Cranial Distortion and Category II Pelvic Blocking: A Pilot Study

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ABSTRACT

Purpose: A relationship between the cranium and the sacrum has been theorized. The purpose of this study was to evaluate visible and therefore measurable effect of distortions in cranial anatomical landmarks by photography due to pelvic torsion, as theorized by the Category II subluxation distortion complex of M.B. De Jarnette D.C..

Methods: Twenty-nine subjects were chosen at random from the student population at Logan College of Chiropractic. A vertical line was drawn at the midline of the bridge of the nose on the nasion. The lateral most edges of the temporal bones were delineated with markers perpendicular to the table. The supine experimental subjects had orthopedic wedges (blocks) placed under the pelvis producing a torsion of the ilia and a photograph of the face was taken. The block position was reversed and an additional photograph was taken. In the control group the pelvis was lifted in the same fashion as if the blocks were to be positioned but none were. The same series of photographs were taken. All photographs were measured for the distances from the midline cranium to the lateral edge of the temporal bones and analyzed for differences.

Results: The statistical analysis of this study demonstrates significant cranial anatomical landmark changes of 2.29mm ± 1.53 (p=0.0065) during the De Jarnette Category II pelvic blocking protocol as compared to reverse blocking and control subjects.

Conclusions: This pilot study proposes a possible cranial motion as a consideration for further study. The TMJ, cervical spine and musculature could also be involved in the cranial anatomical landmark changes.

Key Words: Manipulation; Chiropractic; Cranial Distortion; SOT; Category II; Pelvic Blocking

Introduction

Many therapeutic modalities in physical medicine postulate intimate relationships between various distal body parts. Relationship between the pelvis and the cranium is most notably observed in the fields of chiropractic and osteopathy. Sutherland¹ and De Jarnette² make specific claims and utilize the cranial-sacral relationships therapeutically. Upledger³ continues this tradition, and other authors such as Buddingh⁴ and Denton⁵ further identify specific cranial relationships with other body parts.

Clinicians often observe alleviation of symptoms distant to the specific areas of therapeutic intervention⁰. Although these observations are not often well documented, Kraus⁶, for example, specifically describes involvement of postural concerns with the treatment of temporomandibular joint dysfunction. Structural stress relationships with cervical spine dysfunction and certain types of headaches are also reported⁷.

Cranial Movements

Although the generally accepted medical opinion is that cranial bones fuse and cease to move by adulthood, a variety of research studies demonstrate and sometimes measure cranial sutural motion. Some authors⁸-²³ specifically describes such instances of sutural motion. Adams et al.²⁴ and Rogers et al.²⁵ measured sutural motion and compliance. Others, such as Beerdén²⁶, utilize holographic interferometry to measure cranial motion. Kragt²⁷ suggests cranial bone displacement by use of orthodontic devices. Frymann²⁸ was able to measure the head circumference and the rhythmic variances from 6 to 12

1. Sacro Occipital Research Society International Inc.
Cranial Distortion

The Sacroiliac Joints

A few investigators describe specifically different functions of the sacroiliac joint; Hansen\(^3\) describes three specific functions of the sacroiliac joint. One such function is weight distribution. Second is the small amount of intrapelvic bone motion and the third is that of pelvic expansion for childbirth. Panjabi\(^38\) similarly describes three basic functions of the human structural system. He classifies them as central nervous system function, structural function, and connective tissue function. The earliest such description of these differentiations is by De Jarnette\(^*\) when he described the Category system. De Jarnette proposes that three basic systems are at work in the body: Category I (functional central nervous system), Category II (structural functional weight-bearing) and Category III (connective tissue function). He suggests, along with Panjabi, that these three systems share different aspects of the same structural components of the human skeleton. Differences in functional, structural and connective tissue loading may stress different areas of the involved axial skeletal structures. De Jarnette, however, describes a specific anatomical difference in the sacroiliac joint differentiating between Category I and Category II types of lesions or dysfunctions. Gray’s Anatomy\(^35\) describes the uneven osseous surfaces of the sacroiliac articulation being designed for increased surface area, and therefore increased weight-bearing capability. De Jarnette describes the sacroiliac articulation similarly to Gray’s Anatomy and also describes the anterior area of the sacroiliac joint as being a smooth articular surface, designed for intrapelvic motion. De Jarnette theorizes that either of these two separate anatomical and functional areas can become dysfunctional irrespective of the other. De Jarnette also states that specific lesions of Category I intrapelvic bone motion structures result in differing effects on the body and require different treatment interventions from subluxations of the Category II weight-bearing structure.

