

Development and validation of a periarticular injection technique of the sacroiliac joint in horses

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Summary

Reasons for performing study: Sacroiliac joint osteoarthritis has been recognised as a significant cause of poor performance in competition and racehorses. Reliable diagnostic tools are currently lacking. The diagnosis has been based typically on exclusion of other possible causes of poor performance, back pain and hindlimb lameness.

Objectives: To develop a safe, reliable and minimally invasive periarticular or intra-articular injection technique of potential use for diagnosis and therapy of sacroiliac joint disease in horses.

Methods: Twenty-six horses were used to develop and assess a medial approach to the sacroiliac joint with a 15 gauge, 25 cm long spinal needle. In *Part I*, the cadaveric study, the spinal needle was introduced cranial to the contralateral *tuber sacrale* and advanced along the medial aspect of the ipsilateral iliac wing until the dorsal surface of the sacrum was encountered. One ml methylene blue (MB) was injected in both sacroiliac joint regions of the sacropelvic specimens. The location of MB-stained tissues relative to the sacroiliac joints was recorded after dissection and disarticulation of the sacroiliac joint. In *Part II*, the *in vivo* study, 18 horses were used to validate the *in vivo* application of the sacroiliac joint injection technique. Horses were restrained in stocks and sedated in preparation for needle placement. One ml MB was injected bilaterally prior to euthanasia. Stained tissues were identified and recorded at necropsy. Successful joint injections were characterised as having MB located intra-articularly or ≤ 2 cm periarticularly from the sacroiliac joint margin and localised to the middle or caudal third of the sacroiliac joint.

Results: Intra-articular MB was not observed in any specimen. However, MB-stained tissue was identified periarticularly in all injection sites ($n = 48$). Based on the predetermined success criteria, 96% of the methylene blue depots were located at the middle or caudal third of the sacroiliac joint. Dye-stained tissue was located ≤ 2 cm from the sacroiliac joint margins in 88% of the specimens. Median distance of the MB from the sacroiliac joint margins was 1.0 cm (range 0.2–3.8 cm). The overall success rate considering both location and distance of the MB-stained tissue relative to sacroiliac joint margins was 83% (40 of 48 joints).

Conclusions: The injection technique provides a reliable, easy to perform and consistent access to the medial periarticular aspect of the sacroiliac joint.

Potential relevance: The described injection technique has the potential for both diagnostic and therapeutic applications in the medical management of equine sacroiliac joint disease. Further investigation is necessary to evaluate clinical efficacy and potential adverse effects.

Introduction

Sacroiliac joint disease has many aetiologies, which include osteoarthritis, desmitis, chronic joint instability or acute subluxation. Chronic sacroiliac joint injuries have been recognised as a significant cause of poor performance (Jeffcott *et al.* 1985; Dyson *et al.* 2001). Up to 15% of competition horses, especially hunters, jumpers, eventing horses and steeplechasers are reported to be clinically affected (Jeffcott 1980; Dalin and Jeffcott 1986). Clinical signs are often nonspecific and may include poor performance, refusal at jumps, reduced hindlimb impulsion, poor croup muscling, back soreness, reluctance to trot or pace at high speeds, or a low-grade, shifting hindlimb lameness (Rooney 1977; Jeffcott *et al.* 1985; Dyson *et al.* 2001).

In athletic horses, sacroiliac osteoarthritis appears to be more prevalent than is currently recognised clinically. Necropsy surveys of Thoroughbred and Standardbred racehorses subjected to euthanasia due to unrelated injuries report a high prevalence (between 42 and 100%) of osteoarthritic changes of the sacroiliac joints; most commonly affecting the caudomedial joint margin (Rooney 1977; Dalin and Jeffcott 1986; Haussler *et al.* 1999). The *ante mortem* diagnosis of sacroiliac osteoarthritis is difficult and usually based on subjective clinical findings. Unfortunately, diagnostic imaging modalities, such as ultrasonography, radiography or nuclear scintigraphy, are not always reliable indicators of sacroiliac joint disease (Jeffcott *et al.* 1985; Dyson *et al.* 2001; Tomlinson *et al.* 2001; Erichsen *et al.* 2002). In most cases, the diagnosis of sacroiliac joint disease is based on exclusion of other causes of hindlimb lameness, caudal back pain or poor performance. Consequently, the diagnosis of sacroiliac osteoarthritis is often protracted and expensive, since affected horses have vague clinical signs and are often referred to specialty clinics or universities for advanced diagnostic evaluation.

