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Endoscopic Resection of Dorsal Spinous Processes and Interspinous Ligament in Ten Horses

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Objective—To describe endoscopic surgical subtotal resection of the dorsal spinous processes (DSP) and interspinous ligament in horses.
Study Design—Descriptive clinical study.
Animals—Adult horses (n = 10) with back pain and impinging dorsal spinous processes
Methods—Diseased portions of DSP and interspinous ligament were resected by endoscopic surgery, using Destandau Endospine to create a surgical space and provide triangulation for the endoscope, suction cannula, and surgical instruments. Medical records of 10 horses with pain attributable to DSP pathology treated by endoscopic resection of DSP were reviewed to determine intra- and postoperative complications and outcome.
Results—Affected portions of DSP were successfully resected with minimal hemorrhage. Limited periosteal reaction was noticed after 3 months in 2 horses. Nine horses had no complications and returned to full work within 8 weeks; 1 developed a subcutaneous abscess, which was successfully managed, and returned to work after 3 months. Surgical resection improved presenting clinical signs and owner's complaint although 2 horses did not return to previous performance levels.
Conclusion—Resection of DSP and interspinous ligament can be successfully performed endoscopically in horses. Hemorrhage was minimal but reduced visibility. Complications were minimal and most horses returned to work by 8 weeks.
Clinical Relevance—Endoscopic resection of DSP is a safe and reliable surgical procedure in horses.

INTRODUCTION

RESECTION OF the summits of one or more dorsal spinous processes (DSP) in horses with chronic back pain attributed to impingement and/or overriding of the DSP in the thoracolumbar region was described by Roberts[1] and later by Jeffcott and Hickman.[2] Subsequently, von Salis and Huskamp;[3] Petersson et al;[4] Walmsley;[5] Lauf and Kreling;[6] and Walmsley et al[7] have reported on surgical treatment. Surgery is generally recommended when conservative treatment, such as rest, intralesional corticosteroids and physiotherapy, has failed.[7] Open surgical resection of DSPs involves a median or occasionally paramedian incision in the skin and supraspinous ligament, and then resection of involved DSPs using either an oscillating saw or an osteotome.[7,8] Subtotal ostectomy of DSPs has been performed in standing horses.[8]

Our purpose was to validate use of a minimally invasive endoscopic technique for the resection of DSPs and supraspinous ligament in horses, using the Destandau Endospine. Endoscopic spinal surgery requires specific instrumentation equipment to create a working space and provide channels for triangulation. Prototypes of this

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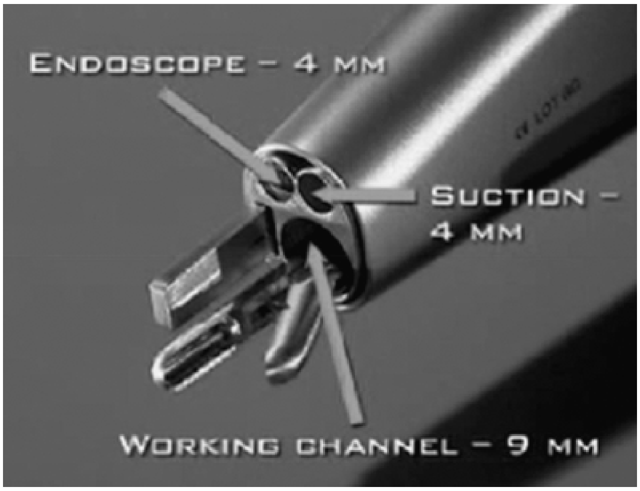

Fig 1. Destandau Endospine.

