Equine cervical ultrasonography

A final thesis
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Equine cervical ultrasonography

Part 1: Ultrasonographic description of the equine cervical anatomy

Part 2: High degree of accuracy of ultrasound-guided intraarticular injection of cervical facet joints in horses – A cadaveric study
Equine cervical ultrasonography

Advantages
- Soft tissue
- Bone surfaces / joint
- Dynamic
  - Guided procedures
- High sensitivity (Schwarz et al., 1999)

Disadvantages
- Only bone surface – not the vertebral canal
- Low specificity (Schwarz et al., 1999)
Part 1: Ultrasonographic description of the equine cervical anatomy

Aim:
Ultrasonographic description of the cervical anatomy from C2 to T1
Materials and method

Structures included
facet joints
vertebrae
paravertebral structures

Structures not included
atlanto-occipital and atlanto-axial articulations
nuchal ligament
structures ventral to jugular groove
Materials and method

Ultrasonography
B&K Medical Ultrasound System 3535
Transducer: 7.5 MHz, straight linear array
8 clinical normal horses
Three locations around facet joint
mid-vertebrae
Materials and method
Materials and method

Ultrasonography
  B&K Medical Ultrasound System 3535
  Transducer: 7.5 MHz, straight linear array
  8 clinical normal horses

  Three locations around
  facet joint
  mid-vertebrae

Frozen cross-sections
Dissection
Results
Facet joint

Fig 13: Identifiable structures on ultrasound images and anatomical cross section at the level of C7-T1. Muscles: M. splenius (a), mm. multifidi cervicis (d), mm. intertransversarii cervicis (e), m. brachiocephalicus (f), m. longus colli (h), m. semispinalis capitis (i), m. serratus ventralis cervicis (j), m. scalenus ventralis (l), m. scalenus medius (l'), m. spinalis cervicis (m), m. longissimus cervicis (n), m. omotransversarius (q). Vertebral: Processus articularis caudalis (A), processus articularis cranialis (B), processus transversus (D), corpus vertebra (E), processus spinosus (F), crista ventralis (G). Misc.: Fascia cervicalis (1), rami from vertebral vessels (y)
Mid-vertebrae

Fig 5: Identifiable structures on ultrasound images and anatomical cross section at the level of C3. Muscles: M. splenius (a), m. longissimus atlantis (b), m. longissimus capitis (c), mm. multifidi cervicis (d), mm. intertransversarii cervicis (e), m. brachiocephalicus (f), m. longus capitis (g), m. longus coli (h), m. semispinalis capitis (i'), m. omotransversarius (q). Vertebral: Arcus vertebrae (C), processus transversus (D), corpus vertebrae (E), processus spinosus (F), crista ventralis (G). Misc.: Fascia cervicalis (1'), funiculus nuchae (2), laminae nuchae (3), a. et v. vertebralis (x)
Variation on cross-sections

Facet C3-4

Facet C4-5
Ultrasonographic variation
Painful conditions in facet joints

Ultrasonographic visible joint space

Use of facet joint block and medication in human medicine
Part 2: High degree of accuracy of ultrasound-guided intraarticular injection of cervical facet joints in horses – A cadaveric study

Aim:
Investigate the possibility and accuracy of ultrasound-guided cervical intraarticular facet joint injection
Investigate different factors influence on the result
Materials and method
Transducer: 5 MHz, curved linear array
Insertion of the needle
lateral to the transducer without needle-guide attachment
dorsal to the transducer with needle-guide attachment
Materials and method

Transducer: 5 MHz, curved linear array

Insertion of the needle
  lateral to the transducer without needle-guide attachment
  dorsal to the transducer with needle-guide attachment

Injectate
  0.25% bromophenol blue dye, 4% agarose

Dissection
Dissection

Intraarticular injection  Intracapsular injection
Materials and method

Transducer: 5 MHz, curved linear array

Insertion of the needle
- lateral to the transducer without needle-guide attachment
- dorsal to the transducer with needle-guide attachment

Injectate
- 0.25% bromophenol blue dye, 4% agarose

Dissection
Logistic regression
Results

Intraarticular injections - 72% (95% CI: 66%-77%)

Intracapsular injections - 17% (95% CI: 12%-21%)

Periarticular injections - 11%

All (except 1) <1 mm from joint capsule
Results

Percent

Number of neck injected

- Periarticular >5 mm (Score 4)
- Periarticular <5 mm (Score 3)
- Intracapsular (Score 2)
- Intraarticular (Score 1)
Results

No significant effect of
- operator  \( (P=0.57) \)
- facet  \( (P=0.08) \)
- needle guide-attachment  \( (P=0.88) \)

Significant effect of
- number injection  \( (P=0.01) \)

92% intraarticular in the last 25 injections
(last 3 necks)
Conclusion

Possible by ultrasonography to perform intraarticular facet joint injections in cervical facet joints

Achieved precision of 72% intraarticular injections and in total 98% within 1 mm of the joint capsule

Marked improvement in the success rate of intraarticular injection as degree of operator experience increased
Perspectives

Adjustment of method
  Projection parallel with joint space

Diffusion (sensitivity, specificity)
  Effect of intracapsular injections
  Effect of periarticular injections

Medial branch block
Medial branch block

Modifieret fra Geyer og Peter (2001)