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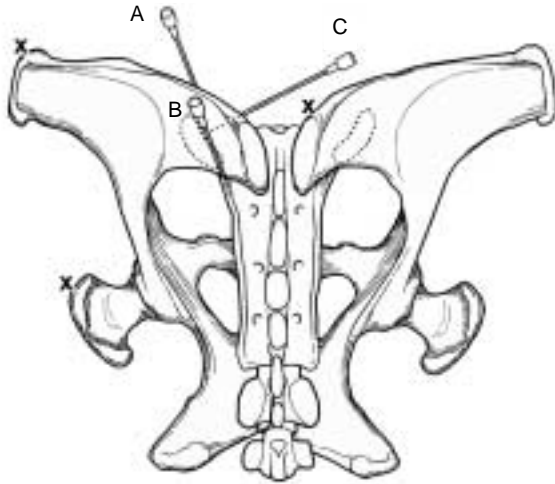


Fig 1: Illustration of potential approaches to the left sacroiliac joint (dotted outline). Dorsal view. A = Cranial approach through the gluteal and longissimus musculature. B = Caudal approach through the gluteal musculature. C = Medial approach with a needle entry point cranial to the contralateral tuber sacrale. Bony landmarks (X) used for approach C include the cranial aspects of the contralateral tuber sacrale, ipsilateral tuber coxae and greater trochanter of the femur.

A reliable sacroiliac joint injections would be the ideal tool to help confirm and treat sacroiliac joint pain. Unfortunately, the deep overlying croup musculature and seemingly inaccessible anatomical location of the sacroiliac joint has limited the clinical application of intra-articular or periarticular injection techniques (Adams 1969; Rooney 1977; Jeffcott *et al.* 1985). Injection of the general sacroiliac region for diagnostic and therapeutic purposes has been reported, but direct access to the sacroiliac joint has not been described (Hardy and Marcoux 1985; Marks 1997; Dyson *et al.* 2001; Dyson and Murray 2003). A superficial site of injection with shorter needles (length 3–10 cm) is likely to influence ligamentous pain originating from the dorsal sacroiliac ligament and may therefore be less specific for osteoarthritic pain originating from the sacroiliac joint (Fig 1, C). In addition, the sciatic nerve and cranial gluteal neurovasculature structures pass through the greater sciatic foramen directly caudal to the sacroiliac joint (Seiferle and Böhme 1992) and could be compromised due to improper needle placement or adverse reactions to injected medications.

In man, intra-articular and periarticular injections of local anaesthetic solutions and corticosteroids are used in the management of sacroiliac osteoarthritis for diagnostic and therapeutic purposes, respectively (Cassidy and Townsend 1985; Maugars *et al.* 1996; Luukkainen *et al.* 1999). Intra-articular injection of the human sacroiliac joint is technically difficult and requires concurrent diagnostic imaging (i.e. fluoroscopy or computed tomography) for proper needle placement (Maugars *et al.* 1992; Braun *et al.* 1995). However, periarticular injections of the human sacroiliac joint are easy to perform, safe and effective in controlling pain associated with sacroiliac joint osteoarthritis (Cassidy and Townsend 1985; Luukkainen *et al.* 1999). The purpose of this study was to develop a safe, reliable and minimally invasive periarticular or intra-articular injection technique of the sacroiliac joint that could be used potentially as a diagnostic and therapeutic tool for the management of sacroiliac joint disease in horses (Engeli *et al.* 2002a,b).



Fig 2: Cranial view of the sacroiliac joint region with a needle placed adjacent to the medial sacroiliac joint margin. A contoured spinal needle is advanced along the medial aspect of the ilial wing until the dorsal aspect of the sacrum is encountered.

Materials and methods

Subjects

Twenty-six horses were studied under animal use protocols approved by the Center for Research Animal Resources (CRAR) and the Institutional Animal Care and Use Committee (IACUC) at Cornell University. The horses did not have a current history of proximal hindlimb lameness or caudal back pain and were subjected to euthanasia for reasons unrelated to the sacroiliac or pelvic regions. There were 11 mares, 14 geldings and 1 stallion, median age 10.5 years (range 8 months–30 years), 14 Thoroughbreds, 5 Quarter Horses, 2 Quarter Horse crosses, 1 Paint, 1 Standardbred, 1 Warmblood, 1 Thoroughbred/ Warmblood cross and 1 Arabian cross. Median bodyweight was 515 kg (range 273–636 kg).

