

Mechanical Drainage of Nerves that Supply Tissues Derived from the Branchial Arches

by

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Ethical Standards:

Procedures followed in these studies were in accordance with the Helsinki Declaration of 1975.

Permission to publish was given by the case subject.

Abstract

Objective: To introduce the concept that a certain form of non-vascular edema can exist at various sites in the nervous system innervating tissue derived from the branchial arches.

Clinical Features: The signs and symptoms will vary depending upon which nerves are affected. The patient in this case is suffering from osteoradionecrosis of the mandible and associated symptoms.

Intervention and Outcome: The testing and treatment are mechanical. The affected nerves in the areas were stretched manually in the long axis direction causing the edema to be 'squeezed out' of the extracellular matrix. Outcomes were measured mainly by the patients' symptom abatement, his personal observations, and independent interprofessional observations and investigations.

Conclusion: The patient reported a marked improvement. By draining this edema a normal blood flow returns to the affected nerves. Practitioners in all fields should be aware of this phenomenon.

INTRODUCTION

A form of non-vascular edema can affect the nervous system at any level^{1,2,3,4,5,6}. This condition is characterized by an expanded extracellular matrix (ECM) surrounding the affected nerves, too high a concentration of macromolecules in this matrix, and a paucity of blood elements in the area^{2,3,5}. It is my hypothesis this edema raises the hydrostatic pressure around the involved nerves so that blood flow in the vasa nervorum is compromised^{7,8}. Blood flow only travels in the direction of lower pressure. If the pressure in these areas of non-vascular edema approaches that of the local capillary pressure at systole then the flow is diminished. Macromolecules such as proteoglycans and glycoproteins in the extra cellular matrix are one cause of this edema^{1,2,3,4,5,6,9,10,11,12,13,14,15,16,17,18,19,20,21}. Local nerves and their associated connective tissue excrete these macromolecules when under stress^{13,22,23,24,25,26}. Areas particularly affected seem to be where neurogenesis and angiogenesis are taking place^{12,14,15,16,27,28,29,30,31}. The patient's symptom picture will vary depending on which nerves are affected.

The goal of treatment is to mechanically drain the excess fluid so the hydrostatic pressure is decreased and blood flow returns.

The case presented here involves nerves supplying tissues derived from the branchial arches. Many conditions affecting these tissues may be caused by this condition and therefore may be helped by manual therapy. It behooves the practitioner to understand the embryonic development of the six pharyngeal (branchial) arches, their pouches and clefts. The interrelationship of these nerves (CNV_{1,2,3}, CNVII, CNIX, CNX, CNXI, CNXII, the cervical plexus) and their association with arch cartilage, blood vessels, muscles, fascia, mucosa, and mesenchyme give diagnostic clues for avenues of treatment. For example, Meckel's cartilage relates the incus and malleus to the sphenomandibular ligament. By end range loading this ligament perhaps small branches of CNV_{2,3} would have a reflex effect in the middle ear. The same thinking is true for the caudal arches. Conditions such as dysphasia and dysphagia may have a beneficial effect by loading involved tissues. Please refer to the Fall 2010 edition of *Massage Matters*, the official magazine of the Massage Therapy Association of British Columbia (<http://www.massagetherapy.bc.ca>). In it you will find several other case studies regarding the head and neck.

CASE REPORT

A fifty-one year old male presented with symptoms resulting from radiation therapy for tongue cancer. The chief complaints were osteoradionecrosis of the mandible, decreased hearing, a sore and stiff tongue, dysphasia, gums and tongue that won't heal, stiffness in the jaw and neck. These symptoms were constant. He started cancer therapy in April, 2010. Physical examination on November 2, 2010 revealed the following: dystrophy of the skin on the left aspect of the throat, a small and hypomobile tongue, an open lesion in the gum and tongue, dysphasia, decreased hearing, hypertonic pharyngeal and masticatory muscles and a forward head posture. My tentative diagnosis was non-vascular edema affecting local nerves and was caused by stress to those nerves and associated connective tissue due to radiotherapy. The trial of therapy consisted of stretching the involved nerves and tissues. I repeated the procedures on 4 occasions over a period of 3 weeks.

My examination of him in late November revealed less hypertonicity in his pharynx and muscles of mastication. The lesions on his tongue and gums had diminished in size and depth. His voice was lower in tone and greater in amplitude.

