

Craniosacral Approach to the Cardiovascular Physiology: Characteristics, Mechanism and Therapeutic Perspectives

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ABSTRACT

Although there are dissenting opinions, the “classic” craniosacral therapy has gained a role in the management and treatment of clinical problems for which the traditional therapeutic strategies led to fluctuating results. Similarly, the biodynamic craniosacral therapy perspective, which involves the intrinsic healing power of the life breath, has been emphasised. Hemodynamic and cardiopulmonary parameters are above all influenced by the heart and brain centres, besides peripheral resistance. Considering the small number of scientific studies on this topic existing in literature, we focused on the anatomical aspects and neurophysiological or vascular connections that can be influenced by craniosacral therapy, aiming to investigate the potential effects on cardiovascular physiology through anatomic links. As far as the spinal neurophysiological complex is concerned, the nervous system preganglionic neurons are located in a cell column in the intermediate area of the lateral horn of the spinal cord; this area is called the intermediolateral cell column. The important vascular effects mediated by the sympathetic chain neurons are only

ipsilateral. The right and left columns have different effects on the heart: the right primarily innervates the sinoatrial node, and the left innervates the atrioventricular node; therefore, an increase in the parasympathictonia and vagal hypertonia induced by biodynamic craniosacral therapy at the superior centres and the suprasedgmental nuclei level can directly lead to a reduction in the frequency of firing of sinoatrial and atrioventricular nodes, modifying the hemodynamic and ventilatory parameters. Even if further in-depth studies are necessary to confirm our hypothesis and experiences, this therapeutic perspective could potentially provide a robust tool to approach the cardiovascular pathophysiology.

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Key words: Craniosacral approach; Cardiovascular physiology; Autonomic nervous system; Complementary medicine; Clinical benefit

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INTRODUCTION

Although there are dissenting opinions^[1-11], the “classic” craniosacral therapy (CST) has gained a role in the management and treatment of clinical problems for which the traditional therapeutic strategies led to fluctuating results. Similarly, the biodynamic CST perspective, which involves the intrinsic healing power of the life breath, has been emphasised.

Few recent scientific studies have been conducted to explore the effects of CST on specific parameters concerning physical exercise, although the literature includes publications on the effects of the classic CST, which are sometimes discordant for several clinical problems^[12-17]. However, the craniosacral system is the most intimate in the human body and it is there that we should focus our attention

in the aim to provide the resources for an healthy body.

The craniosacral system (CSS) is defined as a recognised, functioning physiological system, including the membranes and cerebrospinal fluid surrounding the spinal cord and brain, the bones to which these membranes attach and connective tissue related to these membranes. It is intimately related to and influenced by the nervous, musculoskeletal, vascular, lymphatic, endocrine and respiratory system of the body. The CSS is characterised by rhythmic, mobile activity, being distinctively different from the physiological motions related to breathing and cardiovascular activity^[18].

An important component of craniosacral mobility is referred to as the primary respiratory mechanism, which manifests as palpable motion of the cranial bones, sacrum, dural membranes, central nervous system and cerebrospinal fluid (CSF)^[19].

On the basis of their palpatory ability, the goal of the therapist is to identify the mechanism that needs treatment: fluids, fasciae, membranes, sutures or bones, the five primary constituents of the primary respiratory system.

THE PARASYMPATHETIC NERVOUS SYSTEM

The parasympathetic nervous system (PSNS) is divided into two sections: the cranial and sacral components^[20-22].

The cranial component consists of the following structures: (1) The vegetative nuclei of the brainstem; (2) The autonomic fibres that connect these nuclei to the cranial nerves; (3) The papillary nucleus of the cranial nerve (III); (4) Tears, the nasal mucus and its cranial nerve (VII); (5) The superior salivatory nucleus and its cranial nerve (VII); (6) The inferior salivatory nucleus and its cranial nerve (IX); (7) The masticatory nucleus, its cranial nerve (V) and the fibres that connect it to face, conjunctiva and buccal mucosa; (8) The cardio-pneumo-digestive nucleus and its cranial nerve (X).