Anatomical studies and development of injection technique

Articulated osseous sacropelvic specimens were used to determine the optimal needle placement required to access the sacroiliac joint (Fig 1). The primary goal was to achieve intra-articular access to the sacroiliac joint or as close as possible periarticularly to the caudomedial aspect of the joint, while avoiding adjacent neurovascular structures. A medial approach to the sacroiliac joint was postulated to be the most direct, safe and consistent injection technique (Fig 2). Eight cadavers were used to review the clinically relevant regional anatomy and to assess the feasibility of a percutaneous approach. Sacropelvic specimens were collected at *post mortem* by transection of the vertebral column at the 2nd to 4th lumbar vertebra and bilateral femorotibial disarticulation. The skin and underlying soft tissues were initially left intact to identify consistent topographic landmarks.

Six of the 8 sacropelvic specimens were used to assess the medial percutaneous approach to the sacroiliac joint. Osseous topographic landmarks used to identify the needle entry site and direction of needle advancement included the contralateral *tuber sacrale* and ipsilateral *tuber coxae* and greater trochanter of the femur (Fig 1). The needle entry site was located 2 cm cranial to

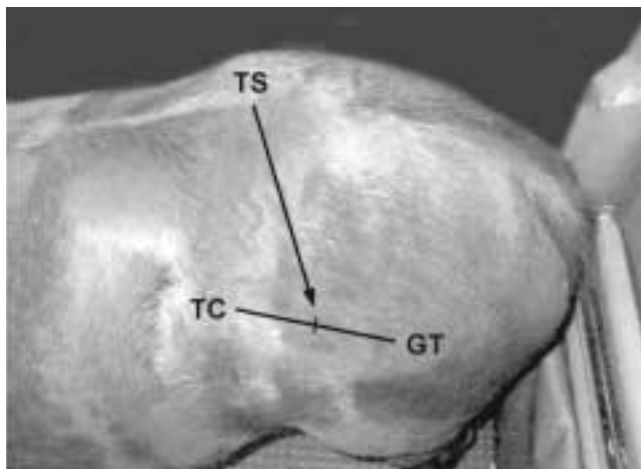


Fig 3: Photograph of the external bony landmarks used to identify the entry point of the needle and the direction of needle advancement (dorsolateral view). The needle entry site is 2 cm cranial to the contralateral (right) tuber sacrale (TS) for injection of the left sacroiliac joint region. The midpoint distance between the cranial aspects of the ipsilateral (left) tuber coxae (TC) and the (left) greater trochanter of the femur (GT) is used as a target for needle advancement (arrow).

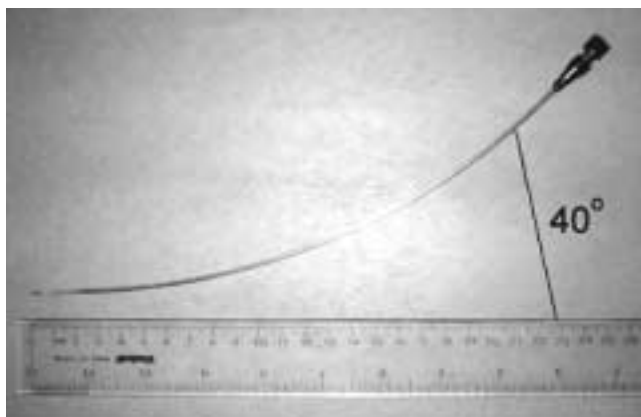


Fig 4: Photograph of the 25 cm, 15 gauge spinal needle with stylette. The originally straight needle is contoured in the direction of the bevel at an angle of approximately 40°.

the contralateral *tuber sacrale*. A 3 mm skin incision was made with a No. 15 scalpel blade (Rib-Back Carbon Steel surgical blade)¹ to reduce skin resistance during insertion and advancement of the needle. A line connecting the needle entry site and the midpoint of the distance from the cranial aspect of the ipsilateral *tuber coxae* and the cranial aspect of the greater trochanter was marked with 2.5 cm wide white tape (Zonas Porous Tape)² and used as a guide for needle advancement (Fig 3).

A custom-made 15 gauge, 25 cm spinal needle (Echotip Disposable Spinal Needle [Ref. V-DSN-15-25.0-ET])³ with a stylette was used for injection. Prior to insertion, the middle of the needle was bent to approximately 40° in the direction of the bevel of the needle tip (Fig 4). The needle was inserted with the bevel facing toward the targeted sacroiliac joint at an angle of 60° relative to the vertical plane. Once inserted through the skin, the needle was advanced across midline between the spinous process of L6 and S1 (Fig 5) until the medial aspect of the ipsilateral *tuber sacrale* was encountered. The needle was then redirected ventrally and advanced at a slightly steeper angle (i.e. 50°) to allow the tip

