

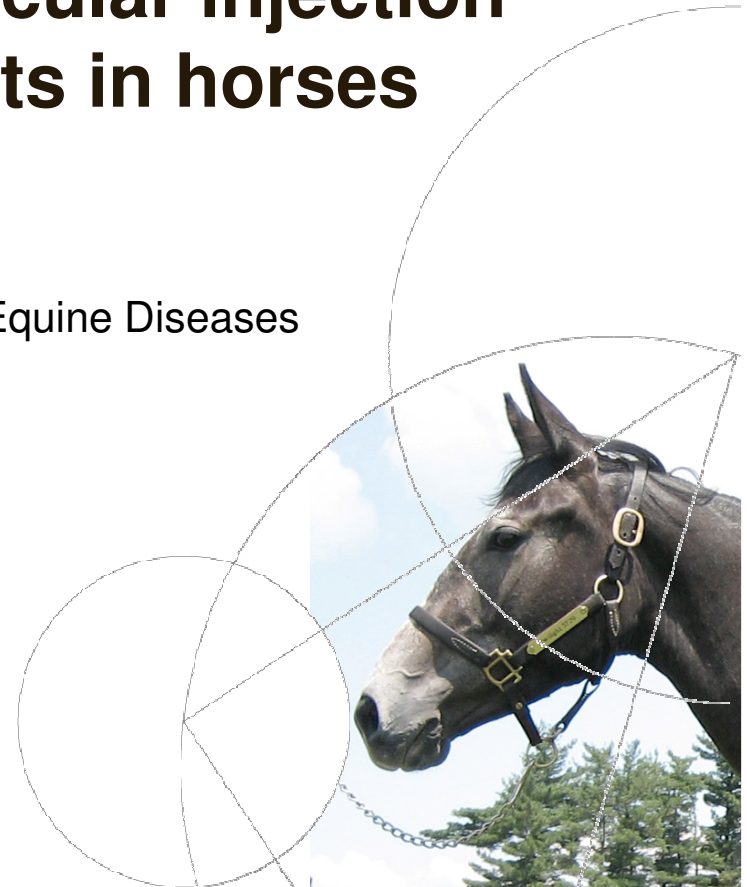


Ultrasound-guided intraarticular injection of thoracolumbar facet joints in horses

Presenter Jon Vedding Nielsen,
Title DVM, MRCVS, Certificate in Equine Diseases

Co-authors / collaborators
Fuglbjerg, V., DVM
Berg, L., PhD
Thomsen, P., Dr. Med. Vet.

Place, date
Dias 1



Research group

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Ultrasonography of the equine cervical region: a descriptive study in eight horses

L. C. BERG, J. V. NIELSEN, M. B. THOERNER¹ and P. D. THOMSEN*

Departments of Anatomy and Physiology and ¹Large Animal Surgery, The Royal Veterinary and Agricultural University of Copenhagen, Bülowsvej 17, DK-1870 Frederiksberg C, Denmark.

Keywords: horse, neck, ultrasonography, anatomy, articular facet

Summary

Reasons for performing study: In equine patients, the cause of clinical signs possibly related to the cervical region is often difficult to diagnose. Ultrasonography allows quick and noninvasive visualisation, but reference material of the normal equine neck is needed.

Objectives: To describe and document the normal ultrasonographic appearance of transverse scans in the cervical region with emphasis on the synovial articular facet joints, cervical vertebrae and paravertebral structures; and further, to provide images of frozen cross-sections for anatomical reference.

Methods: A study describing the normal ultrasonographic appearance of the cervical anatomy was performed. Transverse scans were obtained from second cervical vertebra (C2) to first thoracic vertebra (T1). *Post mortem* photographs of frozen cross-sections were obtained as anatomical reference.

Results: The structures were clearly visualised by ultrasonography and consistency was found between ultrasonographic images and corresponding cross-sectional anatomy. The articular facets varied between horses and facets (C2 to T1). Discrepancy in the existing anatomical descriptions was found.