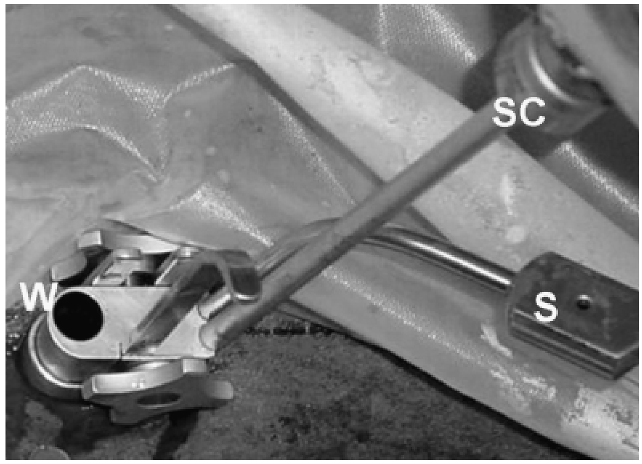

Fig 3. Destandau Endospine in place for SSPs and interspinous ligament resection in the horse (W, working channel; S, suction; SC, endoscope).

equipment were designed by Destandau (1993) and available commercially in 1998 for paraspinal endoscopic laminectomy and discectomy in humans.[9,10] The Endospine (Figs 1–3) consists of a speculum which can be inserted through the superficial layers and brought into contact with the vertebra. The obturator can be removed and a conically shaped full-metal sleeve can be inserted into the speculum. The sleeve has 3 channels, 1 for suction (4 mm diameter), 1 for the endoscope (4 mm diameter), and 1 for surgical instruments (9 mm diameter). The first 2 channels are parallel, while the third is angled at 12° to them. We describe the development of this endoscopic surgical technique and its application in 10 horses with DSP pathology.

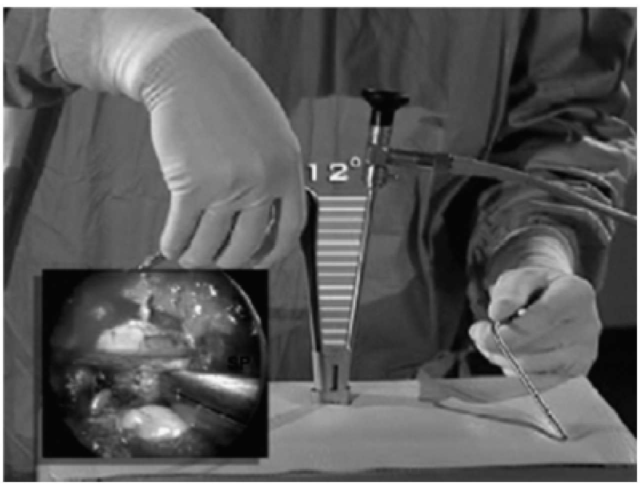

Fig 2. Destandau Endospine. The channels for the telescope and suction cannula are at an angle of 12 degrees to the instruments channel. Inset figure shows an endoscopic view with spinous processes (SP) and interspinous ligament (ISL).

MATERIALS AND METHODS

Horses

Between December 2003 and February 2006, 10 adult horses (2 Standardbreds [TF], 8 Selle Francais [SF], aged 3–14 years, weighing 500–680 kg) had surgical resection of DSP and interspinous ligament under general anesthesia using an endoscopic technique. Horses were used for show jumping (4), dressage (4), Standardbred racing (1) and hacking (1).

Case Selection

For inclusion, horses had a diagnosis of back pain and DSP impingement that failed to respond to conservative management (intralesional corticosteroid administration, controlled exercise).

In the author's practice, every equine orthopedic examination includes systematic assessment of the back.[11] Back pain for horses included in this report was determined by the following clinical signs: abnormal palpation, abnormal mobilization, positive surcingle or saddle test. Radiographs were taken to confirm DSP impingement. Radiographic changes to the DSP were classified by the system of Desbrosse et al[12]: type 1 = enthesiopathy of the supraspinous ligament; type 2 = enthesiopathy of the interspinous ligament; type 3 = DSP impingement; and type 4 = DSP impingement with bone sclerosis and/or osteolysis. Horses selected for inclusion had type IV radiographic lesions.