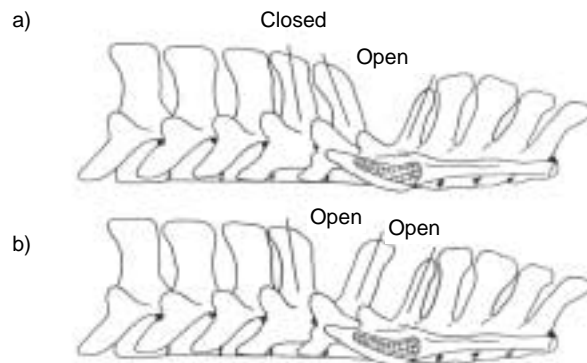


Fig 5: Illustration of variations in the angulation of the dorsal spinous processes at the lumbosacral junction (lateral view). a) The typical lumbosacral (L6–S1) spinous process configuration provides a large interspinous space to cross midline with the needle for injection of the contralateral sacroiliac joint. b) A common variant in angulation of the sixth lumbar vertebra (L6 angled caudally) or, occasionally, the first sacral dorsal spinous process (S1 angled cranially), may restrict direct access to the contralateral sacroiliac joint.

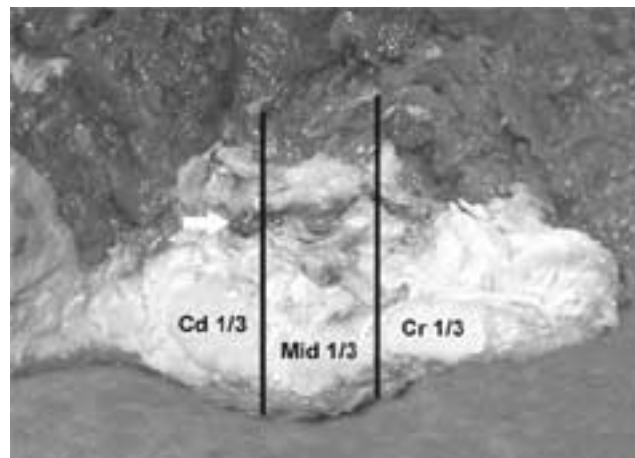


Fig 6: Photograph of the right sacral articular surface of the sacroiliac joint (dorsal view). The sacroiliac joint region was divided into cranial (Cr 1/3), middle (Mid 1/3) and caudal (Cd 1/3) thirds to facilitate localisation of the methylene blue placement. Note the methylene blue (arrow) localised at medial sacroiliac joint margin.

to slide along the medial aspect of the ilial wing (Fig 2), advanced until it firmly engaged the dorsal surface of the sacral wing. The stylette was removed and 1 ml 1% methylene blue dye (Methylene Blue, Certified [Basic Blue 9])⁴ was injected. The procedure was repeated on the opposite sacroiliac joint.

The sacropelvic specimens were dissected systematically to review the detailed muscular, ligamentous, articular and neurovascular anatomy and to evaluate normal anatomical variants of the sacroiliac and pelvic regions. The sacroiliac joints were disarticulated and divided visually into cranial, middle and caudal thirds to record the location and distance of the methylene blue stained tissues relative to the sacroiliac joint (Fig 6). The sacrum and pelvis were boiled in water to remove the remaining soft tissues for further detailed evaluation of the adjacent osseous structures and sacroiliac articulations.

Prior to gross dissection in 3 of the 6 sacropelvic specimens, plain film radiographs and positive contrast sacroiliac arthrograms were performed to determine the radiographic appearance of the



Fig 7: Positive contrast arthrogram of the left sacroiliac joint (ventrodorsal radiograph). Note the deep evaginations of the medial sacroiliac joint capsule (arrows) between the fibres of the interosseous sacroiliac ligament.

sacroiliac articulations and the extent of the sacroiliac joint capsules. Radiographs of the sacroiliac joints were taken using high definition screens at 60 mAs and 52 kV with a 100 cm focal film distance. Bilateral sacroiliac arthrograms were performed via injection of 2 ml radio-opaque solution (Hypaque-76, diatrizoate meglumine and diatrizoate sodium injection, USP 76%)⁵ through the ventral sacroiliac joint capsule (Fig 7).

Two of the 8 sacropelvic specimens were used to produce injection casts of the regional arteries and sacroiliac joints for identification of major vascular structures to be avoided and to determine the extent of the sacroiliac joint capsule. The cranial ends of the severed internal iliac arteries were cannulated and injected with 20 ml red methyl methacrylate (Batson's No. 17 methyl methacrylate [red and blue pigment])⁶ (Fig 8). The ventral sacroiliac joint capsule was identified and injected with 2 ml blue methyl methacrylate⁶. After the vascular and intra-articular casts cured, the remaining soft tissues were gently dissected and the osseous specimens boiled in water to remove any residual soft tissues.

