

The Role of the Spinal Cord in Maintaining Fertility

by

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Literature Review
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ABSTRACT

This study investigated the literature that linked the nervous system, specifically the spinal cord, with maintaining fertility in the human being. It was found that the spinal cord played more of a role in maintaining fertility in the male rather than the female. The spinal cord was found to have played roles in coordinating erection and ejaculation, specifically in the thoracolumbar and sacral areas of the spinal cord. The author concluded although the literature was drawn from spinal cord injured men, the chiropractor may have a role in restoring fertility in the male. A call for more research into spermatogenesis and spinal manipulative therapy was made.

INTRODUCTION

Approximately 10% of couples each year seek assistance from a health care professional, almost always a medical doctor, for infertility(1). The chiropractic profession has offered anecdotal stories of couples conceiving while under the course of chiropractic care, but has not done any full scale scientific investigation of infertility at this point. One illustrative case of infertility has been reported in the osteopathic literature where a 27 year old man under medical treatment for infertility responded to spinal manipulative therapy(2). His sperm count climbed from 40,000 per milliliter to 40,000,000 per milliliter over a period of six months while receiving spinal manipulative therapy. Despite the lack of controlled clinical trials on infertility, the chiropractic profession is currently pioneering work in cystitis, dysmennorrhoea, and interstitial cystitis with regards to somatic dysfunction in the spine. This paper offers a scientific basis for the investigation the link between the nervous system and infertility in couples, specifically directed at the male.

BACKGROUND

When confronted with infertility in a couple, the clinician has the challenge in discerning the cause of the dysfunction. In approximately 40% of cases the cause lies in dysfunction with the female partner. In 40% of cases, it lies with the male. Approximately 10% are idiopathic leaving the remainder of causes to lie with both of the partners(1).

The role of the nervous system in maintaining fertility in the female is currently postulated to be very low. In a study by Reame et al.(3), women's menstrual cycles were unchanged as a result of spinal cord injury, with some women not even missing a period after injury and it is not uncommon for spinal cord injured(SCI) women to deliver a developed baby to full term. Although this does not preclude the possibility of vagal influence upon the reproductive organs, it does suggest that the female reproductive system is mostly, if not totally, hormonally regulated. Because of this assumption, the remaining scope of this paper links the nervous system in maintaining fertility in the male.

ERECTILE DYSFUNCTION IN THE SPINAL CORD INJURED MALE

The nervous system plays much more of a role in maintaining fertility in the male, specifically the sexual act itself. Much of the role of the nervous system in maintain fertility in the male has been

extrapolated in studying spinal cord injured males.

Penile erection, which is the first response occurring during male sexual stimulation, is a vascular event that is neurally controlled(4). The neural activity that is specific to sexual stimulation has been shown to arise in autonomic pathways in the sacral levels S2-S4 (parasympathetic) and thoracolumbar (sympathetic) levels of the cord(5). The evidence points to the vertebral levels of S2-S4 as the major area. The neural activity described above is mediated by spinal reflexes that works in conjunction with supraspinal centers in response to auditory, olfactory, tactile, and imaginative stimuli(4). Sympathetic outflow In patients with lower motor neuron lesions involving the sacral spinal cord, reflexogenic erections do not occur but psychogenic erections may still occur (6). In a sample of 29 impotent men with multiple sclerosis and erectile problems, 26 of the patients had an abnormal pudendal evoked potential suggesting a neurogenic erectile dysfunction in the males(7).