The sacral component is a vegetative, sensory and motor centre derived from segments S2-S4 and innervates the sigmoid colon, rectum, urogenital system, urinary bladder, kidneys, sexual organs and external genitalia via the pelvic nerve^[20-22].

Unlike the sympathetic nervous system (SNS), the PSNS does not have a monosynaptic connection to the adrenal medulla, which is an important aspect from the physiological viewpoint^[20-22].

Hemodynamic and cardiopulmonary parameters are above all influenced by the heart and brain centres, besides peripheral resistance. Considering the small number of scientific studies on this topic existing in literature, we focused on the anatomical aspects and neurophysiological or vascular connections that can be influenced by CST^[20-22].

Hypothetically, the neuroanatomical links can modify some hemodynamic and ventilatory parameters, at rest and/or during exercise, such as heart rate and heart rate recovery prognostic index^[23-31].

ANATOMY

In the heart, the sinus node artery perfuses the sinoatrial node (SAN), positioned on the wall of the right atrium, and 80% of this blood comes from the right coronary artery while 20% comes from the circumflex artery. The right vagus nerve and the sympathetic system innervate this node. The atrioventricular node (AVN) is positioned near the opening of the coronary sinus, between the mitral annulus and the medial margin of the tricuspid valve; here the perfusion comes from the fibrous septum branch of the right coronary artery. The bundle of His is a direct continuation of the atrioventricular node and descends to the left side of the superior margin of the interventricular septum

(SIV); the bundle has dual blood supply, partially from the AVN artery and the descending anterior (DA) coronary artery (first septal perforator branch)^[20-22].

Both the right and the left branches originate from the bundle of His. The right branch continues along the right side of the IVS under the endocardium and is supplied by both the right coronary and the DA coronary arteries. The left branch is positioned on the left side of the SIV in the sub-endocardial layer, from which anterior superior and posterior inferior fascicles originate. These branches end in very thin Purkinje fibers^[20-22].

As far as the spinal neurophysiological complex is concerned, the nervous system preganglionic neurons are located in a cell column in the intermediate area of the lateral horn of the spinal cord; this area is called the intermediolateral cell column (IML). The column seamlessly spreads from the midbrain to the sacral spine, although the autonomic nervous system innervation arises from the sacral spine corresponding to the T1–L2 segments. The IML sends impulses only ipsilaterally and is inhibited by the brainstem structures that are stimulated by ipsilateral cortex and cerebellum; the brain can be stimulated in order to increase the IML inhibition, and generally augment the afferent bombardment from the contralateral side. Arteriolar vasoconstriction, capillary dilatation, piloerection and perspiration, which occur at the segment level, are the principal systemic effects of the IML^[20-22].

The important vascular effects mediated by the sympathetic chain neurons are only ipsilateral. The right and left columns have different effects on the heart: the right IML primarily innervates the SAN and the left IML innervates the AVN. This last anatomical clarification is very important in considering the potential direct connection between the CSS and the origin of cardiac impulses; therefore, an increase in the parasympathetic and vagal hypertonia induced by biodynamic CST at the superior centres and the suprasegmental nuclei level can directly lead to a reduction in the frequency of firing (FOF) of SAN and AVN, modifying the hemodynamic parameters^[20-22].

As well known, craniosacral injuries and injuries of the vertebral axis with interference on the paravertebral ganglionic chain, originating at the superior dorsal rib level, are physiological injuries that have a direct perturbatory influence on the autonomic nervous system (parasympathetic or orthosympathetic) and vascular system^[20-22].

SEARCH STRATEGY FOR IDENTIFICATION OF STUDIES

Computerised searching of the following literature databases was performed: PubMed, Cochrane library. The following clinical keywords were used to search for the intervention of interest: “craniosacral therapy, heart rate, heart rate recovery, autonomic nervous system and cardiovascular physiology”. Candidate articles were then screened for possible inclusion in this review. Table 1 summarizes some of the studies and their main findings.

BIODYNAMIC CRANIOSACRAL THERAPEUTIC APPROACH

CST is a non-invasive method, derived from osteopathy, developed in the 1970s by J. Upledger, MD^[32]. It is based on the assumption that there is a fine rhythmic movement, which pervades the body and can be discerned by practised therapists under their palpating hands. This movement can be utilised for diagnostic as well as therapeutic purposes by regulating the flow of cerebrospinal fluid^[33].