In vivo validation

Eighteen horses were used to validate the *in vivo* application of the proposed sacroiliac joint injection technique. The horses were restrained in stocks and sedated *i.v.* with detomidine hydrochloride (Domosedan)⁷ 0.01 mg/kg bwt and butorphanol tartrate (Torbugesic)⁸ 0.01 mg/kg bwt. An area of 20 x 20 cm on the dorsal midline at the lumbosacral junction was clipped and aseptically prepared. The skin at the needle entry site was infiltrated subcutaneously with 1.5 ml 2% lidocaine hydrochloride (Lidocaine 2% injectable)⁹. Sterile gloves (Micro-touch)¹⁰ were used during bilateral injections of methylene blue into the sacroiliac joint region, as described above. Skin staples (Auto Suture Royal 35W)¹¹ were used to close the needle entry sites. The horses were subjected to euthanasia 20 mins post methylene blue injection.

Sacropelvic specimens were collected at *post mortem* examination as described above. Fifteen of the 18 specimens were dissected systematically to review the regional anatomy. The location and distance of the methylene blue relative to the sacroiliac

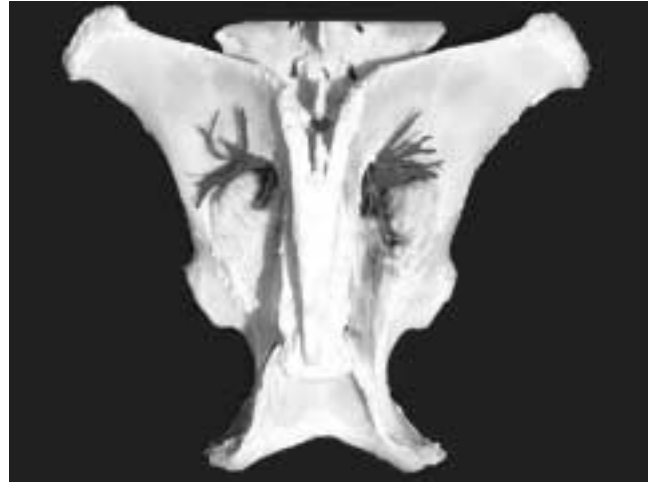


Fig 8: Dorsal view of a sacropelvic specimen with intact vascular casts of the left and right cranial gluteal arteries passing through the left and right greater sciatic foramina. The cranial gluteal artery exits through the foramen and branches into many smaller arteries that supply the overlying gluteal musculature.

joint was recorded after disarticulation of the sacroiliac joints. In the remaining 3 specimens, the intact sacropelvic specimens were frozen for 14 days and sawed transversely into sections 1.5 cm thick, from the mid lumbar region to the sacral apex. The transverse sections were used to identify normal cross-sectional anatomy of the sacroiliac region and to localise the methylene blue stained tissue relative to the sacroiliac joint margins.

Data analysis

Descriptive statistics were completed on the presence, location and distance of the methylene blue depot relative to the sacroiliac joint. Successful joint injections were characterised as having methylene blue located intra-articularly or ≤ 2 cm periarticularly from the sacroiliac joint margin and localised to the middle or caudal third of the sacroiliac joint. Success criteria were based on the assumption that injected medications (e.g. local anaesthetic solutions or corticosteroids) could diffuse effectively across ≤ 2 cm to provide optimal diagnostic or therapeutic effects on sacroiliac osteoarthritis (Luukkainen *et al.* 1999). The criterion of having methylene blue located at the middle or caudal third of the joint was based on the high prevalence of degenerative changes affecting the caudomedial aspect of the sacroiliac joint (Dalin and Jeffcott 1986; Haussler *et al.* 1999). Dye placement at the cranial third of the joint was considered unsuccessful, since deposition of medications for diagnostic or therapeutic purposes in this region would be expected to be less effective, depending on the distance from the sacroiliac joint margin.

For statistical purposes, if the methylene blue was located within 2 or more sacroiliac joint regions (e.g. middle and caudal thirds), only the caudal-most location of the methylene blue was recorded. Age was not normally distributed, and continuous variables were therefore described and analysed using nonparametric methods. Due to individually small numbers, breed was categorised as Thoroughbred (including Thoroughbred crosses) or non-Thoroughbred; gender was categorised as male or female. Associations among continuous variables were tested with Spearman's rank correlation. Associations among dichotomous variables were tested with Fisher's exact test. All tests were 2-sided; significance was set at $P \leq 0.05$.

