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COMMENTARY

Osteopathic decapitation: Why do we consider the head differently from the rest of the body? New perspectives for an evidence-informed osteopathic approach to the head

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Abstract The osteopathic management of the head was initially founded on a biomechanical model which has since proved to be highly controversial. The current call for the evidence-informed practice of osteopathy, and the level of critical reasoning we expect from our students, are no longer compatible with Sutherland's ideas on cranial osteopathy.

Meanwhile, an interesting field has developed called tissue mechanics. This may provide osteopaths with useful evidence to develop a treatment model of the head that fits better with current knowledge. Biomechanics is not limited to kinematics to the human body. It includes tissue mechanics that aims to describe the way living tissues distort under different types of loading. It has been extensively applied to understand the role and development of cranial sutures and the distribution of stresses and strains over the skull.

Even though it is among the hardest materials in the body, bone distorts during normal function and more obviously during trauma. Bone tissues undergo stresses and strains when loaded, like any other material, and cranial bones are no exception to this rule.

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In this article we review the mechanical properties of the cranial bones and sutures and highlight the fact that the muscles are the main cause of cranial bone deflections. Muscle contraction is now recognized to be one of the principal causes of bone loading and this is true for the head: apart from in the case of traumatic events, a large amount of research into the mechanical properties of cranial bones and sutures confirms that muscle contraction is the main cause of skull deflection.

Introduction

The osteopathic approach to the head has for a long time been founded on principles[1] that are now proving highly controversial.[2–4] The current call for the evidence-informed practice of osteopathy[5] and the level of critical reasoning we expect from our students are no longer compatible with Sutherland's cranial model.

Existing questions about the biological basis and the clinical efficacy of the techniques used in Osteopathy in the Cranial Field (OCF) merit deeper investigation[2] but this will not be examined in this paper. Researchers in OCF have mostly attempted to prove Sutherland's intuitions starting from the assumption that they are valid, and seeking evidence to support the way they already practise[6–9] and eventually trying to convince a wider clinical and scientific community of the validity of these concepts. Our purpose is to draw educators' and students' attention to the sound evidence that is already available in the field of biomechanics regarding the mechanical properties of the head. This evidence has the advantage of being largely accepted by the scientific community and provides the osteopathic profession with potentially important avenues of research to develop a treatment model of the head that is consistent with current knowledge (see Fig. 1).

In this article, we suggest and adopt a deductive line of reasoning, beginning by collecting and analysing the existing high-quality, up-to-date evidence on the mechanical properties of the head; that is to say the skull and the surrounding tissues. Our aim is to promote further research by providing information on where to find sound, up-to-date evidence, which is already widely shared and accepted by the scientific community. This is in the hope of informing future models for the osteopathic management of the head in terms of palpation pressures, diagnostic criteria and treatment techniques, which would then require clinical assessment.

A necessary paradigm shift: from biomechanics to tissue mechanics

OCF was born in the 1930s. It is unsurprising that its founders describe it in biomechanical terms;[1,10] biomechanics is suited to the study and description of the complex moments and loads that lead to the movement of bone segments and joints during normal function. Sutherland's reasoning was based on the rigorous study of dry skulls.[11] Even if the rationale leading to hypothesise cranial bone mobility from the suture's shape in the context of patent sutures is valid, as has been demonstrated on animals through the action of the masticatory muscles,[12–14] his assumptions about a hypothetical inherent motility of the central nervous system causing bone deflections are inconsistent with current findings.[3,15] The continuing controversy surrounding Sutherland's model therefore remains justified. Some osteopaths have reacted to the dissatisfaction with the biomechanical model of the skull by substituting a subtler, energetic-based model,[16] but absence of supporting evidence remains an obstacle to teaching and multidisciplinary research.

Meanwhile, the interesting and relevant field of *tissue mechanics* has developed.[17] This may provide osteopaths with useful evidence to develop a model for the management of the head that fits better with current knowledge.

Biomechanics is too often considered as a mere application of kinematics to the human body. It actually also includes the study of how living tissues continually distort and change in response to tissue environment, including the mechanical environment. This sub-field of biomechanics is called tissue mechanics. It is a field that can describe the way the tibia bends during running or jumping,[18] the mechanism behind fatigue fracture,[19–21] intervertebral disc degeneration,[22,23] and the process of bone damage and remodelling.[24,25] Tissue mechanics aims to describe the way living tissues distort under different types of loading.[17,26] In particular, it has been used successfully to understand the role and