Conclusions and potential relevance: The anatomical and ultrasonographic description provides a reference for ultrasonographic evaluation of equine cervical facet joints, vertebrae and paravertebral structures. The findings and variations found are considered to reflect the naturally occurring variations in horses.

Introduction

Diagnosis of an equine patient with clinical signs possibly related to the cervical region is difficult. Radiography is a useful and well-documented diagnostic technique that offers the possibility of evaluating superficial and profound bony changes and visualising the vertebral canal. However, in general practice, difficulties have been described in obtaining diagnostic images of more specific sites of interest (Hager 1986; Craychee 1998).

Ultrasonography is a relatively recent diagnostic technique which offers a quick and noninvasive visualisation of soft tissue

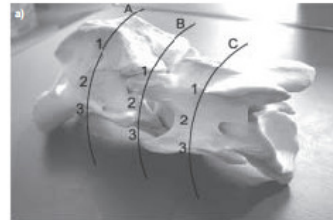


Fig 1: Position of the transducer in relation to the vertebrae. a) The transducer position for mid-vertebral images of the axis (A), images at the level of the widest point of the facet (B) and images at the level of the narrowest point of the facet (C) are shown in dorsal (1), middle (2) and ventral views (3). b) The transducer positions are shown on a transverse image of the facet.

changes such as foreign bodies, atrophy and fibrosis of muscles (Hager 1986; Craychee 1998), as well as evaluation of the outline of bone and joints (Harcke *et al.* 1988). Furthermore, Nazarian *et al.* (1998) have described the evaluation of articular facets, nerve roots and paraspinal tissue in human subjects using ultrasound. Compared to radiography, ultrasonography is a dynamic diagnostic modality. A simple static ultrasonographic picture may

Accuracy of ultrasound-guided intra-articular injection of cervical facet joints in horses: a cadaveric study

J. V. NIELSEN, L. C. BERG, M. B. THOERNER¹ and P. D. THOMSEN*

Departments of Anatomy and Physiology and ¹Large Animal Surgery, The Royal Veterinary and Agricultural University of Copenhagen, Bülowsvej 17, DK-1870 Frederiksberg C, Denmark.

Keywords: horse, neck, ultrasonography, articular facet, intra-articular facet joint injection

Summary

Reasons for performing study: Intra-articular facet joint injection is an established diagnostic procedure in human medicine but there are no reports on its reliability in equine practice.

Objectives: To investigate the accuracy of ultrasound-guided intra-articular injections of the cervical facet joints and to estimate factors influencing the accuracy.

Methods: Sixty injections with blue dye were performed on the facet joints between 2nd and 7th cervical vertebra (C2-C7) on horses subjected to euthanasia for nonorthopaedic reasons. The facet joints were subsequently dissected to verify accuracy of deposition.

Results: Seventy-two percent of the injections were found to be intra-articular, 17% were intracapsular and a total of 98% were within 1 mm of the joint capsule. There was a marked effect of gained experience ($P < 0.01$), but not of other factors tested.

Conclusions and potential relevance: The results of the present study do not translate directly to injections performed in live horses, but they indicate that the method can be applied as a diagnostic as well as therapeutic procedure in C2 to C7 and that it is advisable to practise injections on cadaver specimens before applying the technique.

Introduction

Nerve blocks and intra-articular injections are well-established procedures in equine medicine, supplementing systematic clinical examination in the precise diagnosis of painful conditions and widely used in the treatment of certain joint diseases (McIlwraith 1998; Moore 1999). Refinement of these techniques in recent years, for example by ultrasound-guided injections, has further increased diagnostic sensitivity and the successful treatment of equine lameness. There are, however, areas that have received little attention, such as the diagnosis and treatment of cervical pain, despite the difficulties in diagnosing these lesions and in assessing some radiographic findings of the cervical facet joints (Ricardi and Dyson 1993). This may be due to difficulties in ensuring that the analgesia used are correctly deposited and, therefore, of diagnostic value. In human medicine, accurate intra-