Results

Anatomical studies

The sacroiliac joint has a thin joint capsule containing a minimal amount of synovial fluid (<1 ml). A series of strong dorsal, ventral and interosseous sacroiliac ligaments support the sacroiliac joint. The interosseous sacroiliac ligament interconnects the ventral aspect of the ilium and an osseous ridge on the dorsal surface of the sacral wing, near the medial sacroiliac joint margin. The vertical fibres of the interosseus ligament interdigitate with small evaginations of the medial sacroiliac joint capsule (Fig 7). The sciatic nerve and the cranial gluteal artery, vein and nerve pass through the greater sciatic foramen, located at the caudal aspect of the sacroiliac joint (Fig 8).

Injection technique

The osseous topographic landmarks of the pelvis and proximal femur were easy to identify and provided a consistent approach to the medial aspect of the sacroiliac joint. The *tubera sacrale* were consistent and reliable bony landmarks for determining the proper needle entry site. During advancement in bony sacropelvic specimens, the needle was deflected ventrally, away from the medial sacroiliac joint margin, by the medial angulation of the ilial wing. Access to the medial sacroiliac joint margin was improved by bending the needle prior to insertion to match the curvature of the medial aspect of the ilial wing (Fig 2). Guiding the needle along the medial aspect of the ilial wing helped to direct the needle toward the medial sacroiliac joint margin and also provided an osseous barrier and safeguard to adjacent neurovascular structures.

In large horses, the caudomedial sacroiliac joint was located at a depth of 20–23 cm below the skin of the croup, measured from the contralateral *tuber sacrale*. In average-sized horses, however, 5–10 cm of the 25 cm needle protruded from the skin following proper needle placement. Aberrant needle placement could damage the neurovascular structures at the caudal aspect of the joint. However, the sciatic and cranial gluteal nerves did not appear to have been irritated during any of the injection procedures, judging by the minimal response during needle placement. None of the horses had signs of ataxia or hindlimb weakness after the injections.

In 4 horses, the dorsal spinous process of the sixth lumbar vertebra (L6) or first sacral vertebra (S1) blocked initial needle passage across midline. In most horses, divergent L6 and S1 dorsal spinous processes create a large interspinous space at the lumbosacral junction that provides a pathway for the advancing needle to readily cross midline (Fig 5). A normal anatomical variant of the L6 spinous process is angulation of the dorsal spinous process caudally rather than cranially (Getty 1975; Haussler *et al.* 1997). In a few specimens, the S1 dorsal spinous process was angulated cranially rather than caudally. To avoid the aberrant L6 or S1 dorsal spinous process in the 4 horses, it was possible to guide the needle across midline by choosing a secondary entry site a few centimetres cranial or caudal to the initial needle entry site.

Methylene blue location

Intra-articular methylene blue was not observed in any specimen. However, methylene blue stained tissue was identified periarticularly in all injection sites (n = 48). Based on the predetermined success criteria, 96% (46 of 48 joints) of the

methylene blue depots were located at the middle third (n = 15) or caudal third (n = 31), of the sacroiliac joint. Eighty-eight percent (42 of 48 joints) of the dye locations were located ≤ 2 cm from the sacroiliac joint margins. The overall median distance of the methylene blue from the sacroiliac joint margins was 1.0 cm (range 0.2–3.8 cm) (Fig 6). The overall success rate considering both location and distance of the methylene blue stained tissue relative to sacroiliac joint margins was 83% (40 of 48 joints).

No significant differences in age, sex, weight or breed were found between the 6 cadaver horses and the 18 *in vivo* horses. There were no significant differences in the location or distance of the dye placement relative to the sacroiliac joint margins in the 6 cadaver or 18 *in vivo* horses (all P values ≥ 0.54), except that all unsuccessful dye locations (i.e. cranial third of the sacroiliac joint) were identified on the right side of horses of the *post mortem* group (P = 0.05). Age, weight, breed and sex were not associated with successful methylene blue location or distance from the sacroiliac joint margin (all P values ≥ 0.20). There were no significant left or right differences in the location or distance of the methylene blue relative to the sacroiliac joint margins (i.e. 95% binomial confidence intervals on the success rate for the right side included the estimate for the left side).

Discussion

Anatomical studies

The sacroiliac joint capsule is small and lies in close apposition to the interosseous and ventral sacroiliac ligaments. The medial sacroiliac joint capsule evaginates through separations in the interosseous sacroiliac ligament, which provides an increased surface area for the medial sacroiliac joint capsule (Fig 7). This could increase the possibility of intra-articular injection or the absorption of periarticularly placed medications. However, intra-articular needle placement was unsuccessful due to a dorsal ridge of bone on the sacral wing located near the medial sacroiliac joint margin; the ventral attachment site of the interosseous sacroiliac ligament.