SI Joint – Cranial Relationship

De Jarnette suggests that there is a direct compensatory relationship between the cranial-sutures and the Category II weight-bearing portion of the sacroiliac joint. Furthermore, he suggests a specific direct relationship between the cranial temporal bones and the ilia of the pelvis. This specification is in addition to the more traditional concepts of sacrum and occipital bone relationships by Sutherland, Upledger\(^1\) and others.

De Jarnette describes a lesion of the sacroiliac weight-bearing portion of the pelvis (Category II) as producing a pelvic torsion where one ilium will move posterior and inferior, producing a functional long leg on the ipsilateral side, while the other ilium will move anterior and superior, producing a functional short leg on the ipsilateral side (Figure 1). It is theorized that this gravitational distortion pattern will have structural stress ramifications superiorly throughout the entire structure.

The temporal bones, which are theoretically related to the ilia, will also distort appropriately, producing an external rotation on the posterior inferior ilium side and internal rotation on the anterior superior ilium side. According to Frymann\(^40,41\) relating respiratory motoneurones within the thoracic spinal cord create a reciprocal influence between respiratory system (diaphragm excursion) and the nervous system (cranial motion). Mithell\(^32\) described the ilium and sacral apex motion in relationship with the respiratory movement. Blum and Curl\(^43\) also describe the relationship between the cranium and the pelvis by way of dentate ligaments. Other authors mention a flexion/extension motion of the meninges relating to the respiratory movement. Blum and Curl\(^43\) also describe the ilium and sacral apex motion in relationship with the respiratory movement. Blum and Curl\(^43\) also describe the relationship between the cranium and the pelvis by way of dentate ligaments. Other authors mention a flexion/extension motion of the meninges relating to the respiratory movement.

The purpose of this study is to evaluate any visible and therefore measurable effects of distortions in the cranial anatomical landmarks due to pelvic torsion, as theorized by the Category II subluxation or distortion complex of De Jarnette.

Methods

Twenty-four test subjects and five control subjects were chosen at random at Logan College of Chiropractic and Atrium Health Services of St. Louis, Missouri. The Institutional Review Board at Logan College of Chiropractic approved this investigation. A tripod equipped with a 35mm camera and 70mm lens was situated in a stationary position over the head end of a stationary flat adjusting table. At the head end of this treatment table was placed a naugahyde-covered piece of plywood. Each subject lay supine on the table with his or her head upon the plywood looking straight into the camera lens. The camera lens was situated vertically and directly above the bridge of the nose of the subject. A remote shutter device was used to prevent camera motion.

Upon each test and control subject a 0.5 mm vertical line was drawn at the midline of the bridge of the nose at the nasion using a fine tip washable marker. This reference line was used to measure the distance from the center of the nasion to the lateral margins of the head bilaterally.

A rectangular box was placed on either side of the head upon the plywood. Each box was then moved medially until it contacted the lateral-most portion of the squamous potion of
Cranial Distortion

According to De Jarnette and Sacro Occipital Technique Category II protocol, the appropriate treatment of the pelvic structural lesion utilizes specifically designed orthopedic wedges.

In the Sacro Occipital Technique Participant Guide, a posterior ilium orthopedic wedge is placed perpendicular to the patient under the posterior inferior iliac spine. An opposing orthopedic wedge is placed at a 45 degree angle under the ischial tuberosity of the anterior superior ilium side pointing directly to the end of the posterior inferior block (Fig. 2). This position theoretically allows for precise detorsion of the pelvis with the Category II-type lesion. This is then theorized to counteract, in some degree, the collection of distortions emanating from the pelvic instability.

Neither test nor control subjects were evaluated for this particular pelvic lesion prior to their participation in this study. Each of the test subjects simply were requested to lie supine on the treatment table with his or her head directly under the lens of the camera. First a neutral photograph was taken. Second, with each subject, De Jarnette orthopedic wedges were placed in a fashion as if a right posterior ilium lesion existed. This blocking position would rotate the right ilium anterior superior and counter-rotate the left ilium posterior inferior. After 15 seconds, a second photograph was taken. The blocks were then reversed as if to torsion the left ilium of the pelvis anterior superior and the right ilium posterior inferior. After 15 seconds, the third photograph was taken.

