyle. J Vertebral Subluxation Res 2003(1):1-3
31. Ressel O. A Commentary on infertility. J Vertebral Subluxation Res December 24, 2003
32. Rosen MG. Sacro Occipital Technique management of a thirty four year old woman with infertility. J Vertebral Subluxation Res 2003(1): 1-4.
33. Senzon SS. Successful in vitro fertilization in a poor responder while under Network Spinal Analysis care: a case report. J. Vertebral Subluxation Res., September 14, 2003
34. Shelley J. Healthy pregnancy in a previously infertile patient following D.N.F.T. chiropractic care: a case report. J Vertebral Subluxation Res 2003(1):1-7.
35. Behrendt M. Insult, Interference and Infertility: An overview of chiropractic research. J J Vertebral Subluxation Res March 2 2003.
36. http://www.drabruzzi.com/hills_criteria_of_causation.htm
37. Pandian Z, Bhattacharya S, Nikolaou D, et al. In vitro fertilisation for unexplained subfertility. CochraneDatabase of Systematic Reviews. In The Cochrane Library, 3. Oxford: Update Software, 2003
38. Jaffe SB, Jewelewicz R. The basic infertility investigation. Fertil Steril 1991;56:599–613
39. Collins JA, Burrows EA, Willan AR. The prognosis for live birth among untreated infertile couples. Fertil Steril 1995;64:22–8.
40. Hull MGR, Glazener CMA, Kelly NJ, et al. Population study on causes, treatment, and outcomeof infertility. Br Med J 1985;304:1693–7.
41. Randolph JF Jr. Unexplained infertility. Clin ObstetGynecol 2000;43:897–901.
42. Isaksson R, Tiitinen A. Superovulation combined with insemination or intercourse in the treatment of couples with unexplained infertility and minimal endometriosis. Acta Obstet Gynecol Scand 1997;76:550–4.
43. Hughes E, Collins J, Vandekerckhove P. Clomiphene citrate for unexplained subfertility in women. Cochrane Database of Systematic Reviews. In TheCochrane Library, 3. Oxford: Update Software, 2003
44. Guzic DS, Sullivan MW, Adamson GD, et al. Efficacy of treatment for unexplained infertility. Fertil Steril 1998;70:207–13
45. Kobeissi L, Inhorn MC, Hannoun AB, Hammoud N, Awwad J, Abu-Musa AA. Civil war and male infertility in Lebanon. Fertil Steril 2007; [Epub ahead of print].
46. Thornton JG, Morley S, Lilleyman J, Onwude JL, Currie I, Crompton AC. The relationship between laparoscopic disease, pelvic pain and infertility; an unbiased assessment. Eur J Obstet Gynecol Reprod Biol 1997;74(1):57-62.
47. Gurleyig E, Celik C, Eran F, Oral O.Infertility and chronic pelvic pain due to retained fetal bone fragments. Eur J Obstet Gynecol Reprod Biol 2007 Nov 8 [Epub ahead of print].
48. Stovall TG, Elder RF, Ling FW. Predictors of pelvic adhesions. J Reprod Med 1989;34(5):345-8.
49. van Goor H. Consequences and complications of peritoneal adhesions. Colorectal Dis 2007 Oct;9 Suppl 2:25-34.
50. Burns L. Vertebral Lesions and the Course of Pregnancy in Animals. JAOA, 1923;23: 3.
51. Sackett DL, Straus SE, Richardson WS, et al. Evidence-Based Medicine: How to Practice and Teach EBM . 2nd ed. Edinburgh, Scotland: Churchill Livingstone Inc; 2000:173-177

Table 1. Diagnostic Criteria for Unexplained Infertility

Testing	Description
Ovulation and the Luteal Phase,	Ovulation is usually indicated by: • existence of a regular menstrual cycle (26–32 days, with the cycle length varying no more than 4 days from cycle to cycle), • an ovulatory progesterone rise at midcycle and a luteal phase of 512 days12. • Different cut-off values indicative of ovulation are progesterone levels of 416 nmol/l8, 418 nmol/l at two assays or 425 nmol/l in the midluteal phase13.
Tubal Patency	Tubal patency can be determined by ultrasoundassisted hysterosalpingosonography (HSSG), hysterosalpingography (HSG) or, if necessary, laparoscopy and chromopertubation
Semen	Semen analysis is evaluated according to the criteria of the World Health Organization15. Based on the criteria for normality of the semen analysis, a sperm concentration of 520 million/ml, motility of 550% and normal morphology of 515% are required.