articular deposition is ensured mainly by palpation or by the use of fluoroscopy with secondary arthrography (Barnsley *et al.* 1994; Kaplan *et al.* 1998; Shipman *et al.* 2001), but ultrasound-guided intra-articular injections in facet joints have also been described (Külmer *et al.* 1997). Palpation-guided intra-articular injections or the use of fluoroscopy have not, to our knowledge, been reported in equine medicine. In a recent study, we showed the normal ultrasonographic appearance of the cervical region and found the equine cervical facet joints to be easy to both locate and clearly visualise using ultrasonography (Berg *et al.* 2003). In addition, the method of ultrasound-guided injections of facet joints in horses has been reported briefly by Grisel *et al.* (1996) and Snyder and Spier (2001). Despite the potential use of this method, we have found no investigations of its reliability. Therefore, the objective of the present study was to investigate the accuracy of ultrasound-guided intra-articular injections of the cervical facet joints and to estimate the factors influencing this accuracy.

Materials and methods

Necks

The study was performed on 8 necks from horses subjected to euthanasia due to nonorthopaedic reasons at the Royal Veterinary and Agricultural University, Copenhagen, Department of Clinical Studies, Large Animal Surgery. The horses weighed mean 500 kg (range 450–600 kg) were of average body condition and had similar muscle proportions on the neck. No clinical examination of the neck region was performed prior to euthanasia. The necks, including the 5 joints from the 2nd (C2) to the 7th (C7) cervical vertebrae, were separated from the rest of the body. It would have been an advantage if the facet joint C7-T1 could have been included, since this is far more difficult to visualise ultrasonographically due to the deeper location beneath part of the pectoral girdle musculature and caudomedial to the craniodorsal margin of the scapula. However, this was not possible as the horses were regular patients from the large animal hospital and therefore had to go through a routine *post mortem* examination, which rendered that part of the carcass severely damaged. For all necks the injections were divided, with one operator performing the injections on one side followed by the other operator injecting the other side. None of the operators had

*Author to whom correspondence should be addressed.

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*Author to whom correspondence should be addressed.

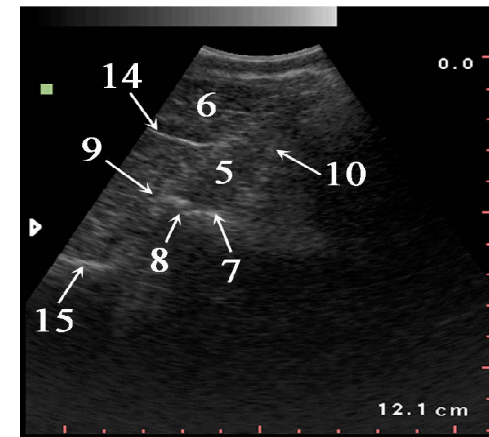
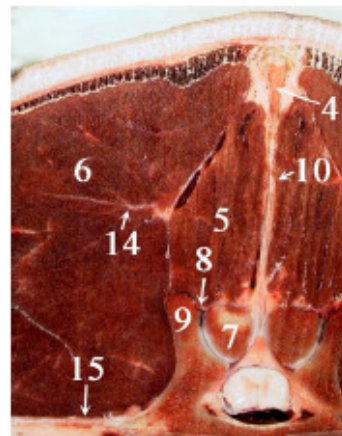
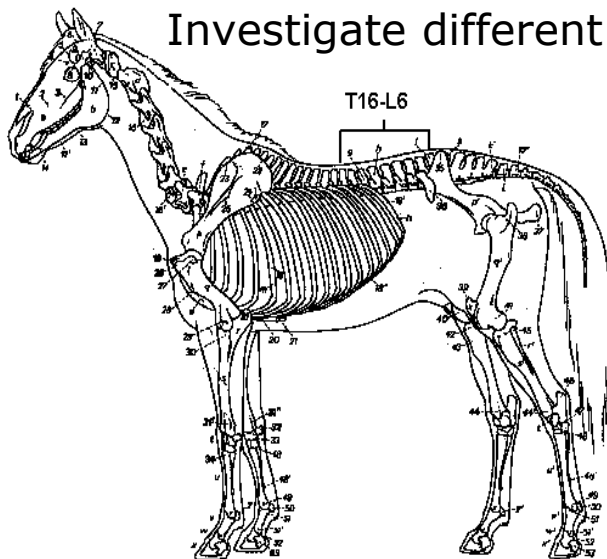
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Aim of the study

