Measurement of Cranial Palpation Pressures used by Qualified Osteopaths-A Cross-Sectional Study

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INTRODUCTION

Osteopathic cranial manipulation, also referred to as Osteopathy in the cranial field (OCF) or craniosacral therapy (CST), is practiced widely by osteopaths, chiropractors, physical therapists and massage therapists. 1-5 While the current scientific evidence does not support the commonly accepted theoretical models of osteopathic cranial manipulation and evidence of the effectiveness of cranial manipulative treatment is yet to be established, 1,3,5-7 for many practitioners the extent of anecdotal confirmation supporting both the descriptive model and clinical outcomes is interpreted as sufficiently compelling to justify continued use of cranial treatments in clinical practice. 6

In the absence of substantiating evidence for the various components of the current cranial treatment models, practitioners of OCF have been challenged to demonstrate a relationship between the therapy and positive clinical outcomes. 5-8 Accurate interpretation of data from clinical trials of OCF will require the use of valid and reliable diagnostic tests in order to ensure homogeneity of the study population, and that the components of a treatment intervention are precisely described and standardized to the extent possible. 9 Although exact standardization of cranial manipulative therapy procedures is difficult, and may even be viewed as inconsistent with some theoretical aspects of the therapy, several components of cranial manipulative treatment may be amenable to standardization. These include the duration of treatment, practitioner hand contacts, a

ABSTRACT

BACKGROUND & PURPOSE: Osteopathic cranial manipulation, also referred to as Osteopathy in the cranial field (OCF) or craniosacral therapy (CST), is practiced widely by osteopaths, chiropractors, physical therapists and massage therapists. The objective of this study was to evaluate the pressure of palpation used by qualified osteopaths during a cranial test procedure.

METHODS: 43 participants (32 men and 11 women; aged 25-65 years) who were registered osteopaths participated both as subjects and testers. Data on palpation pressures employed during cranial palpation were obtained using a FlexiForce® tactile force sensor device.

RESULTS: The absolute palpation pressures recorded throughout the study procedure ranged from 0 to 1.81 N/cm², with the mean pressure of the 3-second tests ranging from 0.01 to 1.69 N/cm². The median of the 43 tests was 0.28 N/cm², and the overall mean pressure was 0.42 N/cm². There was no relationship between experience and pressure palpation (p=0.09), although the graph suggests a trend (R²=0.81) to pressure of palpation decreasing with many years of experience.

CONCLUSION: The results suggest that the application of cranial palpation is extremely variable. Highly experienced practitioners may use less pressure and demonstrate less variation, however, a significant proportion of less experienced practitioners use comparable pressure.

Key words: Clinical decision-making, clinical reasoning, therapeutic decision-making.

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‘direct’ or ‘indirect’ theoretical approach to modifying somatic dysfunctions, and the general pressure of palpation.

To our knowledge, quantification of palpation pressures used by experienced practitioners of OCF has not been reported to date. The objective of this study was to evaluate the pressure of palpation used by qualified osteopaths during a cranial test procedure. A secondary aim was to determine the relationship between cranial palpation pressures and years of practice experience. Based on anecdotal reports, it was hypothesized that palpation pressure measurements would decrease with increasing practitioner experience.

METHODS

Participants

Participants for the study were recruited from members of the Registre des Ostéopathes de France (ROF) attending their annual general meeting in Paris, France. Following verbal notification of the study procedure, 43 participants (32 men and 11 women; aged 25-65 years) were enrolled after written consent was obtained. Each of the participants acted once as a practitioner and once as a subject. The study procedure was approved by the Comité d’Ethique (Ethical Committee) of the Centre Européen d’Enseignement Supérieur de l’Ostéopathie (CEESO).