Table 2. Theories on the possible causes of unexplained infertility

Possible Cause of Unexplained Infertility	Description and/or Examples
altered pituitary or follicular dysfunction,	• elevated levels of follicle stimulating hormone (FSH) in the early follicular phase and luteinizing hormone (LH) abnormalities • elevated estradiol levels in the follicular phase and elevated estradiol/progesterone ratio suggesting altered folliculogenesis • absent midcycle elevation of the hormone prolactin
Luteal Phase,	• Impaired (shorter) luteal phase and decreased peak serum progesterone level • An abnormal follicular LH pulse frequency or decreased midfollicular FSH level have been postulated to induce an impaired luteal phase functional imbalance in the hypothalamus • decreased inhibin-B concentrations are associated with increased FSH concentrations, and both may reflect a diminished ovarian reserve
gamete dysfunction,	• Altered folliculogenesis, impaired oocyte maturation, reduced oocyte quality and defects in gamete interaction • sperm dysfunction would impair the ability of spermatozoa to penetrate the cervical mucus, the zona pellucida and the ooplasmic membrane • insufficient acrosome reaction • failure in the natural ovum pick-up mechanism by the Fallopian tube
altered endometrial function,	• Low endometrial progesterone receptor concentrations, inadequate estrogenic induction of progesterone receptors, decreased inhibin levels22 and suboptimal expression of integrins or pinopode formation in the endometrium • Aberrant patterns of integrin expression, e.g. absence of the β3 subunit in the window of implantation despite normal histological maturation of the endometrium
altered uterine or spiral artery blood flow, and	• Increased uterine artery impedance, absent end-diastolic flow or an abnormal flow in spiral arteries in the midluteal phase have been suggested to impair the implantation process • Poor endometrial blood flow has in some studies predicted poor implantation rate
immunological factors	• Antiovarian antibodies are frequent among women with unexplained infertility as are elevated anti-spermatozoal18,38 and anti-cardiolipin antibodies • inadequate maternal immunosuppression, which might cause embryo rejection in women • endometriosis • occupational exposure to noise, chemicals, radiation, mercury and cadmium may be linked to unexplained infertility • Women's anxiety and stress levels may also lower the chances of conception

Table 3. Review of the literature on chiropractic care in patients with infertility.

Author/Ref	Age	How Long Infertile	Technique	Prev. Care	Time between start of chiropractic and Pregnancy
Adams[24]	22	Primary Amenorrhea	AK/Full Spine	None	w/in 4 months start unassisted cycles, 20 months pregnant
Anderson-Peacock[25]	36	9 yrs	TRT (torque Release)	Inserol	within 3 months
Anderson-Peacock[25]	35	2 yrs	TRT	None	within 2 months
Bedell[26]	27	2 miscarriages in 6 mo.	TRT	Clomid & Synth Progesterone	App. 3 months (and carried to term)
Blum[27]	32	7 yrs	SOT & CMRT	None	After body recover from 12 yrs of unresolved colitis (take 1yr., pregnant 1 month after)
Kaminski[28]	31	>1yr	Diversified (3 mos) & TRT (6 mos)	Clomid	diagnosed with "lazy" reproductive system. 3 months start regular cycles, app. 6 mo. pregnant
Lyons[29]	27	5 yrs.	Gonstead	Fertility meds	App. 1 month
Nadler[30]	42	perimenopause	TRT	None	In 5 weeks, cycle shift from 24-26 days with 8-10 Days flow to 29-30 days, w/in months - pregnant
Ressel[31]	65	Amenorrhea since 18	Thompson	None	cycles restart in app. 4 weeks
Rosen[32]	34	always	SOT	Meds & IVF	approximately 4-5 weeks
Senzon[33]	34	IVF	NSA (Network)	IVF, FSH & Gonadotropin Releasing Hormone	3 months with IVF
Shelley[34]	32	2 yrs - IVF	DNFT	AI (art insem), clomid & IVF	3 ½ months with IVF