DURAL PORT THERAPY

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ABSTRACT

Introduction: Dural port therapy (DPT) is a chiropractic procedure which can be used effectively with Sacro-Occipital Technique (SOT) procedures and which uses the sacrum as a lever to influence and balance the spine and cranium by way of the meningeal system.

Discussion: Rationale and research is presented to explain the basis behind DPT's method of affecting the craniospinal system and its relationship to the meninges. Though the procedure can be used with most conditions, DPT appears to be safe to use with osteoporotic conditions, fractured vertebrae, and other conditions where a "thrust" to the spine may be contraindicated. Basic methods of using DPT are presented along with alternative methods which can be applied when the basic methods are not sufficient.

Conclusion: DPT reduces sacral, spinal, and cranial dura meningeal tension, lesions, torque and stress, as well as dural sleeve vasomotor interference. The possibility that the doctor can influence the nervous system directly in such a powerful manner warrants further investigation. (J Chiropr Med 2002;1:54-61)

KEY WORDS: MeSH: Chiropractic Manipulation; Nervous System. Non-MeSH: Sacro-Occipital Technique; Craniosacral Adjusting; Meningeal Tension; Dural Port Therapy

INTRODUCTION

Dural Port Therapy (DPT) is a procedure which uses the sacrum as a lever to influence and balance the spine and cranium by way of the meningeal system. It can be used as an auxiliary procedure with Sacro-Occipital Technique (SOT) procedures or by itself as the only procedure in isolated cases. The procedure appears to be safe for osteoporotic conditions, fractured vertebrae, and other conditions where a "thrust" to the spine may be contraindicated. While DPT uses the sacrum as a lever

to influence the "dura meningeal system," at the same time DPT directs a gentle force to the spinal segment involved for corrections. DPT reduces sacral, spinal, and cranial dura meningeal tension, lesions, torque and stress, as well as dural sleeve vasomotor interference. Therefore, DPT can reduce localized nerve irritation and allow for improved neurological integrity.

The dura mater is a tough fibrous membrane. It is the outermost covering of the brain and the spinal cord. The dura of the brain and that of the spinal cord are similar and continuous with one another at and through the foramen magnum. The dura mater is the outermost envelope of the central nervous system. However, within the cranium aside from surrounding the cerebrum and cerebellum, the dura mater also compartmentalizes each structure and separates one from another and the right from the left side. The external layer serves as the internal periosteum for the cranial bones and is continuous through the sutures with the periosteum of the external surface of the skull, where it anchors and attaches itself. The internal meningeal layer has 4 folds; the falx cerebri, the tentorium cerebelli, the falx cerebelli, and the diaphragma sellae. The dura anchors strongly to the different areas of the inner cranial vault especially where the meningeal layer comes in contact with the periosteal layer. (1-11)

The cranial dura is firmly adherent to the different points within the cranium, to the ring of the atlas and extends as the spinal dura having firm attachments to the foramen magnum, second and third cervical vertebrae. The posterior cervical epidural ligaments anchor the posterior dura mater to the ligamentum flavum. (12) A connective tissue bridge also has been noted between the rectus capitis posterior minor muscle and the dorsal spinal dura at the atlanto-occipital junction. (13) Continuity was also "observed between the ligamentum nuchae and the posterior cervical spinal dura as the latter passed deeply from the midline toward the dura, but only at the first and second cervical vertebral levels. The ligamentum nuchae also passed bilaterally on to the occipital bone as far as the sutures between the occiput and the temporal bones, approaching the inferior nuchal line superiorly." (14)

Meningovertebral ligaments (ligaments of Hofmann) are found along the spinal canal between the L5/S1 intervertebral level and cephalad up to T1. These liga-

ments appear to be more prevalent in the lumbar vertebral column but are also present throughout the thoracic vertebral column. It is theorized that the dural sac attachments to the posterior aspect of the vertebral bodies and the posterior longitudinal ligament could act to traction the dural sac in the event of nuclear bulge or herniation. (15)