Development of the injection technique

Several entry sites and directions for needle advancement for percutaneous injection of the sacroiliac joint region were evaluated during the initial portion of this study (Fig 1). Unfortunately, cranial and caudal approaches have unreliable anatomical landmarks for both needle entry and depth of needle placement. With the cranial approach (Fig 1, A), medication is placed too far from the typical location of osteoarthritic changes in the sacroiliac joint. The caudal approach (Fig 1, B) greatly increases the risk of penetrating major neurovascular structures exiting the greater sciatic foramen at the caudal aspect of the sacroiliac joint.

The medial approach (Fig 1, C) was easy to perform due to reliable bony landmarks for both needle entry and advancement. Unlike other approaches, the entire caudomedial aspect of the sacroiliac joint is accessible with this technique. Prebending the needle prior to insertion improved our ability to reach the sacroiliac joint in bony specimens. In 96% of the specimens, dye was identified adjacent to the most frequently reported location of sacroiliac osteoarthritic changes. However, it is important not to direct the needle too far caudally due to the presence of major neurovascular structures exiting the greater sciatic foramen.

In vivo injection technique

The injection procedure typically took 15–20 mins to complete. With proper sedation, needle placement was well tolerated in all horses, comparable to collection of cerebrospinal fluid at the lumbosacral junction. It is important that horses stand squarely on all 4 limbs for proper identification and localisation of the sacropelvic landmarks required for proper needle placement. Needle entry cranial to the contralateral *tuber sacrale* provides improved access to the medial sacroiliac joint margin due to an angled needle placement. The 3 mm skin incision dramatically reduced resistance during advancement of the large gauge needle.

The 15 gauge, 25 cm spinal needle provided excellent access to the caudomedial sacroiliac joint margins in all horses. Smaller gauge needles (i.e. 18 and 16 gauge) were not rigid enough to keep the initial bend of the needle as it was manipulated and advanced along the medial aspect of the ilial wing. The proper depth and placement of the needle was identified consistently when the needle contacted the dorsal surface of the sacrum and could not be advanced any further (Fig 2). Guiding the needle along the medial aspect of the ilial wing prevented the needle from being placed too far laterally. Placement of the needle too far medially (i.e. vertical needle placement) was identified if the needle contacted bone prior to reaching the anticipated depth of 15–20 cm in average-sized horses. Aberrant placement of the needle too far either cranially or caudally could be identified if the needle did not contact the dorsal sacrum prior to the needle hub reaching the skin surface. If this occurred, the needle was withdrawn partially and redirected either cranially or caudally until the dorsal sacrum (i.e. bone) was contacted.

At necropsy, there was no evidence of haemorrhage in the soft tissues adjacent to the sacroiliac joint, suggesting that the cranial gluteal artery or vein were not disrupted. The absence of haemorrhage suggests that the osseous structures protected the large vessels from damage or that the neurovascular structures were not accessible with the 25 cm needle. The medial approach appears to be a safe technique for accessing the caudomedial sacroiliac joint.

Methylene blue location

The overall success rate of 83% (i.e. injections fulfilling both location and distance criteria) demonstrates the reliability of this periarticular injection technique. In conclusion, in man, intra-articular and periarticular injections of local anaesthetic solutions and corticosteroids have been used to confirm and treat sacroiliac joint osteoarthritis (Cassidy and Townsend 1985; Maugars *et al.* 1996; Luukkainen *et al.* 1999). Intra-articular injection of the human sacroiliac joint is technically challenging, but has been performed with the aid of diagnostic imaging, such as arthrograms, fluoroscopy and computed tomography. However, these diagnostic tools are not currently readily available for imaging the equine sacroiliac joint. The close proximity of the methylene blue relative to the caudomedial sacroiliac joint suggests that a medial periarticular injection technique has the potential to improve dramatically the diagnosis and treatment of sacroiliac joint osteoarthritis in horses by injecting a corticosteroid-local anaesthetic mixture. (Engeli *et al.* 2002a,b) Additional studies are needed for validation of the diagnostic and therapeutic application of the described injection technique. The clinical indications, efficacy and risks also need to be established to use this technique routinely.

