London College of Animal Osteopathy

The Role of Cranial Osteopathy in the Treatment of Sacroiliac Joint Dysfunction in Horses

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1. Introduction

Sacroiliac joint dysfunction (SIJD) is recognised as an important cause of poor performance and hindlimb lameness in horses. The sacroiliac region plays a fundamental role in transferring propulsive forces from the hindlimbs to the axial skeleton, acting as a stabilising interface between the pelvis and the vertebral column. The equine sacroiliac joint is primarily adapted for stability rather than extensive motion (Ross & Dyson, 2011) and even subtle dysfunction may interfere with force transmission, resulting in altered pelvic mechanics, reduced impulsion, and compensatory tension within the thoracolumbar musculature (Ross & Dyson, 2011; Denoix, 2014). Diagnosis of SIJD remains challenging, as clinical signs are often vague and imaging is limited by the depth and complex anatomy of the region. Diagnosis therefore typically relies on a combination of clinical assessment, regional analgesia, and imaging findings (Ross & Dyson, 2011; Walter et al., 2024). These diagnostic challenges highlight the need for a comprehensive approach that considers both local pathology and wider biomechanical influences.

Osteopathy is founded on principles emphasising the interrelationship between structure and function and the body's inherent capacity for self-regulation. Within osteopathic medicine, the cranial concept proposes functional continuity between the cranium and sacrum via the dural membranes and associated connective tissue structures (Chila, 2011). Alterations in tension within this system have been proposed to influence neuromuscular coordination and postural regulation (Chila, 2011; de Lahunta et al., 2021). Despite increasing clinical interest in osteopathy, scientific evidence remains limited, particularly in equine medicine. In this paper, cranial osteopathic techniques are discussed primarily through the lens of the craniosacral concept, as this represents the most accessible body of related literature. The broader craniosacral therapy (CST) literature (largely human) suggests possible effects on pain and function in some contexts, but heterogeneity and debate about mechanisms remain prominent (Haller et al., 2019; Ceballos-Laita et al., 2024). Equine-specific CST research is still emerging, and extrapolation between species requires careful consideration. Nonetheless, the anatomical continuity between the cranium and sacrum provides a theoretical framework for exploring whether cranial techniques may support the management of SIJD.

The purpose of this paper is to examine the role of cranial osteopathy in the treatment of SIJD in horses. Specifically, it seeks to explore whether cranial osteopathic techniques can support the management of SIJD in horses. It is hypothesised that incorporating cranial osteopathic techniques enhances outcomes in horses treated for SIJD.

2. Anatomy and Biomechanics of the Equine Sacroiliac Joint

2.1 Anatomical structure of the sacroiliac joint

The equine sacroiliac (SI) joint forms the articulation between the wing of the ilium and the sacrum. Unlike highly mobile synovial joints, the equine SI joint is primarily adapted for stability. It consists of a small ventral synovial component and a larger dorsal syndesmotic portion, supported by extensive ligamentous structures (Ross & Dyson, 2011; Orsini et al., 2022). The dorsal sacroiliac ligaments (short and long components) provide substantial resistance to shear and torsional forces, while the interosseous sacroiliac ligament complex contributes significantly to joint stability by firmly binding the sacrum to the ilium (Orsini et al., 2022).

This stability-dominant design is consistent with the SI region's primary task: reliable load transfer from hindlimb propulsion into the axial skeleton during athletic work. In practical terms, the SI joint functions less like a "motion joint" and more like a tightly controlled interface whose small movements contribute to shock absorption, pelvic symmetry, and coordinated lumbosacral mechanics (Ross & Dyson, 2011).

Beyond the SI articulation itself, the pelvis operates as a ring. This means that changes in one component such as iliosacral mechanics, pubic symphysis stresses, lumbosacral posture, or surrounding myofascial tone can alter how forces are distributed across the region (Denoix, 2014; Ross & Dyson, 2011). This "ring" behaviour is clinically relevant because SIJD often appears alongside thoracolumbar dysfunction, hindlimb lameness, or training-related overload patterns rather than as a single isolated lesion (Ross & Dyson, 2011).