Measuring equipment

Data on palpation pressures employed during the study were obtained using a FlexiForce® tactile force sensor device (Tekscan Inc.: Massachusetts, USA). FlexiForce® consists of an ultra-thin, flexible force sensor connected to force measurement software installed on a standard PC (Picture 1). The sensor used in this study had a measurement range from 0 N/cm² to 1.81 N/cm², occurring in gradations of 0.008 N/cm². The surface area was 0.71 cm², with a thickness of 0.2 mm. The manufacturer evaluated error margin was less than +/-5%.

Procedure

The FlexiForce® sensor was placed on the subject’s left frontal bone adjacent to the fronto-malar suture by the same operator for all measurements (Picture 2). The finger tips of the practitioner’s left hand contacted the frontal bone at the superolateral portion of the orbit, with the thumb positioned over the force sensor. The thumb tips of the practitioner’s right hand contacted the malar at the inferolateral portion of the orbit.

When the practitioner signalled that ‘engagement’ with the Cranial Rhythmic Impulse (CRI), a palpable rhythmic fluctuation ranging from 2 to 7 cycles/minute, at the suture had been achieved, a 3-second pressure measurement was recorded via the FlexiForce® system. Practitioners’ years of practice (yop) and percentage of daily practice employing CST were also recorded.

Data extraction and analysis

FlexiForce® records one pressure measurement every 0.125 seconds, thus giving a total 25 pressure measurements for each test recording from 0 to 3 seconds. The raw data were exported to Microsoft Excel software (version 2007, Microsoft; Washington, USA) and then converted from grams-force to Newtons/cm² in accordance with the International System of Units (SI). The mean pressures from each 3-second test were used for statistical analyses. Practitioners were categorized according to years of practice experience (yop) and the pressure measurements from each category compared.

RESULTS

Acceptable data was recorded for all 43 test performances. Practitioners were categorized as 0-5 yop (n=13), 5-10 yop (n=14), 10-20 yop (n=10), and >20 yop (n=6) (Table 1). Thirty-six of the 43 practitioners used OFC for more than 50% of their practice hours.

The mean palpation pressure used by each practitioner over the 3-second test is represented graphically in Figure 1. The absolute palpation pressures recorded throughout the study procedure ranged from 0 to 1.81 N/cm², with the mean pressure of the 3-second tests ranging from 0.01 to 1.69 N/cm². The median of the 43 tests was 0.28 N/cm², and the overall mean pressure was 0.42 N/cm².

Cranial palpation pressures by Osteopaths

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Picture 1: The FlexiForce®

Picture 2: Positioning the FlexiForce®
Table 1: Mean pressure of 3-seconds tests (N/cm²)

<table>
<thead>
<tr>
<th>Group</th>
<th>0-5 yop (n=13)</th>
<th>5-10 yop (n=14)</th>
<th>10-20 yop (n=10)</th>
<th>&gt;20 yop (n=6)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group mean</td>
<td>0.518</td>
<td>0.455</td>
<td>0.464</td>
<td>0.078</td>
<td>0.423</td>
</tr>
<tr>
<td>SD</td>
<td>0.417</td>
<td>0.455</td>
<td>0.306</td>
<td>0.057</td>
<td>0.393</td>
</tr>
<tr>
<td>CV</td>
<td>0.805</td>
<td>1.000</td>
<td>0.659</td>
<td>0.728</td>
<td>0.929</td>
</tr>
</tbody>
</table>

Figure 1: Pressure palpation (N/cm²) and practitioner’s years of practice.

Table 2: Comparison of mean pressure among treatment groups

<table>
<thead>
<tr>
<th>Dunn's Multiple Comparison Test</th>
<th>Significant (p &lt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 years vs 5-10 years</td>
<td>Ns</td>
</tr>
<tr>
<td>0-5 years vs 10-20 years</td>
<td>Ns</td>
</tr>
<tr>
<td>0-5 years vs &gt;20 years</td>
<td>*</td>
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<tr>
<td>5-10 years vs 10-20 years</td>
<td>Ns</td>
</tr>
<tr>
<td>5-10 years vs &gt;20 years</td>
<td>Ns</td>
</tr>
<tr>
<td>10-20 years vs &gt;20 years</td>
<td>*</td>
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</tbody>
</table>
Comparison among treatment groups was carried out using non-parametric analysis of variance with the Kruskall-Wallis test, followed by Dunn's test for multiple group comparisons. The results suggested that practitioners with >20 yop use significantly less pressure than practitioners with less than 20 yop (p = 0.024) (Figure 1). No difference was found between the 0-5 yop, 5-10 yop and 10-20 yop groups (Table 2). There was no relationship between experience and pressure palpation (p=0.09), although the graph suggests a trend (R^2=0.81) to pressure of palpation decreasing with many years of experience (Figure 2).