The control subjects were all treated identically to the test subjects, except on each occasion no pelvis blocking was utilized. Instead, each individual received a neutral photograph followed by a second and third neutral photograph, each at 15 second intervals. Before each of the later two photographs the control subject’s pelvis was raised on each side as if an orthopedic block were being placed. In this fashion, each of the 24 tests subjects and five control subjects yielded three photographs for a total of 87 photographic documents.

Each of these photographs was made into an 8" X 10" print. The prints were then randomized for marking and measuring.

Using a parallel ruler, lines were drawn along the entire vertical dimension of the photograph at three places, the first being the central mark at the nasion of each test subject. The other two lines were drawn through an identical place on each of the two perpendicular marking devices corresponding to the lateral-most position of the right and left temporal bones of each subject. The distance in millimeters between the center mark and each of the right and left lateral parallel lines was measured. Measurements were made on the superior and the inferior aspects of each photograph, and the results were averaged in order to compensate for any imprecisions in the distances between the right and left pairs of parallel lines. In this fashion, distances "A" and "B" as depicted in Figure 3 could be measured with a relatively high degree of accuracy. These distances were measured, and a comparison was made among the differences measured within a single test subject with respect to neutral as well as right posterior and left posterior ilium distortions.

Results

In comparing the experimental group of blocked patients and the control group of patients not blocked, there was a significant (p=0.0065) difference in the amount of change following the intervention (table 1 and 2). The mean change in the experimental group was 2.29mm ± 1.53, and the mean change in the control group was 0.9mm ± 0.394 (table 3). Significance was determined by Student's t-test.

Discussion

This investigation was designed to simply evaluate and investigate a possible clinically observed phenomenon that is supported by the philosophical constructs of various chiropractic techniques. As a pilot study, it has significant limitations.

None of the subjects chosen were evaluated for the existence of the Category II lesion. Therefore, it is possible that the results may be skewed and would tend to be more apparent if individuals exhibiting the clinical lesion were utilized. Further investigations utilizing more sophisticated equipment, such as a digital camera, and a more accurate computer analysis might yield more precise information. Also, if the subject’s head was tilted or moved during the process this could change the result. Because we didn’t move the control subjects like we did with the block subject groups, this could play a major role in our interpretation of the result. These studies should be performed with a larger sampling and a more diverse population sample and be segregated according to the proposed Category II pelvic lesions. Such information could yield considerable insight into structural dysfunctions, including low back pain, headache and TMD.

Furthermore, a relationship of the temporomandibular fossa with respect to pelvic bone position is proposed. The internal/external torsion of the temporal bones produces a disrelationship of the temporal fossa, creating an imbalance in the mandible, thus potentially relating to temporomandibular joint dysfunction (TMD). Further studies could yield insights into the treatment of this and other cranially-related disorders such as headaches and cranial nerve dysfunction.

The statistical analysis in this study demonstrates significant cranial anatomical landmark changes as measured by photographic analysis. This change is theorized to be due to the relationship between pelvic torsion and cranial bone distortion, which hinges upon whether or not cranial bones in the adult human are indeed capable of motion.

The mechanism producing the observed cranial distortions with respect to pelvic torsion is often described by proponents as of a structural etiology related to dural attachments. However, applying this established physiology, a neurologically based theoretical model for the pelvic-cranial relationship may also be offered. According to some osteopathic research, SIJ motion is synchronized with
the craniosacral mechanism. This relationship has biomechanical components as well as diaphragmatic respiratory influence. Furthermore a neurological mechanism is documented. Range of motion stimulation of the sacroiliac joint accumulative receptors will have a whole body response through its associated movement patterns including the entire craniosacral mechanism. The somatotrophic spinal cord nuclear arrangement of the medial or postural neuromuscular interneuron tracks, thus nuclear arrangement of the medial or postural neuromuscular craniosacral mechanism. The somatotrophic spine joint accumulative receptors will have a whole body response is documented. Range of motion stimulation of the sacroiliac joint accumulative receptors will have a whole body response is documented. Range of motion stimulation of the sacroiliac joint accumulative receptors will have a whole body response. This is one of the few, if not the only, study of this kind to date. For this reason, no serious conclusions or definitive statements can be made concerning the findings as presented. Considering the evidence demonstrated by this study, further investigations are warranted.

Conclusions

This study proposes a consideration for cranial bone motion in the adult human. It also suggests potential therapeutic and diagnostic measures with respect to the treatment of various cranial-related syndromes such as headaches and TMJ dysfunction. Furthermore, it suggests a significant relationship between the cranium and pelvis as is postulated by several major techniques in chiropractic. TMJ motion, cervical spine, musculature and other factors could contribute to the motion of the photographic cranial anatomical landmark changes.