The spinal dura is a cylindrical sheath which surrounds the spinal cord and spinal nerve roots, which passes through the intervertebral foramina. Along with the other dural spinal attachments an external aspect of the spinal dura has attachments by fibrous slips to the posterior longitudinal ligament and to a fatty connective tissue layer called epidural fat. This separates it from the periosteum and provides additional cushioning for the spinal cord and nerves within the spinal cord. The various dural attachments allow stability, yet still enable flexibility. The lateral wall of the dura is stabilized internally to the pia mater and therefore also to the spinal cord by the denticulate ligament. The denticulate ligament attaches to the spinal dura at regular intervals for the foramen magnum to the conus medullaris by tooth-like extensions of the pia mater between each spinal nerve. (1-11)

The dura mater and pia mater extend and continue coverage of the ventral and dorsal roots of each spinal nerve. Immediately after the nerve emerges from the intervertebral foramen, the recurrent meningeal nerve branch re-enters the vertebral canal through the foramen where it supplies afferent fibers to the vertebrae and their ligaments and carries sympathetic post ganglionic fibers to the blood vessels of the spinal cord and its membranes.

Although the spinal cord usually extends only to the L1 vertebrae level, the dural covering continues to line the entire extent of the vertebral canal, creating a large spinal-fluid-filled subarachnoid space. The spinal dura, which anchors itself firmly at the second sacral segment, continues down the sacral canal to the filum terminale and extends downward to blend with the periosteum on the dorsum of the coccyx, where it fuses with the periosteum. (3) There it secures the caudal end of the spinal cord and is called the central ligament of the spinal cord. The central ligament assists in maintaining the cord in position during movements of the body. (1-11)

DISCUSSION

Sutherland, the "father of osteopathic cranial manipulation," described a relationship between the spinal and

cranial meninges and called this relationship the reciprocal intraspinal membranes. He theorized that "there are two functions of the reciprocal intraspinal membranes. First, the intraspinal membranes enable the cranium and sacrum to function in unison. Therefore, just as the cranium can affect the sacrum or spine, the sacrum can affect the spine or cranium. The second important function of the reciprocal intraspinal membrane tension is that it contributes to the fluctuation of the cerebrospinal fluid within the vertebral column." (16)

There appears to be an inherent motility of the nervous system which is sufficient to create a cerebrospinal fluid pulse wave, sometimes independent of pulmonary or vascular influences (17-36). The pulse wave, or motion independent of pulmonary or vascular influences, is often called the primary respiratory motion. The movement of the nervous system has an inhalation, also called flexion, phase and an exhalation, also called extension, phase (4-11,16). SOT can evaluate the condition of meningeal tension (3,4,6,7,9) which is associated with the flexion/inhalation and extension/exhalation phase of the primary respiratory motion. When the meninges, neural tissues, and specifically the spinal dura are fixated in flexion or extension it is theorized that this could affect lumbar cerebrospinal fluid fluctuations (3,37-40).

Lumbar cerebrospinal fluid (CSF) fluctuations primarily are believed to be associated with blood pressure variants and affected by both arterial and venous vascular components (38-40). Diaphragmatic respiration has also been shown to affect CSF pulsations (17-36), though there appear to be fluctuations that are not associated with either vascular or pulmonary influences (28-31,34,36). The fluctuations not associated with vascular or pulmonary influences, called primary respiratory motion, are believed to be associated with normal movements of the brain and spinal cord which affect or are affected by motions of the cranium and sacrum. This pulse wave, which is believed to be independent of vascular or pulmonary influences, is palpated by those proficient with cranial palpation (41-45). They find that the primary respiratory motion within the craniospinal system has a rhythmic increase and decrease of pressure, creating a pulse wave approximately 6-14 times per minute. This pressure variant is associated with slight movements of the sacrum as well as the various structures that have meningeal attachments and to a degree the whole body.

The sacrum is believed to have a motion which creates a tugging and releasing effect on the dura mater, causing

physiological changes within the meningeal system (46,47). This repetitive sacral movement affects the opening and closing motion at the dural sleeves and dural ports and is believed to enhance motion and mixing of CSF within the spinal canal, affecting the spinal root levels. This motion of the sacrum creates a “flexion and extension” response to the craniosacral mechanism that is called the “primary sacral respiratory mechanism” Anatomically on flexion or inspiration, the sacral base lifts posteriorly and slightly superiorly and the sacral apex goes anteriorly as the spinal cord slightly decreases its vertical dimension. On extension or expiration we have just the opposite and the sacral apex lifts posteriorly and slightly inferiorly and the sacral base goes anteriorly as the spinal cord slightly increases its vertical dimension (4–11,16).