**DISCUSSION**

**Palpation pressures used in OCF**

This study provides the first quantitative measurement of palpation pressures used by osteopath practitioners of OCF. It is commonly recommended that cranial palpation pressure be employed in the range of 5-10 gf.\(^1\) In our study, this pressure range converts to 0.05-0.1 N/cm\(^2\). Considering that 79% of practitioners in this study used pressures above the recommended maximum, with a mean pressure more than 4 times this value (0.42 N/cm\(^2\)), it is likely that cranial palpation pressures have been underestimated. Since it is unknown whether clinical outcomes are dependent on the pressure of palpation, an optimal pressure range cannot yet be proposed.

In a previously published study, a mean palpation pressure of 0.55 N/cm\(^2\) was recorded for a group of pre-trained osteopathy students, indicating that palpation pressures used by novice osteopathic practitioners are significantly greater than more experienced practitioners.\(^12\) These results suggest that training methods typically used in imparting the technical parameters of OCF diagnosis and therapy to osteopathy students may not be sufficiently effective. It is plausible that the use of an objective reference standard for biomechanical palpatory parameters may aid and accelerate the transmission of correct application of manual techniques to osteopathy students. This hypothesis will be examined in further research.

**Variation in pressures**

The results of this study indicate that osteopaths vary considerably (CV = 0.929) in their application of palpation pressure during cranial manipulation. An explanation for this variation may be found in CRI ‘entrainment’ models, which propose that palpation of functional expression of the CRI at varying levels is dependent on a complex interaction of “multiple biological oscillators” present between the patient and the practitioner.\(^13,14\) Palpation pressures may also vary according to the specific physiological or tissue targets.
of cranial palpation.\textsuperscript{14-17} Therefore, different matching of subjects to practitioners may necessitate different application of palpation pressure.\textsuperscript{18}

It is also possible that the variation in palpation pressures reflects the poor rater reliability demonstrated in several studies on palpation of the CRI.\textsuperscript{19-22} Poor reliability may result from disparate levels of skill among qualified osteopaths, different interpretations of cranial palpation practice, or different semantics used to conceptualize cranial palpation.

Examination of intra-practitioner pressure variation among different subjects and for the same subjects at different time points is necessary in order to determine the relevance of the variability recorded in this study.

Experienced practitioners

The results of this study suggest that highly experienced OCF practitioners (>20 yop) may employ less pressure compared to practitioners with less than 20 years of experience. However, it should be noted that a significant proportion of less experienced practitioners (27\%) use comparable pressure. Highly experienced practitioners may also demonstrate less inter-practitioner variation. If the lower variation is confirmed in future research, this population may be preferred for clinical studies of OCF where consistency of technique application is necessary to ensure reliable interpretation of outcomes data.

CONCLUSION

This study is the first to provide data on the palpation pressures used during an osteopathic cranial test procedure. The results suggest that the application of cranial palpation is extremely variable. Highly experienced practitioners may use less pressure and demonstrate less variation, however, a significant proportion of less experienced practitioners use comparable pressure. Cranial manipulation training using quantitative feedback of palpation pressures may be useful in conveying precise information regarding technique application and reducing practitioner variation. Further research has been planned in order to test this hypothesis and to confirm palpation pressures and variability employed by highly experienced OCF practitioners.

References


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ACKNOWLEDGMENTS

None

CONFLICTS OF INTEREST

None identified or declared.