2.2 Biomechanical function of the sacroiliac region

Biomechanically, the sacroiliac region functions as a force transmission hub, transferring ground reaction forces from the hindlimbs through the pelvis into the axial skeleton. Effective locomotion therefore depends on coordinated interaction between passive stabilisers (ligaments and joint congruence) and active muscular support (Ross & Dyson, 2011; Denoix, 2014). Experimental and anatomical work supports that sacroiliac motion is extremely small and that ligament integrity is central to pelvic stability, reinforcing the view of the SI joint as a stability-oriented articulation (Degueurce & Chateau, 2004; Goff et al., 2008). Clinically, dysfunction is therefore more plausibly linked to altered load transfer and neuromuscular coordination than to gross joint displacement.

The lumbosacral junction is especially relevant because it strongly influences pelvic orientation and sacral positioning. Flexion at the lumbosacral junction supports engagement and collection, while extension supports stride length and propulsion. SI function cannot be separated from lumbosacral mechanics because the sacrum is both a structural bridge and a mechanical "keystone" in axial-pelvic coupling (Ross & Dyson, 2011; Denoix, 2014).

2.3 Neuromuscular stabilisation and functional integration

Stability of the sacroiliac region is not solely dependent on ligamentous integrity. Surrounding musculature, including longissimus dorsi, multifidus, gluteal muscles, and the hamstring group, contributes to dynamic stabilisation of the pelvis and lumbar spine (Ross & Dyson, 2011). Functional integration between limb and trunk is further supported by coordinated muscular and fascial structures that contribute to load transfer and movement coordination (Denoix, 2014).

Training influences these stabilising systems. Conditioning, fatigue, and repetitive technical demands (collection, jumping efforts, lateral work, speed work) can shift recruitment strategies and tissue loading. In biomechanics-focused training texts, the emphasis is repeatedly placed on developing controlled strength, posture, and movement quality to reduce overload in stability-dependent regions such as the SI and thoracolumbar spine (Denoix, 2014; Williams, 2014). From a rehabilitation standpoint, restoring coordinated movement patterns is central, particularly when pain has altered motor strategies and the horse has adopted compensatory bracing or asymmetry (Bromiley, 2007).

3. Pathophysiology of Sacroiliac Joint Dysfunction

3.1 Mechanical instability, ligament strain, and regional pain

SIJD in horses is commonly associated with mechanical instability, ligamentous strain, or altered load distribution within the sacroiliac region (Ross & Dyson, 2011). A clinical study of 74 horses with pain associated with the sacroiliac joint region described reduced performance, hindlimb impulsion deficits, and back pain as common presenting features, highlighting that sacroiliac pain frequently presents as a performance problem rather than overt lameness (Dyson & Murray, 2003). Because the joint is designed primarily for stability, dysfunction often presents as subtle loss of coordinated control rather than obvious "laxity." Repetitive athletic loading may contribute to microtrauma in dorsal ligaments and surrounding entheses, leading to pain, altered movement strategies, and secondary muscle guarding (Ross & Dyson, 2011; Orsini et al., 2022).

Clinical reality is that SIJD is often a "region pain syndrome" rather than a single discrete lesion. Local nociception can arise from ligaments, adjacent musculature, lumbosacral facets, or compensatory hindlimb structures. Diagnostic analgesia targeted to the sacroiliac region can improve performance or lameness, supporting involvement of the region even when imaging is inconclusive (Offord et al., 2021). A large retrospective study of 296 horses further demonstrated frequent coexistence of sacroiliac pain with other orthopaedic abnormalities, emphasising the need for integrated clinical assessment rather than reliance on a single definitive test (Barstow & Dyson, 2015). This is important for research and osteopathic manual therapy (OMT) reasoning: if the diagnosis includes different underlying problems, responses to manual treatment will vary unless cases are clearly defined.