Infiltration of local anesthetic (10 mL 2% mepivacaine hydrochloride injected 3 cm deep) into different sites of impingement was performed to assess if impingement was causing pain. Improvement was documented by response to palpation and the surcingle, or saddle test.[12] Scintigraphy was not available. Horses selected for surgery had 1 or 2 sites of impingement causing pain (Table 1). Horses with >2 sites were excluded because of initial concern about possible long surgical times and patient safety.

Table 1. Summary of 10 Horses Treated by Endoscopic Dorsal Spinous Process and Interspinous Ligament Resection

Horse	Age (Years)	Sex	Breed	Use	History Before Surgery	Site of Impingement	Complications	Outcomes
1	14	NM	TF	Hacking	Pain to palpation over back. Does not accept the surcingle. Epiaxial muscle atrophy.	T14-T15	None	Back pain improved/Could tolerate surcingle/Persistance of muscle atrophy
2	14	F	SF	Show jumping	Lameness and inability to jump. Bucking when ridden. Pain to palpation over back. Epiaxial muscles atrophy.	T14-T15	None	Returned to show jumping/Back palpation and muscles became normal/Did not return to initial level of performance
3	3	M	SF	Dressage	Pain to palpation over back. Does not accept the saddle or surcingle. Impossible to break.	T16-T17	None	Normal work
4	7	NM	SF	Show jumping	History of back pain. Initially responsive to local administration of corticosteroids then refractory to treatment for 3 months.	T14-T15	Wound sepsis. Managed by local treatment Lunged for 6 weeks before being ridden	Returned to show jumping
5	9	F	SF	Dressage	Became impossible to ride. Did not tolerate the saddle and the surcingle any more.	T14-T15	Periosteal reactions on x-rays after 3 and 6 months	Returned to dressage
6	8	NM	SF	Show jumping	Good sport horse. Started to buck when ridden. Inability to jump for 6 months	T15-T16	None	Returned to high level show jumping
7	7	F	SF	Dressage	Pain to palpation over back. Does not accept the saddle or surcingle.	T14-T15	Slight periosteal reactions on x-rays after 3 and 18 months	Returned to high level dressage
8	10	NM	SF	Show jumping	Inability to jump.	T14-T15 T15-T16	None	Returned to show jumping
9	10	NM	SF	Dressage	Bucking when ridden. Pain to palpation over back.	T14-T15	None	Returned to dressage
10	4	NM	TF	Racing (Standardbred)	Lameness. Veering. Impossible to race.	T12-T13	None	Back to racing. Medium level

M, male; F, female; NM, neutered male; TF, Trotteur Francais; SF, Selle Francais.

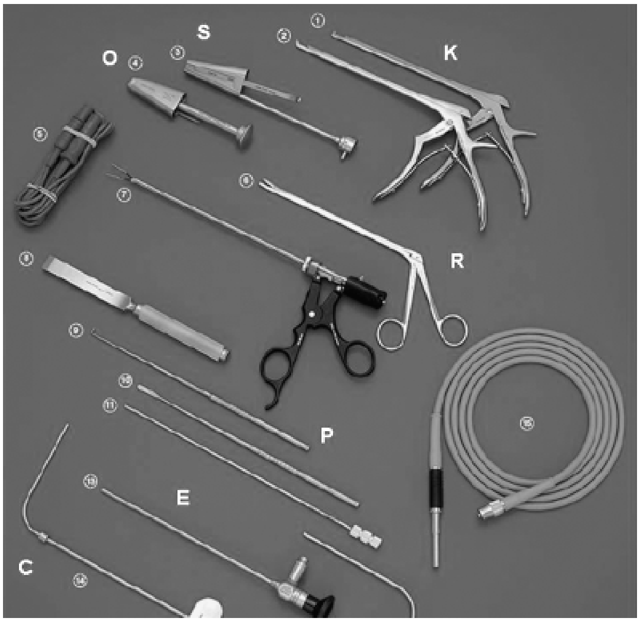

Fig 4. The Destandau Endospine Kit with suction cannula (C), endoscope (E), Kerrison Rongeur (K), rongeur (R), endospine sleeve (S), endospine obturator (O).