Upledger notes that the fascia is one continuous sleeve from the cranium to the feet and extends into the spine and blends or becomes part of the meningeal system (5,8). Thus it is proposed that a disturbance in postural position or physiological motion of the primary sacral respiratory mechanism can directly affect any other segmental part of the spine or cranium through the reciprocal tension membranes of the craniospinal meningeal system (46–52).

DeJarnette developed a method of determining whether the meninges, as they attach to the second sacral segment and lumbosacral region (4,6,7,9) are in excessive flexion or extension. (Figure 1) The term “SB+” (SB plus) is associated with meningeal extension or increased sacral meningeal/neural tension. “SB–” (SB minus) is associated with meningeal flexion or decreased sacral meningeal/neural tension. SB+ and SB–, increased or decreased meningeal tension, is determined by placing the practitioner’s thumb gently over the fifth lumbar spinous with the patient in a relaxed, prone position. The patient is then asked to cough to cause movement of the fifth lumbar vertebrae. Movement of the thumb is observed. One position might be ceilingward with a “bounce” upon the cough. This would be termed “SB+”. When the thumb “jerks” cephalward, it

Figure 1: SB Cough Test

is called “SB–”. A bouncing toward the ceiling with an equal movement toward the cranium, is considered a balanced SB+/- or SBN (normal) and associated with balanced tension of the meninges in the lumbopelvic region (3,4,6,7,9). It can be reasoned that the SB “+ or –” with its accompanying meningeal flexion/extension, (at the sacral level) also relates to the spine and cranium by way of the spinal meninges (3,4,6,7,9, 46–52).

Breig has also noted a relationship between dynamic tensions within the craniospinal system. He found through his neurosurgical practice and research that meningeal connections to osseous structures and connective tissue create a normal balanced tension necessary for neurological health. He states that “from a biomechanical aspect the spinal cord . . . cannot be considered in isolation but must be treated as a continuous tract of nervous and supporting tissues, from the mesencephalon to the conus medullaris.” He refers to this relationship as the “pons-cord-tract.” He continues, “the static and dynamic properties of the pons-cord-tract constitute a self-contained biomechanical compartment.” He noted that during gross flexion and extension of the vertebral column the pons-cord-tract would respond by lengthening and shortening. He noted that during these spinal movements “the axons and blood vessels of the spinal cord undergo deformation similar to that of the cord as a whole” (3).

DeJarnette’s work parallels that of Breig and states that when a SBN response occurs to testing, the craniospinal system is in balanced meningeal tension and “health.” When a SB+ (excessive extension) or SB– (excessive flexion) response occurs, there will often be an associated vasomotor response at specific vertebra associated with a localized decreased vascularity at the spinal segment(s). This SB+ or – is associated with increased or decreased tension within the meninges and related to lengthening or shortening of the spinal cord (4,6,7,9). Breig explains why vascular insufficiency would occur at the vertebral level regardless if there is too much or too little tension: “When the cord shortens axially the transverse channels running between the intersecting glial fibers are kept patent by these fibres; they can be seen in both sagittal and coronal sections. At the same time the tendency for the tissue investing the channels to collapse is also counteracted by the resistance of the collagen fibres in the walls of the channels. The channels running axially are also kept open by the collagen fibres which, when compressed axially, bend away from these perivascular channels and displace the tissue towards the surface of the piamater.” When there is a failure in the pons-cord-tract to maintain this balance

and excessive shortening occurs the “intersecting glial fibers” and “collagen fibers” can not keep the perivascular channels patent and a localized vasomotor response will present itself at the vertebral level under this increased stress (3). (Figure 2)

Breig further states, when there is lengthening or “stretching of the cord, the protective function of the collagen fibres comes into play in the reverse sequence. The axially running nerve-and glial fibres are then pulled around the transverse perivascular channels. The tendency for constriction of these channels is then counteracted by the sudden resistance of those collagen fibres of the rhomboid network, which run transversely and parallel to the channels. Narrowing of the axially coursing channels when stretched is presumably resisted by the stiffening collagen fibres running in the axial direction. The constrictive tendency of the stretched cord tissue is thus counteracted, and any lateral pressure on the blood-vessels is prevented.” When

there is a failure in the pons-cord-tract to maintain this balance and excessive lengthening occurs the “collagen fibres of the rhomboid network” and those “collagen fibres running in an axial direction” can not keep the perivascular channels patent and a localized vasomotor response will present itself at the vertebral level under this increased stress (3).