3.2 Altered biomechanics and compensatory patterns

Altered function of the sacroiliac region can disrupt normal pelvic symmetry and axial alignment. As force transmission becomes inefficient, compensatory adaptations may develop within the thoracolumbar spine and associated musculature. Horses with SIJD frequently demonstrate reduced impulsion, difficulty engaging the hindquarters, or resistance to collection (Ross & Dyson, 2011). These patterns are consistent with protective movement adaptations in which the horse reduces load through painful or unstable structures by altering posture, stride mechanics, and muscle activation.

From this perspective, sacroiliac dysfunction may not only represent a local joint issue but also a manifestation of broader compensatory patterns involving the axial skeleton and central regulation of tone and coordination, as reflected in thoracolumbar stiffness and epaxial hypertonicity frequently described in equine back dysfunction literature (Haussler et al., 2021). A key biomechanical point is that stiffness is not always "a joint problem," but may represent a neuromuscular strategy to stabilise a region perceived as threatened. When the SI region is painful or unstable, increased paraspinal and gluteal muscle tone has been described in association with sacroiliac dysfunction (Ross & Dyson, 2011). While increased muscle tone may contribute to regional stabilisation, prolonged hypertonicity can restrict normal motion and alter load distribution within the axial system. Over time, these adaptations can become self-perpetuating. The horse may continue to move in an altered pattern even if the initiating factor has partly resolved.

3.3 Neuromuscular and sensorimotor implications

Pain and altered loading in the SI region can influence sensorimotor integration. Proprioceptive input from pelvic and axial structures contributes to coordination of limb placement, trunk stability, and postural control. When afferent input is altered by pain or inflammation, changes in neuromuscular activation and muscle tone may occur (de Lahunta et al., 2021; Haussler et al., 2021).

Equine neuroanatomy texts emphasise that spinal and supraspinal networks integrate sensory input with motor planning. Even without overt neurological disease, nociception can alter reflex activity, timing, and muscle tone regulation (de Lahunta et al., 2021). Clinically, this may contribute to altered coordination and inefficient movement patterns. This provides an important bridge to cranial approaches, as interventions aimed at modulating tone regulation, autonomic balance, and axial integration may be rational adjuncts when SIJD includes a significant sensorimotor component rather than a purely mechanical lesion.

4. The Osteopathic Framework and the Craniosacral Concept

4.1 Osteopathic principles and OMT reasoning

Osteopathic medicine is grounded in principles emphasising unity of the organism, the interrelationship of structure and function, and the body's capacity for self-regulation (Chila, 2011). In an OMT framework, clinical reasoning typically asks:

1. What is restricting motion or function
2. What compensations are present, and
3. What interventions may improve the system's ability to adapt.

Applied to SIJD, this means considering: pelvic ring mechanics, lumbosacral posture, hindlimb loading, thoracolumbar stiffness, and the horse's overall ability to coordinate movement under athletic demand (Ross & Dyson, 2011; Denoix, 2014). It also means acknowledging that "pain behaviour" and tone changes are part of the clinical picture, not noise to be ignored.

Importantly, OMT is not defined by one technique but by a reasoning-based approach that recognises that treating SIJD is rarely only about the SI joint itself, but about restoring coordinated function across the axial system through structured clinical assessment and intervention. The potential value of osteopathic approaches in SIJD therefore depends on whether manual assessment and treatment can contribute to improved movement quality and functional outcomes within a broader management and rehabilitation plan guided by reassessment (Haussler et al., 2021; Atalaia et al., 2021).

4.2 The craniosacral system: anatomy and proposed function

The craniosacral concept describes a proposed functional relationship between the cranium, spinal dura mater, and sacrum within osteopathic theory (Chila, 2011). Anatomically, the dura mater forms a continuous sheath surrounding the central nervous system and extending caudally within the vertebral canal. Veterinary neuroanatomy confirms dural continuity and clinically relevant relationships between dura, vertebral canal structures, and emerging nerve roots, providing a neuroanatomical substrate for considering interactions between dural tension patterns, central integration of sensory input, and lumbosacral mechanics (de Lahunta et al., 2021).