Describe a method of ultrasound-guided lumbar intraarticular facet joint injection

Investigate different factors influence on the result



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Materials and method

Cadaveric study

12 backs, T14-16, euthanized for other reasons than back problems

Back	1	2	3	4	5	6	7	8	9	10	11	12
Facet	T16-L4	T16-L4	T16-L4	T16-L4	T14-L2	T14-L3	T17-L5	T16-L5	T15-L6	T18-L6	T18-L5	T15-L4

Two operators

- Veterinary surgeon with 6 years of experience with ultrasonography and intraarticular facet joint injections
- Veterinary student with limited experience in ultrasonography and facet joint injections



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Materials and method

Injection method

Transducer: 5 MHz curved linear array transducer

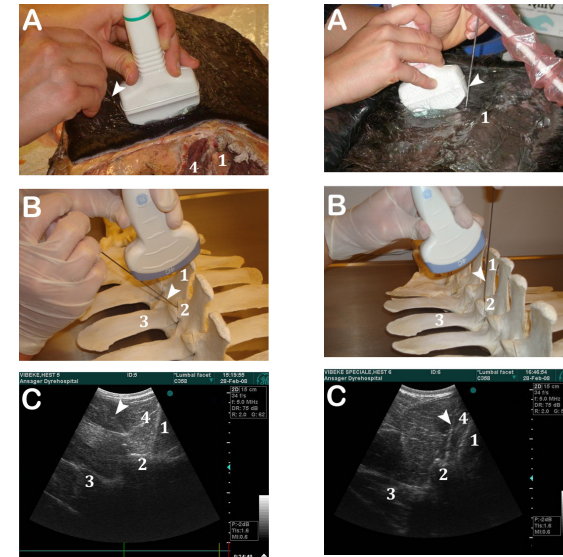
Needle: 16cm 14G/15,2cm 18G

Injectate

0,25% bromophenol blue dye, 4% agarose

Insertion of the needle:

- Lateral to the transducer
- Medial to the transducer



Place, date
Dias 5

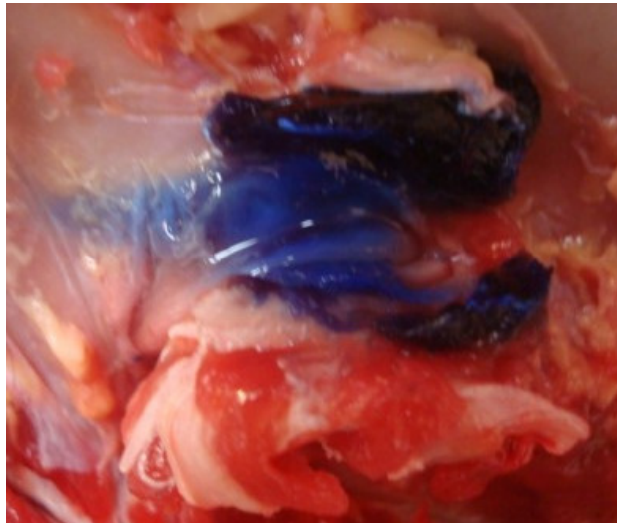
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Materials and method

Dissection

Verification of the injections



Intraarticular injection

Score 1



Periarticular injection

Score 2 $\leq 2\text{mm}$

Score 3 2-5mm

Score 4 $> 5\text{mm}$

Score 5 negative



Place, date
Dias 6

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Materials and method

Statistics

X²-test, significance level $P < 0,05$

ANOVA, significance level $P < 0,05$

Variables:

Back number

Operator

Facet joint

Needle size 14G/18G

Injection method lateral/medial

+/- cutis



Place, date
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Results

27% intraarticular (95% CI: 20-34)