Dural port therapy (DPT) uses the procedures developed by DeJarnette for treatment of SB+/- conditions and its associated treatment of localized vasomotor insufficiency at the vertebral level, where the excessive shortening or lengthening of the cord is summated. DPT appears to work well with, and enhances, Sacro-Occipital Technique (SOT)’s Category I, II, and III procedures.

The category system of analysis was developed by DeJarnette (9). He organized patterns of various possible bodily distortions, particularly the disturbances which

Figure 2: SB+ and SB-

occur in the sacroiliac and lumbosacral regions. Briefly, Category I relates to imbalance or torque at the anterior aspect of the sacroiliac junction and its affect on meningeal balance and CSF fluctuation. Category II is associated with various degrees of posterior sacroiliac joint and ligamentous spraining and trauma. A Category III condition will occur when the pelvis can no longer maintain weight bearing capacity and shifts the “burden” to the lumbosacral junction with resultant discopathy and radiculopathies (9).

DeJarnette (4,6,7,9) postulates that with a category I condition the dura responds and torques to compensate for stress at the anterior sacroiliac joint and this in turn sets up dural port involvements with dural sleeve closures or restrictions as described similarly by Breig (3). Dural sleeve closure or restriction can effect CSF flow to the nerves, causing possible vascular changes and interference with the lymphatics (53–56). This irritation can also affect the recurrent meningeal nerves, set up vasomotor responses and cause afferent or efferent nerve irritation with unneeded impulses. DPT can also be used in Category II procedures because it enables the doctor to balance and “unwind” the spinal meningeal system and normalize dural stresses without having to possibly aggravate a sprain of the sacroiliac junction.

Sacral base positive (SB+) or sacral base negative (SB–) indicates dural port and dural sleeve involvement with nerve root meningeal stress leading to localized vasomotor disturbances. SB procedures help to find the disturbances and when a correction should be made to a specific vertebra’s spinous process to release the dural port and dural sleeve involvement and clear the vasomotor interference. It has often been found that some patients have more than 1 or 2 locations in the spine where a vasomotor (VM) response will occur to testing. Using the DPT procedure, VM interference can be palpated and detected within the lumbar, thoracic and cervical.

Indicators for DPT

DPT is indicated when pain continues along the spine, sacroiliac or cranium after regular procedures have been used. When the doctor is not able to apply a thrust to the tissue due to fractures, osteoporosis, fear of manual adjustment; or deep pain within the spine which palpation does not reveal as a subluxated vertebrae, DPT can be applied. Dural port therapy can be used by itself as the corrective procedure utilized or as an auxiliary procedure with the various SOT procedures (4,6,7,9).

The concept behind DPT is that the technique uses the body’s own natural biomechanics of the spine. In the

prone position during diaphragmatic inspiration the spine has a gliding motion slightly posteriorly and cephalic, with the surrounding muscles and tissue following the same motion. On diaphragmatic inspiration, the sacral base moves slightly superiorly and posteriorly with the apex going anteriorly, causing a tugging within the dural and related myofascial system.

During diaphragmatic expiration, the spine moves with a gliding motion caudally and with slightly anterior tipping of the spinous process along with surrounding muscles and tissue following. The sacral base moves slightly inferiorly and anteriorly while the apex goes posteriorly as the dura, of the spine and sacrum lengthens. Where there is either restriction or loss of motion palpated within the sacrum or spinal area this would indicate dural imbalance and localize the region for the DPT procedures.

Technique

DPT attempts to use the body’s own natural functions to release lesions and fixations within the spine and cranium. By using the SOT cough test we are able to tell if the dura is fixed in flexion or extension, which would be SB+ or SB–, or normal with no interference within the dural system. Performing the SB cough test determines the block placement position. With finding of SB+ (Figure 3) each block is placed under the anterior superior iliac spines and aimed caudally at 45 degrees and slightly towards one another. With finding of SB– (Figure 4) each block is placed under the greater trochanters with the blocks directed through the acetabulum facing 45 degrees cephalward.