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Manufacturers' addresses

- ¹Becton Dickinson Acute Care, Franklin Lakes, New Jersey, USA.
- ²Johnson & Johnson Medical, Arlington, Texas, USA.
- ³Specialty Veterinary Products, Baton Rouge, Louisiana, USA.
- ⁴Sigma Chemical Company, St. Louis, Missouri, USA.
- ⁵Nycomed Inc., Princeton, New York, USA.
- ⁶Polysciences, Inc., Warrington, Pennsylvania, USA.
- ⁷Pfizer Animal Health, Exon, Pennsylvania, USA.
- ⁸Fort Dodge Animal Health, Fort Dodge, Iowa, USA.
- ⁹The Butler Company, Columbus, Ohio, USA.
- ¹⁰Ansell Healthcare Products Inc., Massillon, Ohio, USA.
- ¹¹United States Surgical Corporation, Norwalk, Connecticut, USA.

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CESMAS 2004

Final Announcement of the

CONFERENCE ON EQUINE SPORTS MEDICINE AND SCIENCE OF THE RACE AND ENDURANCE HORSE

International forum for the exchange of information on sport horses

23RD-25TH SEPTEMBER 2004 - OSLO, NORWAY

with Seminars on 22nd September & Practical Courses on 26th and 27th September

Our Partners

Boehringer Ingelheim; Electro Medical Systems; Equine Veterinary Journal; High Medical Technologies; Intervet; Life Data Labs; Norwegian Standardbred Racing Association; Schering Plough Animal Health/Essex; Vetray; Videomed

Seminars: Wed 22nd September 2004

- ◆ Nutrition of the endurance and racing horse
- ◆ High altitude training
- ◆ Magnetic resonance imaging
- ◆ Racehorse health programmes
- ◆ Muscle conditioning
- ◆ Energetics and healing

■ **Welcome Reception**

Conference: Thurs 23rd September 2004 (Poster presentations will be given during coffee breaks and lunch)

- ◆ Does heart rate indicate the health status of endurance horses during competition?
- ◆ Lipoic acid and vitamin E supplementation to horses diminishes endurance exercise-induced oxidative stress, muscle enzyme leakage and apoptosis
- ◆ When and how should horses travel to perform optimally in sports?
- ◆ Validation of an innovating electrolytes form to facilitate rehydration in performance horses
- ◆ Limb length inequality and poor performance in the racing Thoroughbred
- ◆ Glycogen replacement formulas following a treadmill exercise test in endurance-trained horses
- ◆ Nutritional and husbandry management of racehorses

■ **Free Evening**

Conference: Fri 24th September 2004 (Poster presentations will be given during coffee breaks and lunch)

- ◆ Tissue adaptation to training: which type of exercise for what? Part 1
- ◆ Tissue adaptation to training: which type of exercise for what? Part 2
- ◆ French Trotters' myosin heavy chain composition in *gluteus medius* muscle and relationship with performance
- ◆ What can be done in the short time before competition - if a medical problem shows up?
- ◆ Physiological measurements, endoscopy and bronchoalveolar lavage in a population of 81 French Standardbred Trotters during a standardised exercise test on the treadmill: poor performers vs. controls
- ◆ Rest and treadmill endoscopic findings in 87 racehorses presented for poor performance

■ **'Rustical Evening' at the Kontiki Museum - Dinner and Drinks**

Conference: Sat 25th September 2004 (Poster presentations will be given during coffee breaks and lunch)

- ◆ Locomotor disorders of elite Standardbred racehorses
- ◆ Predictive interest of physiological and gait variables in French trotters performance
- ◆ Monitoring soundness in young Thoroughbred racehorses
- ◆ Efficacy of equine osteopathic treatment for suspected lower back pain as assessed through motion evaluation and infrared thermographic imaging
- ◆ Frozen needle muscle biopsies as an option to the diagnosis of equine motor neuron disease
- ◆ Dynamic bilateral arytenoid and vocal fold collapse associated with head flexion in 5 Norwegian coldblooded trotter racehorses

■ **Gala Dinner - Wine, Food and Fun!**

International Committee

Warwick M. Bayly, USA
Anne Couroucé-Malblanc, France
Sue Dyson, UK
Arne Holm, Norway
Arno Lindner, Germany
Marianne Sloet, The Netherlands

Hilary Clayton, USA
Jean-Marie Denoix, France
Adriana Ferlazzo, Italy
Arne Lindholm, Sweden
José Luis López Rivero, Spain
Steven Wickler, USA

Local Committee

Siv Hanche-Olsen
Knut Erik Johansen
Birgitte Myhre
Helene Stenersen
Arne Holm
Lars Moen
Tobias Revold
Per Ole Tysland

For more information on transport, hotels, partners, instructors, poster titles etc., please contact:

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