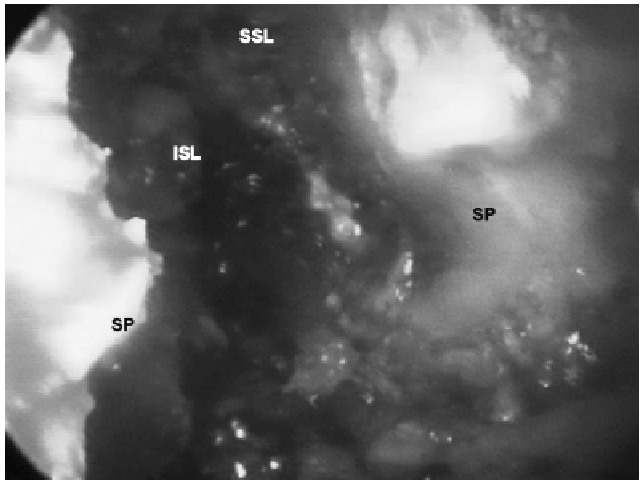

Fig 5. Endoscopic view showing spinous processes (SP), interspinous ligament (ISL) and supraspinous ligament (SSL) after resection.

Equipment

For all procedures, Destandau endospine (Karl Storz, Tuttingen, Germany) equipment was used, with a modified obturator of increased length, designed by the authors. Endoscopic surgical instruments used were: Kerrison rongeur (3 mm, 17 cm long), Fergusson suction cannula (11 cm long); rongeur (17 cm long), and motorized burrs (5 and 9 mm in diameter, 10 cm long, Karl Storz; Fig 4).

Surgical Procedure

Procaine penicillin G (22,000 U/kg, intramuscularly [IM]), gentamicin sulfate (6.6 mg/kg, intravenously [IV]) were administered preoperatively. Surgery was performed under general anesthesia, typically in right lateral recumbency because of surgical theatre configuration. Horse were premedicated with acepromazine (0.01 mg/kg, IV), sedated with xylazine (0.5 mg/kg, IV), anesthetized with a combination of ketamine (2.2 mg/kg, IV) and diazepam (0.08 mg/kg, IV), and maintained on halothane in oxygen. After aseptic skin preparation, affected DSPs and surrounding soft tissue were further desensitized by infiltration of 2% mepivacaine hydrochloride (40–60 mL) adjacent to right and left sides of each DSP to be removed, through a 21 gauge, 5 cm, disposable needle, to a depth of 5 cm, and subcutaneously along the proposed incision line. Needles were inserted through the skin under radiographic control to identify sites where DSP were to be resected.

A 3 cm craniocaudal skin incision, 3 cm lateral to midline, 5 mm remote to the most lateral aspect of the supraspinous ligament, was performed on the left side. The thick fascia over the epaxial musculature was incised. Sharp and blunt dissection was used to free and retract the paravertebral muscles. A blunt probe was used to localize the DSPs and the interspinous space. The speculum and obturator were progressively advanced until they contacted the spinous processes, at an angle of 70° to the long axis of the spinous processes. After removal of the obturator, the surgical site was observed through the speculum with cold light and any soft tissue bulging into the speculum was excised with rongeurs. The sheath was then introduced through the speculum. The suction cannula and a 0°, 4 mm in diameter, 18 cm long endoscope were inserted through the channels. The interspinous ligament, supraspinous ligament, and spinous processes were observed (Fig 5).