Periarticular – distance from the joint capsule

- 51% ≤ 2 mm (95% CI: 42-59)
- 17% 2-5mm
- 4% > 5 mm

2% negative

Depth of the facet joints 4-9cm

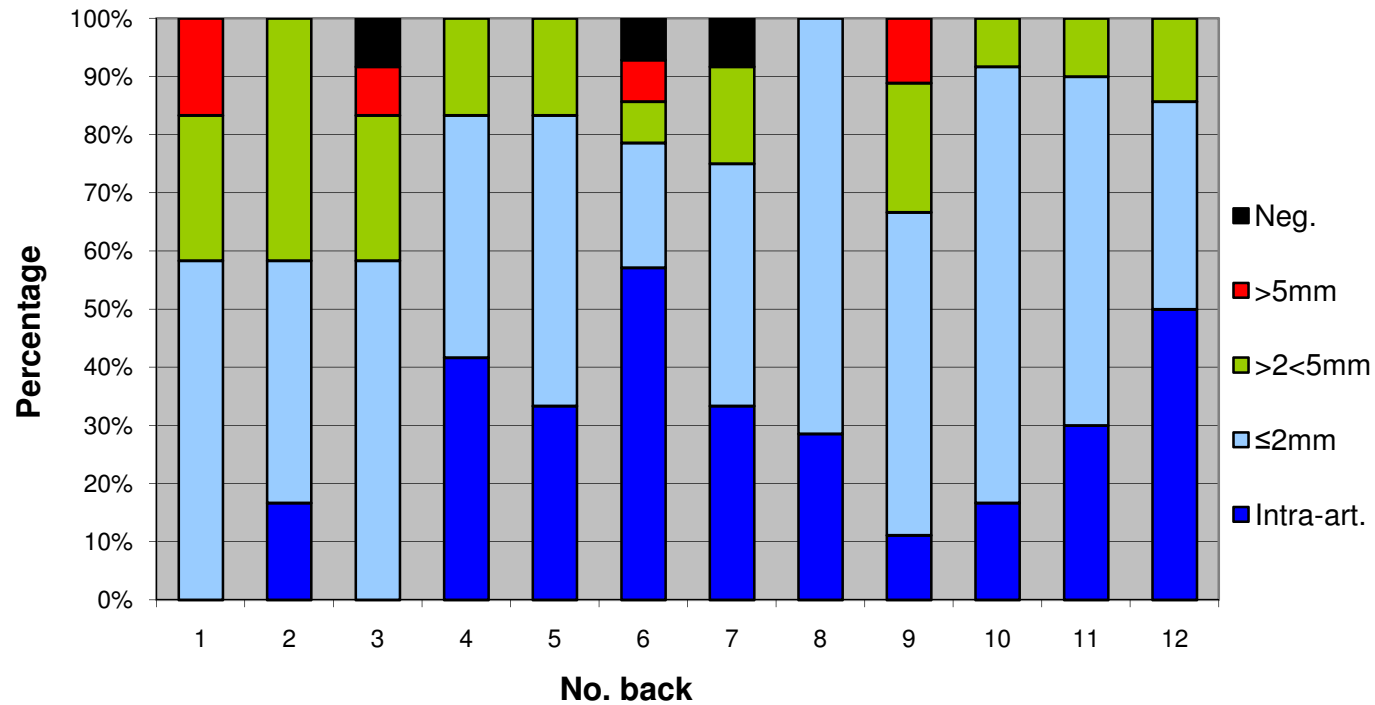


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Results



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Results

No significant effect, $P > 0,05$

- Back number
- Facet joint
- Operator

Significant effect, $P < 0,05$

- Injection method –Medial approach
- Needle –18G



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Conclusion

Medial approach and 18G needle validated as a useful method of intraarticular facet joint injection

- Successrate 88% of injections $\leq 2\text{mm}$
- New study with only medial approach and 18G will increase the overall successrate

Lumbar intraarticular injections are difficult

Clinical evaluation of general joint therapy in facet joints



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