Acknowledgements

Special thanks go to the numerous students at Logan College of Chiropractic who previously attempted this study, providing a greater understanding as to appropriate design of the methodologies utilized. Thanks also, to Logan College of Chiropractic, Sacro Occipital Research Society International, Inc. (SORSI), Dr. Gary Sanders of Logan College for their ongoing support and assistance.

References

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54. Grottel K, Krutki P, Mrowczynski W. Triple projections of neurons located in S1 and S2 segments of the cat spinal cord to C6 segment, the cerebellum and the reticular formation. Exp Physiol. 1998;83(6):737-746
Fig. 1. Illustrates the typical torsional distortion of a sacroiliac lesion involving the weight-bearing articulations.

Subdislocated Sacro-iliac Joints

(Category II)

- PI-Ex
- AS-In
- 5th Lumbar Rotation
- ASIS Superior
- Enlargement Obturator Foramen

Sacral Side-Bending Rotation and Torsion
Fig. 2. In this study, rectangular boxes placed perpendicular to the headrest of the supine subject were moved medially until the lateral-most edges of the temporal bones were contacted. These provided reference points in order to measure distances "A" and "B" as illustrated. The differences between each of the "A" and "B" measurements on each of three consecutive photographs were evaluated and then each of the photographs compared.
Fig. 3. Illustrates the orthopedic block placement for the supine subject with a left posterior ilium. In this study, subjects were not evaluated for pelvic torsion but each was photographed in a neutral position as well as with the block placement for a right posterior ilium and a left posterior ilium. Control subjects received no block placement.
Table 1: Photographic cranial anatomic landmark measurements of the left and right side of the face pre and post De Jarnette Category II blocking protocol for a Left and Right Posterio-inferior Innominate in the experimental group (in mm)

<table>
<thead>
<tr>
<th>Left side of the Face (Left Temporal to nasium)</th>
<th>Right side of the Face (Right Temporal to nasium)</th>
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<tbody>
<tr>
<td>Pre Right PI Blocking Left PI Blocking Right face difference Left face difference</td>
<td>Pre Right PI Blocking Left PI Blocking Right face difference Left face difference</td>
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<td>52.5 52 52 0.5</td>
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<td>59 59.5 55.5 0.5 3.5</td>
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<td>58.5 61 61.5 1.5 2</td>
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<td>61 60.5 61 0.5 0</td>
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<tr>
<td>60 60 62.5 0 2.5</td>
<td>59.5 55 55 4.5 4.5</td>
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<td>57 51.5 54 6.5 3</td>
<td>56 60.5 57.5 4.5 1.5</td>
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<td>55 55 56 0 1</td>
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<td>57 55.5 56 1.5 1</td>
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<td>50 48 48 2 2</td>
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<td>71 71 71 0 0</td>
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<td>59.5 60 58 0.5 1.5</td>
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<tr>
<td>54 56 55 2 1</td>
<td>57.5 56 56 1.5 1.5</td>
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<tr>
<td>65 64 65 1 0</td>
<td>70.5 68.5 72.5 2 2</td>
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**Table 2:** Photographic cranial anatomic landmark measurements of the left and right side of the face pre and post simulating De Jarnette Category II blocking by lifting Postero-Inferior Innominate and Greater Trochanter for control group (in mm)

<table>
<thead>
<tr>
<th>Left side of the Face (Left Temporal to nasium)</th>
<th>Right side of the Face (Right Temporal to nasium)</th>
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<tbody>
<tr>
<td>Pre</td>
<td>Right PI Blocking</td>
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<td>73</td>
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</table>

**Table 3:** The mean change of the photographic cranial anatomical landmark measurements for the experimental and control groups (in mm)

<table>
<thead>
<tr>
<th>Groups</th>
<th>Left side of face (Left Temporal to nasium)</th>
<th>Right side of face (Right Temporal to nasium)</th>
<th>Total changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental Group: Right PI Blocking</td>
<td>1.33</td>
<td>1.77</td>
<td>3.10</td>
</tr>
<tr>
<td>Experimental Group: Left PI Blocking</td>
<td>1.53</td>
<td>1.88</td>
<td>3.41</td>
</tr>
<tr>
<td>Control group: Right PI Blocking</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>Control group: Left PI Blocking</td>
<td>0.6</td>
<td>0.3</td>
<td>0.9</td>
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