In early January, 2011 the patient reported the following. His jaw and pharyngeal muscles are much more relaxed and his TMJ has a much greater range of movement. His speech, swallowing and hearing have also improved. Some lesions in his oral cavity have almost disappeared. The severity and area of dystrophic skin on his lower neck has lessened.

Both his oral surgeon and his radio oncologist noted a rapid improvement since starting care here.

Table 1 *Summary of results.*

	Date of Onset	Frequency, Severity and Duration of symptoms	Intervention and Date(s)	Frequency, Severity and Duration of Symptoms
Case I Radiation	April, 2010	Constant	Nerve Stretching Nov.03, 09, 10, 15, 2010	Since late November a 75% abatement of his symptoms.

DISCUSSION

In cases of this type of non-vascular edema involving nerves in the periphery, traction of those nerves will cause excess fluid around them to be removed. Nerves are viscoelastic and stretching them will decrease their internal volume and increase the pressure within³³. The increased pressure from the loading procedure causes the fluid to leave the area. It is important for the traction to be held for several seconds and then repeated, allowing the excess fluid enough time to flow out. This is like 'wringing-out' a damp cloth. These kinds of procedures were used in treating this patient.



Fig. 1. This patient felt a warm and tingling sensation into his TMJ area immediately after the treatment. I believe this sensation was due to the blood flowing into the affected nerves.

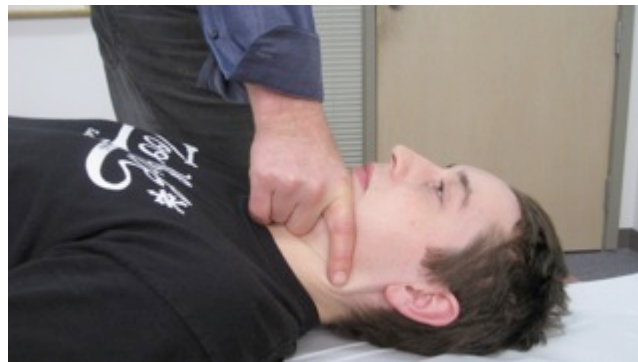


Fig. 2 This patient felt a warming in his right ear afterwards.

I have been a practicing chiropractor for thirty-three years and first stumbled onto this phenomenon in 1998. Only in 2009 did I realize the entire nervous system may be affected by non-vascular edema and not just the occasional peripheral nerve. This more universal hypothesis motivated me to write this paper.

Over the last ten years I have had the opportunity to 'stretch' affected peripheral nerves on many occasions. Here, the nerves to the tissues associated with the viscerocranium is one case. Other examples include the primary ventral rami of the spinal nerves, including their plexi and end nerves, the primary dorsal rami of the spinal nerves, some cranial nerves and some visceral nerves. Obviously not all chronic mechanical problems have this pathology but those that do will respond quickly.

CONCLUSION

The subject experienced significant improvement. These results along with my experiences over the last ten years have allowed me to draw certain conclusions. The condition of non-vascular edema is real and this treatment is effective. Perhaps in the future microcirculation to the affected nerves will actually be measured.

This case represents a novel diagnosis and treatment protocol for many conditions seen in the dental surgeon's office. Temporomandibular dysfunction, chronic odontalgia, and tinnitus are some examples. The treatment described in this paper falls well within your scope of practice.

More generally, the affected nerves could be anywhere. They may include those to a tendon resulting in a tendinopathy^{3,5,6,9,10,11,20,21}, those to a disc resulting in an internal disc disruption syndrome^{27,34,35,36,37,38}, or those to the intestine as in an irritable bowel syndrome (Auerbach's and Meissner's plexi). Other nerves could include those of the brain and central nervous system resulting in conditions such as anosmia, migraines, tinnitus, post concussive syndrome, slow recovery from an ischemic stroke, and various psychiatric disorders^{1,2,12,13,14,15,16,17,25,32,39,40}.

Thousands of articles have been written about chronic problems affecting the musculoskeletal system, the viscera and the central nervous system. What is being presented in this paper is a new way to observe, test and treat many of those conditions. The testing for and treatment of non-vascular edema are both parts of the same process. If the patient responds, you have a good diagnosis. If there is no effect from the testing then the condition is due to something else and no harm was done.

Hopefully this paper will represent a starting point for future research.

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