Table 1 Main studies exploring the reliability of craniosacral therapy and the effects on autonomic nervous system.

Authors, year	Main conclusions
Green C <i>et al</i> 1999 ^[5]	This systematic review found insufficient evidence to support craniosacral therapy.
Hanten WP <i>et al</i> 1998 ^[7]	The results indicated that a subject's craniosacral rhythm is not related to the heart or respiratory rates of the subject or the examiner.
Cutler MJ <i>et al</i> 2005 ^[10]	The current study is the first to demonstrate that cranial manipulation, specifically the CV4 technique, can alter sleep latency and directly measured muscle sympathetic nerve activity in healthy humans. These findings provide important insight into the possible physiologic effects of cranial manipulation.
Wirth-Pattullo V <i>et al</i> 1994 ^[12]	Measurements of craniosacral motion did not appear to be related to measurements of heart and respiratory rates, and therapists were not able to measure it reliably.

The focus of craniosacral examination and treatment lies on the craniosacral structures; these include the bones and connective tissues (membranes of the brain and spinal cord) of the skull and spine and the cerebrospinal fluid. Anatomically surrounding and physiologically sustaining the central nervous system, these structures have a direct influence on functioning of the autonomic nervous system^[33]. The effects which can be brought about through CST are achieved through gentle touch in the areas of the skull, face, spine and pelvis^[33]. Treatment is not primarily aimed at symptoms, but determined by priorities established by the therapist during each patient examination^[33].

CST is mostly applied by trained craniosacral therapists but can also be performed by osteopaths and other healthcare practitioners who have undergone the appropriate training. CST is commonly described as an alternative treatment approach, applying a gentle manual force to address somatic dysfunctions of the head and the remainder of the body. The interplay of diagnosis and treatment is aimed at mobilising the cranial sutures which are abnormally restricted to physiologic motion. Restrictions in the craniosacral system are manually identified which include the bones, membranes and CSF that surround the brain and spinal cord^[34].

Focusing the attention on the treatment, all the subjects experienced a state of rest and relaxation; for biodynamic CST, the practitioner should have a great deal of tactile experience in injury normalization.

Accordingly to the existing literature concerning the effect of the classic CST on several central and cardiopulmonary diseases^[1-16] and the evidence-based medicine derived from these studies as well as the anatomical and neurophysiologic links previously described, we focus mainly on the following key points in a complete session cycle of treatments: (1) Lateral venous sinuses; (2) Torcular heurphili; (3) Cavernous sinus; (4) Sagittal sinus; (5) O/M horizontal and vertical arms; (6) Third ventricle; (7) Fourth ventricle; (8) Lateral ventricles.

In particular, the third, fourth, fifth, sixth, seventh, ninth, tenth, eleventh and twelfth cranial nerve nuclei lie on the fourth ventricle; the SAN is substantially innervated by the ninth cranial nerve. Considering that the intracranial circulation flows via the jugular foramen, we assume that a method focused on the occipito-mastoid suture release and petro-basilar articulation can relieve the nerve and the big vessels in order to achieve the correct neurophysiology. Similarly, the fourth ventricular filling and emptying in still point techniques have a direct impact on the liquid homeostasis and nourishment of the aforementioned nuclei, possibly improving nerve impulses and, consequently, the hemodynamic and ventilatory parameters.

PERSPECTIVES AND CONCLUSION

Finally, we can surely assert that this treatment can cause parasympathicotonia and reduced orthosympathicotonia with direct effects on the IML, together with possible vagal hypertonia; this could directly reduce the FOF of SAN and AVN, peripheral vascular resistance and ventilatory parameters, allowing a related heart rate and heart rate recovery decrease. Even if further in-depth studies are necessary to confirm our hypothesis and experiences, this therapeutic perspective could potentially provide a robust tool to approach the cardiovascular pathophysiology.

CONFLICT OF INTERESTS

There are no conflicts of interest with regard to the present study.

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