Safety and Utility of Osteopathic Manipulative Treatment for the Acute Care of Severe Traumatic Brain Injury - a Case Report

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INTRODUCTION

The CDC estimates that 1.4 million people sustain traumatic brain injury (TBI) annually of whom 235,000 are hospitalized and 50,000 die.1 The total number of TBIs has increased by 58% over the past decade, resulting in steadily increasing healthcare expenditures.2 A multidisciplinary approach is recommended for treatment and rehabilitation after TBI, although the most effective modalities or combination of modalities have yet to be determined.3,4 OMT, especially Osteopathy performed in the cranial field may alter CNS physiology5-9 and has demonstrated significant clinical effects in various populations.10-14 Historically, acute TBI has been regarded as a potential contraindication to OMT;15 thus, data regarding the benefits of OMT for acute TBI are sparse.16 Herein, we describe a case of severe TBI for which OMT was a consistent part of comprehensive, acute inpatient, multimodal care.

CASE DESCRIPTION

History of Present Illness: H.F. is a 21 year-old male who presented as a level one trauma after a four-story fall. Post-resuscitation Glasgow coma score (GCS) was 7. CT of the brain revealed a R epidural hematoma, R subdural hematoma, bilateral intraparenchymal hematoma as well as diffuse cerebral edema and pneumocephalus (Figure 1).

Craniofacial fractures included LeFort II and III, left temporal bone, left frontal sinus and left orbital roof with suspicion of left optic nerve transection (Figure 2). Extracranial fractures included left C6-T7 transverse process and right clavicle fractures. Apart from assorted external soft tissue injuries, other clinical and imaging findings were atypical.

In the surgical intensive care unit, the patient remained intubated and was started on hypertonic saline infusion. OMM/NMM consultation and treatment began on hospital day (HD) four. Past medical and surgical history and review of systems were unobtainable at the time of consultation.

Physical exam: Vital signs: T 97.9, HR 80, BP 115/50, RR 18, SpO2 100%

Assessment and Plan

21 yo M with no known PMHx s/p fall from 4 stories with multicompartmental hematomas, diffuse cerebral edema, Le Fort II III facial fractures with suspicion for optic nerve transection, cervical transverse process and R clavicular fractures currently on hypertonic saline, intubated with GCS 6T off sedation with above noted severe acute somatic dysfunction in a traumatic pattern. Gentle OMT was applied to all above noted areas of somatic dysfunction using balanced membranous and ligamentous tension, myofascial release and osteopathy in the cranial field technique to reduce the traumatic strain pattern, optimize respiratory mechanics and circulation and to promote lymphatic and venous sinus drainage. Patient tolerated treatment without observed complications.

Hospital and Treatment Course (continued)

He was discharged home with GCS 15. There were no adverse outcomes associated with OMT. One month after discharge, repeat cranial imaging demonstrated resolution of all intracranial bleeding and patent ventricles (Figure 3).

During the patient’s hospital course, the severity of asymmetry and restricted range of motion of the cranial base, spine and ribs gradually improved. Although still slightly asymmetric at the time of discharge, there was improvement in the overall positional symmetry of the facial bones.

DISCUSSION

TBI is associated with increases in inflammatory cytokines, such as interleukin (IL)-2, IL-6 and tumor necrosis factor-alpha (TNF-a), requiring removal via venous and lymphatic drainage systems.17 05% of the blood flowing through the dural venous sinuses leaves the head through the jugular foramina, with the remaining 95% draining via facial veins and the external jugular vein.18 However, following TBI, magnetic resonance venography has demonstrated decreased venous outflow through these primary channels and greater use of secondary pathways.19 This favoring of venous drainage outside the jugular system is associated with increased intracranial pressure (ICP) and decreased intracranial compliance.17,19

The dural venous sinuses are located in the bifurcated attachment of the dural membranes between the pericranial and meningeval layers; therefore, derangements in the tension of the dural membranes may result in derangements of venous sinus structure and subdural drainage.20,21 The tentorium cerebelli attach to the superior border of the petrous portion of the temporal bones, enclosing the superior petrosal sinuses. Posteriorly, they attach to the transverse ridge on the inner surface of the occipital bone, encasing the transverse sinuses.22 The falx cerebri attaches anteriorly along the frontal crest of the frontal bone and onto the crista galli of the ethmoid, and posteriorly, attaches to the upper aspect of the tentorium.