DPT monitoring begins with placing the blocks in the SB+ or SB– position depending on the results of the cough test. When the blocks are in position, the doctor has the patient take a deep inhalation, and hold briefly (2–3 seconds) and then instruct the patient to exhale while the doctor monitors the sacrum to determine its normal motion. The doctor’s other hand monitors spinal motion that should normally occur with respiration.

Figure 3: SB+ Position

Figure 4: SB- Position

The patient's spine is monitored 3 segments of vertebrae at a time, beginning at the lower lumbar region. (Figures 5 & 6) Observe through monitoring whether each spinal segment has normal excursions during inhalation and exhalation. Normal motion occurs when during inhalation there is a cephalward lifting of the spinal segments being monitored. When there is fixation the spinal segment under study will not move, or might move caudalward during inhalation. The doctor monitors the spinal segment while standing on the side of the patient, and uses the other hand to monitor sacral mechanics while the patient takes a deep breath and lets it out.

The objective of DPT is to acquire normal sacrospinal mechanics and motion synchronizing the spine, ribs and cranial bone to the "respiration" of the sacrum.

As each segment of the spine is monitored the sacrum is simultaneously palpated for its normal motion. If there is fixation of the vertebral segment or incomplete flexion and extension of the sacrum, DPT treatment is indicated. Block placement is determined by the SB+/- cough test but otherwise treatment that follows will be the same, regardless of cough test findings.

1. If the sacrum moves in extension but not in flexion, then the sacrum is held in extension while the patient takes a deep inspiration and dorsiflexes his/her feet, (Figure 7) on exhalation the patient plantar-

Figure 5: DPT SB+ Procedure

Figure 6: DPT SB+ Procedure

Figure 7: Dorsiflexed feet

flexes his/her feet. (Figure 8) (If the sacrum moves in extension and not in flexion then the sacrum is held in flexion.) Simultaneously, the fixated spinal segment is held with the examining hand, with 2-5 pounds of pressure, during diaphragmatic inspiration and on diaphragmatic exhalation. This is performed for approximately 3 to 5 respiratory cycles or until a release occurs.

2. Then the patient takes another deep breath, dorsiflexes his or her feet and the doctor encourages normal sacral flexion and then has the patient exhale, plantar flex the feet and direct the sacrum into extension. Simultaneously, direct the fixated spinal segment cephalward with inhalation and relax contact on exhalation. This is performed for approximately 3 to 5 respiratory cycles or until a release occurs.

Figure 8: Plantar Flexed Feet

3. If the sacrum and segment do not move normally with respiratory excursions, then with breathing and feet positions similar to the other DPT procedures, enhance the sacrum's normal motion with respiration while holding the fixated vertebral segment for 3 to 5 cycles or until a release occurs.
4. Another possibility is to hold the sacrum in the position it does not move freely move during inhalation or exhalation. With the feet following the breathing, simultaneously apply gentle pressure (posterior to anterior with a cephalward component) to the fixated spinal segment. On inspiration the vertebral segment is lifted cranially and with exhalation the vertebral segment contact is relaxed. This is performed for approximately 3 to 5 respiratory cycles or until a release occurs.

It might only be necessary to perform the first of these procedures or all 4 might be necessary. Each case is individual and can have varying focal points of meningeal fixation and vasomotor disturbance. The sacrum will sometimes change when pressure is applied to the spinal segment under meningeal stress. Sacral responses can be palpated as a tightening effect or a "non-motion." To summarize, during deep inspiration, enhance the sacrum's motion into its restricted position while directing the restricted spinal tissues in a cephalic direction with a slight pressure anteriorly and hold. While continuing to hold the contact, have the patient let the breath out quickly and hold it out. Most of the time this will allow for a release which is monitored in the tissues at the intraspinal area and various segments of the sacrum. If the release does not occur after 5 breathing cycles, then proceed with the procedures 2 through 4.

CONCLUSION

DPT is a gentle yet powerful technique that can be used to release meningeal and vertebral fixations. Due to the dura and its connection to the connective tissue of the vertebral column (15), restrictions can be palpated most especially with diaphragmatic respiration (46). Often-times when there is meningeal stress an associated localized vasomotor insufficiency will occur at the affected vertebral segment. DPT allows the doctor to correct this vasomotor response and vertebral fixation with patients that have osteoporotic conditions, fractured vertebrae, and other conditions where a "thrust" to the spine may be contraindicated.

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