Cold saline (0.9% NaCl) solution and gauze swabs soaked in 1:1000 epinephrine were passed through the working channel to control bleeding. The interspinous ligament was transected by radiofrequency (Cool Ablation or Coblation; Arthrocare France, Vesoul, France) from the supraspinous ligament to a depth of 3 cm. A Kerrison rongeur was used to resect the caudal aspect of the cranial spinous process, and the cranial aspect of the caudal spinous process. Resection was performed to a depth that ensured a gap of 5 mm between the DSP bodies. Additional bone was removed from the DSP using a 5 mm, then a 9 mm, motorized burr. Any abnormal appearing soft tissues surrounding affected DSP were removed by radiofrequency, and the wound was lavaged with saline solution. During surgery, the angle of the sheath to the long axis of the spinous processes varied between 45° (when the site of interest was the more distal part of DSP) and 100° (when it was the more proximal part). Skin was closed with 2 polyamide using an interrupted vertical mattress pattern. An adhesive bandage was placed over the wound and removed after recovery. The surgical site of each horse was assessed radiographically at completion of surgery and the next day (Fig 6). The wound was protected with an adhesive dressing for 1 week.

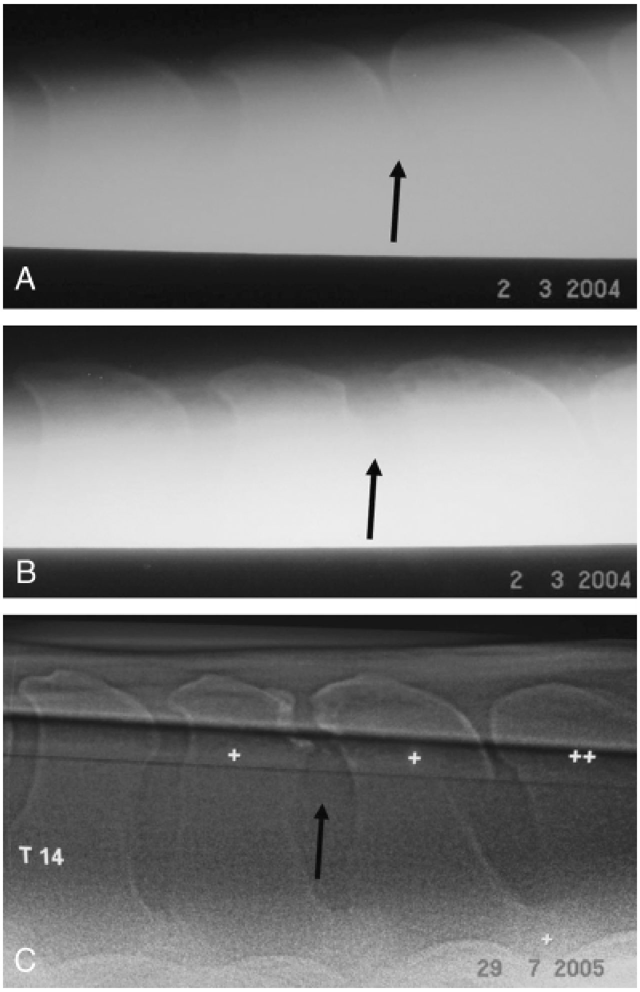

Fig 6. Lateral radiographs (horse 6) of the thoracolumbar spinous processes. (A) impinging spinous processes (arrow) before surgery, (B) immediately after surgery there is not contact, and (C) 17 months after surgery.

Postoperative Treatment and Aftercare

No additional antimicrobial, anti-inflammatory or analgesic drugs were administered. Horses were hospitalized for 3 days then discharged. Hand walking was started after hospital discharge, 30 minutes twice daily. Skin sutures were removed at 14 days. Horses were returned to walking for three weeks, then lunging work for 3 weeks, and riding at 6–8 weeks.

Assessment of Clinical Outcome

Horses were re-examined clinically at 3 months and radiographically 3–4 months later. Four horses were radiographed after 1–2 years (Fig 6).