Within cranial osteopathy, the Primary Respiratory Mechanism (PRM) is described as consisting of five interrelated components: the inherent rhythmic motion of the brain and spinal cord, fluctuation of cerebrospinal fluid, mobility of the intracranial and intraspinal membranes (reciprocal tension

membranes (RTM)), articular mobility of cranial bones, and involuntary mobility of the sacrum between the ilia (Chila, 2011). These components and their proposed integration within the PRM remain debated in the wider scientific community, particularly regarding measurement reliability and underlying mechanisms (Ceballos-Laita et al., 2024). Nevertheless, within osteopathic theory they function as an internal clinical model that informs reasoning and technique selection (Chila, 2011).

Even if the full PRM model and its broader cranial osteopathic interpretations are viewed critically, two points remain relatively well established:

1. Dura and connective tissues are continuous structures that can transmit mechanical strain, and
2. Autonomic and pain regulation are influenced by central and peripheral neurophysiology, which may be modulated by manual input in some contexts (de Lahunta et al., 2021; Haller et al., 2019).

4.3 Reciprocal tension membranes, dural anchoring, and sacral relevance

Within cranial osteopathy, the RTM, including the falx cerebri, tentorium cerebelli, and associated dural partitions, are described as key elements of cranial spinal continuity within osteopathic theory (Chila, 2011). Clinically, the proposed relevance to SIJD is based on the osteopathic model suggesting that sacral positioning and lumbosacral mechanics may influence dural tension patterns, and that cranial restrictions may theoretically transmit strain caudally (Chila, 2011).

Given this dural continuity and its terminal attachments within the vertebral canal, a structural basis exists for considering interactions between neural tissues and lumbosacral mechanics (de Lahunta et al., 2021). In a stability-dominant joint such as the sacroiliac joint, where subtle coordination changes may have functional consequences, small shifts in tone regulation and axial integration could be clinically relevant. From this perspective, cranial techniques are theoretically justified not as a means of directly correcting the sacroiliac joint, but as interventions that may support improved regulation of tone, posture, and coordination within the axial system.

4.4 Autonomic regulation, stress physiology, and muscle tone

A central theoretical rationale in cranial OMT concerns its proposed influence on autonomic balance, often described as supporting parasympathetic activity and reducing excessive sympathetic drive within osteopathic theory (Chila, 2011). While equine-specific autonomic research on cranial techniques is limited, available human CST literature reports effects on pain and function in some

chronic conditions (Haller et al., 2019) and systematic reviews continue to examine clinical effectiveness across conditions (Ceballos-Laita et al., 2024).

Equine studies investigating manual or osteopathic therapy have begun to explore physiological responses. A recent randomized controlled equine study examined changes in cortisol, testosterone, and the testosterone-to-cortisol ratio following osteopathic intervention, representing an initial effort to examine objective neuroendocrine markers within equine OMT research. However, interpretation requires caution given the pilot nature of the study, potential confounders, and the absence of direct clinical outcome measures (Vokietytė-Vilėniškė et al., 2025).

Clinically, SIJD often presents with muscle guarding of the thoracolumbar, gluteal, and hamstring musculature and an altered "feel" under saddle. A plausible mechanistic bridge is that manual interventions, whether cranial or non-cranial, may influence pain processing and muscle tone through neurophysiological pathways, including descending modulation, autonomic regulation, and altered afferent input (Haussler et al., 2021; Haller et al., 2019). While direct evidence for cranial techniques in SIJD remains limited, these mechanisms provide a coherent osteopathic rationale for integrating cranial approaches as part of a comprehensive management strategy.

4.5 Somatic dysfunction models and SIJD

Somatic dysfunction is defined in osteopathic texts as impaired or altered function of components of the somatic system; skeletal, arthrodial, myofascial, and related vascular and neural elements (Chila, 2011). SIJD can be conceptualised as a somatic dysfunction pattern involving altered motion, asymmetry, tissue texture changes, and neuromuscular imbalance. In horses, the SI region's stability dependence means dysfunction may express more through muscle recruitment and movement quality than through gross joint range change (Ross & Dyson, 2011; Denoix, 2014).