EJACULATORY DYSFUNCTION IN SPINAL CORD INJURED MALES

There is believed to be a ejaculatory reflex center located between T12 and L2 which is responsible for the coordination and integration of the neural input from higher cerebral centers and that from sensory fibers(8). The reflex center properly sequences the efferent outflow

between the lumbar sympathetics, which is responsible for emission, and the sacral somatics, which is responsible for antegrade ejaculation. It has been reported that that 17% with complete and 60% with incomplete lower motor neuron lesions have ejaculatory failure(9). Besides the difficulty of the delivery of semen, abnormal spermatogenesis has been noted in spinal cord injured males. The semen volume is usually low with variable sperm concentration and poor sperm motility(10). The authors postulated that poor thermoregulation of the scrotum can lead to heat damage of spermatozoa in the male. Thermoregulation is controlled by local mechanisms and unique pathways that undergo "switching" processing within the central nervous system, including the spinal cord and brain. The paper did not specify the specific lower motor neuron lesions. If some of the lower motor neuron lesions being treated by a chiropractor were canal stenosis or neuropraxia from discogenic spondylosis, investigation into the male's fertility status might be warranted.

IMPLICATIONS IN TREATMENT

It has been observed in clinical practice that impotence can be related to lumbar disc herniation and disease(11). In fact, it has been reported that impotence may be the presenting complaint in patients with occult lumbar disc disease(12). It is has not been determined if the cause is

psychological or true functional physiological disturbance.

The chiropractic profession has always held the theory that somatic dysfunction in the spine can cause visceral disease(13). Reflex effects of spinal somatic nerves on visceral function is currently under investigation and provides a theory of possible dysfunction that could occur in males with dysfunction in the lumbar spine. A musculo-vesical reflex has been established where rhythmic micturition contractions were inhibited when thin afferent fibers in hindlimb muscle nerves were stimulated by close intraarterial injection of algescic substances, such as KCL and bradykinin(13). An interesting study would be to see if that reflex extended to the erectile tissue of the penis.

Because it has been determined that occult lumbar disc disease is linked to impotence, an inquiry into the patient history while preserving the patient's modesty would be in order for the treating physician. Coordination with a fertility specialist when a diagnosis of lumbar disc disease is made would benefit the patient.

CONCLUSION

The review of the literature has suggested that the high incidence of male infertility in the U.S. population along with evidence of central regulation of ejaculation and erection present in the spinal cord lends credence to the claim many chiropractors have made about restoring

fertility to a patient. Further research should be aimed at studying the viscerosomatic reflex and the effect on erectile function, ejaculatory function, and spermatogenesis in the male. A simple controlled clinical trial of evaluating sperm count in a diagnosed infertile male and spinal manipulative therapy might be a good pilot study into the effect of the nervous system on maintaining fertility in the male.

REFERENCES

1. Wyngaarden J. et al eds., Cecil's Textbook of Medicine, 19th ed., W.B. Saunders Co., pp. 1370-71, 1992.
2. Hoag, J. et al eds., Osteopathic Medicine, McGraw Hill Book Co., pp. 672-73, 1969.
3. Reame, N.E., A prospective study of the menstrual cycle and spinal cord injury, *Am J Phys Med Rehabil.* 1992, 71: 15-21.
4. DeGroat, W.C. et al., Physiology of Male Sexual Function, *Ann Intern Med.* 1980; 92: 329-331.
5. Weiss HD. The physiology of human penile erection, *Ann Intern Med.* 1972; 76:793-9.
6. Bors E, Comarr AE. Neurological disturbances of sexual function with special reference to 529 patients with spinal cord injury, *Urol Survey.* 1960; 10:191-222.
7. Kirkeby HJ et al. Erectle dysfunction in multiple sclerosis, *Neurology.* 1988: 38:1366-71.
8. Seftel, D. et al. Disturbed sexual function in patients with spinal cord disease, *Neuro Clin.* 1991: 9:757-78.
9. Brindley, GS, The fertility of men with spinal cord injuries, *Paraplegia.* 1984; 22:337.
10. Mallidis et al., Collection of semen in men in acute phase of spinal injury, *Lancet.* 1994: 343:1072.
11. Ameloar RD. Dubin L. Impotence in the low back syndrome, *JAMA* 1971; 216:520.
12. Shafer N. Rosenblum J. Occult lumbar disc causing impotency, *NY State J Med.* 1969; 69:2465-70.

13. Sato A, The reflex effects of spinal somatic nerve stimulation on visceral function, *JMPT*. 1992; 15:427-31.