RESULTS

Mean surgical time was 60–120 minutes with decreased time associated with increasing familiarity with the technique. Intraoperative hemorrhage was minimal in volume but reduced visibility and necessitated variable time for control. On immediate postoperative radiographs (on the table), a space of 1 cm was visible between both spinous processes. Radiographs the next day were usually of poor quality because of air within the wound. No major postoperative complications were identified.

Palpation around the surgical incision was slightly resented for 2 days but no major discomfort was noted afterwards. In horse 4, wound infection 3 weeks after surgery responded to local wound management. New bone formation was noticed on radiographs taken after 3 months in horses 5 and 7; periosteal new bone was minimal in the other horses. In horses 7, bone sclerosis was visible on the spinous process margin close to the supra-spinous ligament. New bone proliferation was more extensive in horse 5 and involved the more dorsal aspect of the spinous process. All horses returned to full work after 8 weeks. Horse 4, which had postoperative wound infection, was lunged for 6 weeks without riding to allow wound healing, but returned to full work after 8 weeks. After surgery, presenting clinical signs were improved and owner's initial complaints addressed; however, 2 horses did not return to previous performance levels.

DISCUSSION

DSP impingement has been reported as one of the most common causes of equine back pain.[13,14] Positive results have been reported after surgical resections of the affected spinous processes.[1,2,4,13] Long-term follow-up on 209 horses diagnosed with back pain caused by overriding spinous processes showed that 72% returned to full work after surgical resection.[2,8]

Observation of spinal processes is essential for their resection; however, some authors report that, when subtotal ostectomy is performed with horses in lateral recumbency, it is sometimes difficult to separate muscular attachments from the surface closest to the table because of poor visibility and accessibility.[8] Observation of the different anatomic structures is good with endoscopic resection but requires initial training to recognize the endoscopic anatomy. We optimized the surgical techniques on cadavers before the current study.

Hemorrhage from large vessels is common with conventional surgery for DSP resection and is usually controlled by electrocoagulation or ligature.[7] Perkins et al [8] reported that hemorrhage was substantially reduced when surgery was performed in standing horses. They presumed that blood pressure or venous congestion was less within blood vessels supplying the DSP and surrounding tissue. We found that although bleeding was minimal in volume it was sufficient to reduce visibility by obstructing the end of the endoscope, thus substantial surgical time was spent performing hemostasis. Epinephrine was used to reduce bleeding. Electrosurgery was of little value because it was difficult to identify the origin of hemorrhage. We think that this endoscopic surgical approach could be used in standing horses, which may decrease bleeding and reduce surgical time. Further, with standing surgery, the anesthetic risk would also be reduced which might allow resection of more than 1 or 2 sites of impingement.

Walmsley et al reported a very low percentage of complications and no long-term consequences despite the invasive nature of the surgery.[8] Lauk and Krelin [5] on the contrary, reported a 20% incidence of wound dehiscence,which may reflect the use of drains.[8] We encountered one complication: wound infection occurred 3 weeks after surgery in horse 4 and may have been linked to the use of a dirty blanket. The marked postoperative swelling and seroma formation, reported by Walmsley et al[8] using a paramedian approach was not observed in our horses. It is possible that with technique proficiency that the smaller incision and decreased dead space created might reduce complications related to seroma; however outcome was not specifically investigated in our study.

A postsurgical complication commonly reported after DSP resection is development of new bone on the edge of a resected spine. This new bone growth may impinge on the adjacent dorsal spine and require removal.[2] Walmsley et al did not observe any periosteal reaction on 70 of the horses in their survey on radiographs taken 8–9 weeks postoperatively.[8] They suggested that the beveling of the DSPs might reduce periosteal bone reaction. We identified limited periosteal reaction in 2 horses at 3–4 months postoperatively.