Animal osteopathy texts emphasise whole-body assessment and the relevance of compensation patterns, including axial chain adaptations that can perpetuate dysfunction (Nevin et al., 2020). Within that model, cranial findings are interpreted in relation to axial and pelvic function rather than as isolated regional issues. Cranial techniques are therefore framed as one component of restoring coordinated function in horses presenting with conditions such as SIJD.

5. Critical Review of Evidence

5.1 Evidence base in relation to SIJD and axial dysfunction

The scientific literature addressing SIJD in horses is limited, both for cranial osteopathy and for conservative interventions more broadly. A major challenge is diagnostic heterogeneity: the sacroiliac region is anatomically deep, imaging has limitations, and pain sources frequently overlap with thoracolumbar, hindlimb, or lumbosacral pathology (Ross & Dyson, 2011; Walter et al., 2024). As a result, study populations labelled as "SIJD" often represent mixed clinical presentations rather than isolated ligamentous or joint pathology.

This complexity has important implications for research interpretation. If sacroiliac dysfunction represents a regional pain and coordination disorder rather than a single structural lesion, outcome measures must reflect functional integration rather than isolated joint mobility. Many equine axial dysfunction studies therefore assess variables such as nociceptive thresholds, trunk stiffness, flexibility, or movement symmetry (Haussler et al., 2021). Observational osteopathic studies report improvements in gait or performance following treatment (Colles et al., 2014; Thoresen, 2009); however, the absence of randomised controls, standardised SI-specific outcome measures, and consistent case definitions limits causal interpretation.

The current evidence base therefore does not support strong claims regarding specific technique efficacy for SIJD, but instead supports cautious interpretation and highlights the need for clearer case selection and functional outcome measures in future research. These constraints help explain why much of the equine osteopathic literature relies on observational designs and why high-level SIJD-specific evidence remains difficult to generate (Atalaia et al., 2021; Thoresen, 2009).

5.2 Cranial osteopathy: evidence relevance and limitations

Direct equine research on cranial osteopathy in SIJD is limited; therefore, much of the evidence base is extrapolated from human CST literature. Open-access systematic reviews and meta-analyses in humans have reported clinically meaningful effects of CST on chronic pain outcomes and function in some contexts (Haller et al., 2019). Other systematic reviews and meta-analyses have attempted to synthesise the broader CST evidence across conditions, reporting heterogeneous and often low-certainty findings alongside ongoing controversies regarding mechanisms and study quality

(Ceballos-Laita et al., 2024; Amendolara et al., 2024). These findings cannot be assumed to translate directly to equine SIJD. Equine-specific publications describing the adaptation of CST to horses are also available (Kanik et al., 2017). However, these reports are primarily descriptive and lack controlled study designs or standardized outcome measures. A controlled equine study investigating cranial osteopathy therapy demonstrated short-term reductions in back nociception measured by pressure algometry, suggesting that cranial techniques may positively influence pain sensitivity in the axial region (Vokietytė-Vilėniškė et al., 2022). However, the study focused on thoracolumbar nociception rather than sacroiliac-specific pathology and did not directly assess functional performance outcomes or long-term clinical relevance. While these findings provide preliminary objective support for cranial intervention in horses, extrapolation to SIJD management must therefore remain cautious.

5.3 Theoretical plausibility vs. clinical claims

The craniosacral concept within cranial osteopathy offers a coherent osteopathic framework based on dural continuity and axial integration (Chila, 2011). Equine neuroanatomy supports that dura is continuous and intimately related to vertebral canal structures (de Lahunta et al., 2021). Equine biomechanics supports that SIJD is strongly influenced by axial integration and neuromuscular stabilisation (Ross & Dyson, 2011; Denoix, 2014). Taken together, these strands provide theoretical plausibility for cranial techniques as supportive care.

While theoretical plausibility cannot be equated with proven efficacy, dismissing cranial approaches on this basis alone would overlook the integrative logic central to osteopathic reasoning. A more coherent position is to frame cranial osteopathy as an adjunct within SIJD management, guided by reassessment and functional outcomes rather than isolated structural correction. This position aligns with recommendations for outcome-based clinical reasoning and cautious interpretation of manual therapy evidence (Haussler et al., 2021; Ceballos-Laita et al., 2024).