Minimally invasive procedures are considered cost effective and allow earlier resumption of activities, work, and return to competition. Mild postoperative pain was elicited during the first 2 days after surgery, which is similar to reports of conventional open techniques. The minimal complications, lack of pain and small size of the wound might allow a quick return to full activity (8 weeks). This is an earlier return to work than the 3–6 months reported in other studies[8]; however, without knowing the rationale for the later return to work in other studies it uncertain if the earlier return to work we achieved is a true benefit of the endoscopic approach or a difference in convalescent strategies. Because the objective of the surgical procedure is resection of the diseased portion of the bone and the ligament, the reduced exposure possible with the endoscopic approach may permit a faster return to work. One advantage of the endoscopic technique might be the selective removal of impinging bone rather than the whole dorsal part of the DSP and minimal disruption of the attachment of the supraspinous ligaments.

In our opinion, endoscopic resection of DSPs is a minimally invasive procedure that provides a safe and effective alternative to open surgical resection. Longitudinal studies in a larger number of horses are need to confirm these initial observations.

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REFERENCES

1. Roberts EJ: Resection of thoracic and lumbar spinous processes for relief of pain responsible for lameness and some other locomotory disorders in horses. Proc Am Assoc Equine Practnr 14:13–30, 1968
2. Jeffcott LB, Hickman J: The treatment of horses with chronic back pain by resecting the summits of the impinging dorsal spinous processes. Equine Vet J 7:115–9, 1975
3. von Salis B, Huskamp B: Vorlaufige Erfahrungen mit der konservativen und chirurgischen Behandkung der Wirvelsaulenerkrankung der Pferde. Prakt Tierarz 4:291–294, 1978
4. Petterson H, Stromberg B, Myrin I: Das thorkolumbale, interspinale Syndrom (TLI) des Retpferdes—Retriospecktiver Vergleich konservativ und chirurgisch behadelter Falle. Pferdeheilkunde 3:313–319, 1987
5. Lauk HD, Kreling I: Behandlung des Kissing spines-Synroms beim pferd- 50 Falle Teil 2: Ergebnisse. Pferdeheilkunde 14:123–130, 1998
6. Walmsley JP: Dorsal spinous process resection in 21 horses: indications, surgical technique and prognosis. *Proceedings of the 4th Annual Scientific Meeting of European College of Veterinary Surgeons*, Utrecht, Netherlands, June 1995, pp 61–62
7. Walmsley JP, Pettersson H, Winberg F, et al: Impingement of the dorsal spinous processes in two hundred and fifteen horses: case selection, surgical technique and results. Equine Vet J 34:23–8, 2002
8. Perkins JD, Schumaker J, Kelly G, et al: Subtotal ostectomy of dorsal spinous processes performed in nine standing horses. Vet Surg 34:625–629, 2005
9. Destandau J: A special device for endoscopic surgery of lumbar disc herniation. Neurol Res 21:39–42, 1999
10. Destandau J: Paraspinal Endoscopic Laminectomy and Diskectomy, in Kim DH, Fessler RG, Regan JJ (eds): Endoscopic Spine Surgery and Instrumentation. Percutaneous Procedures. New York, NY, Thieme Medical Publishers, 2005, pp 241–245
11. Desbrosse F, Vandeweerd JM: Back pain and lameness: a clinical approach to assess their relationship. *Proceedings of*

the 9th Congress World Equine Veterinary Association, Marrakech, Morocco, February 2006, pp 51–56
12. Desbrosse F, Pierrat C: Le chevauchement des processus épineux chez le cheval. Prat Vét Equine 17:15–25, 1985
13. Jeffcott LB: Disorders of the thoraco-lumbar spine of the horse: a survey of 443 cases. Equine Vet J 12:197–210, 1980
14. Steckel RR, Kraus-Hansen AE, Fackelman GE, et al: Clinical aspects of thraco-lumbar spinal disease in horses: a review of 50 cases. Proc Am Assoc Equine Practnr 36:583–591, 1991