6. Integrating Cranial Osteopathy into SIJD Management (Theoretical)

6.1 Why an integrative perspective fits SIJD pathophysiology

Clinically, SIJD sits at the intersection of stability, load transfer, and sensorimotor control. Rehabilitation literature in horses reflects this reality: management commonly includes attention to movement retraining, conditioning, and manual approaches because function emerges from system-level integration (Atalaia et al., 2021; Bromiley, 2007).

From an osteopathic standpoint, OMT is positioned to influence both local and global factors: tissue mobility, myofascial tone, and the horse's ability to coordinate movement. This aligns with how SIJD manifests clinically, often as a whole-body performance issue rather than a single joint complaint (Ross & Dyson, 2011; Nevin et al., 2020).

6.2 Specific theoretical contributions of cranial techniques to SIJD management

Cranial techniques are theorised to contribute in three main ways:

1) **Supporting axial integration and dural strain reduction**

If SIJD includes altered lumbosacral mechanics and sacral positioning, cranial techniques aimed at balancing craniospinal membrane tension could theoretically reduce abnormal strain patterns along the dura and associated connective tissues (Chila, 2011; de Lahunta et al., 2021). This is framed as supporting coordinated function rather than mechanically repositioning the SI joint.

2) **Modulating autonomic tone and reducing protective guarding**

Persistent pain often correlates with sympathetic arousal and protective muscle guarding. Cranial techniques are frequently justified within OMT as supporting parasympathetic balance and improving regulatory capacity (Chila, 2011). Human CST evidence suggests possible benefits for pain and function in chronic conditions (Haller et al., 2019), and equine OMT research is beginning to explore objective physiological markers relevant to stress responses (Vokietytė-Vilėniškė et al., 2025). A cautious, defensible statement is that cranial techniques may support downregulation of guarding patterns and improve tolerance to therapeutic work.

3) **Influencing sensorimotor integration and movement quality**

SIJD can be interpreted partly as a disorder of coordination: altered pelvic stability, changed proprioceptive signalling, and changed motor output. Neuroanatomical principles support that altered

afferent input can influence central motor control (de Lahunta et al., 2021). OMT literature proposes that manual inputs can alter afferent signalling and thereby support improved motor organisation (Chila, 2011). Although direct equine evidence remains limited, the convergence of biomechanical, neurophysiological, and osteopathic principles provides a coherent rationale for integrating cranial techniques when clinical goals include improved movement quality and pelvic–trunk coordination.

In practical osteopathic reasoning, cranial assessment would not be approached in isolation, but as part of evaluating how the sacrum, lumbosacral junction, and cranial base interact within load transfer and tone regulation patterns. Within SIJD management, cranial osteopathy is best positioned as an adjunct to veterinary diagnosis and evidence-based care. Its clinical application should remain proportional to the current level of evidence and guided by outcome-based reassessment (Haussler et al., 2021; Atalaia et al., 2021).

7. Conclusion

SIJD in horses represents a stability-dependent and system-level condition in which altered load transfer, neuromuscular coordination, and compensatory adaptations interact. The diagnostic complexity and overlapping pathology associated with SIJD limit strong technique-specific claims; however, they also reinforce the need for integrative and reasoning-based approaches to management.

Within an osteopathic framework, cranial osteopathy is theoretically relevant because of craniospinal continuity and its proposed influence on tone regulation, autonomic balance, and axial integration. While equine-specific cranial evidence remains limited, emerging controlled findings indicating short-term reductions in axial nociception, together with the anatomical and neurophysiological rationale presented in this paper, supports the integration of cranial osteopathic techniques as part of a comprehensive SIJD management strategy.

Accordingly, the hypothesis that cranial osteopathic techniques may enhance outcomes in horses treated for SIJD can be conceptually supported within an osteopathic framework, particularly where restoring axial coordination, reducing protective guarding, and enhancing functional performance are central to clinical goals. When applied within structured clinical reasoning and outcome-based reassessment, cranial approaches align with core osteopathic principles and may contribute positively to the management of SIJD in horses.

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