Equine cervical ultrasonography

A final thesis

Royal Veterinary and Agricultural University of Copenhagen

Authors

Lise C. Berg, DVM

Jon V. Nielsen, DVM, MRCVS

Tutor Preben D. Thomsen, Dr. Med. Vet

Assistant tutor Martin B. Thøfner, PhD

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

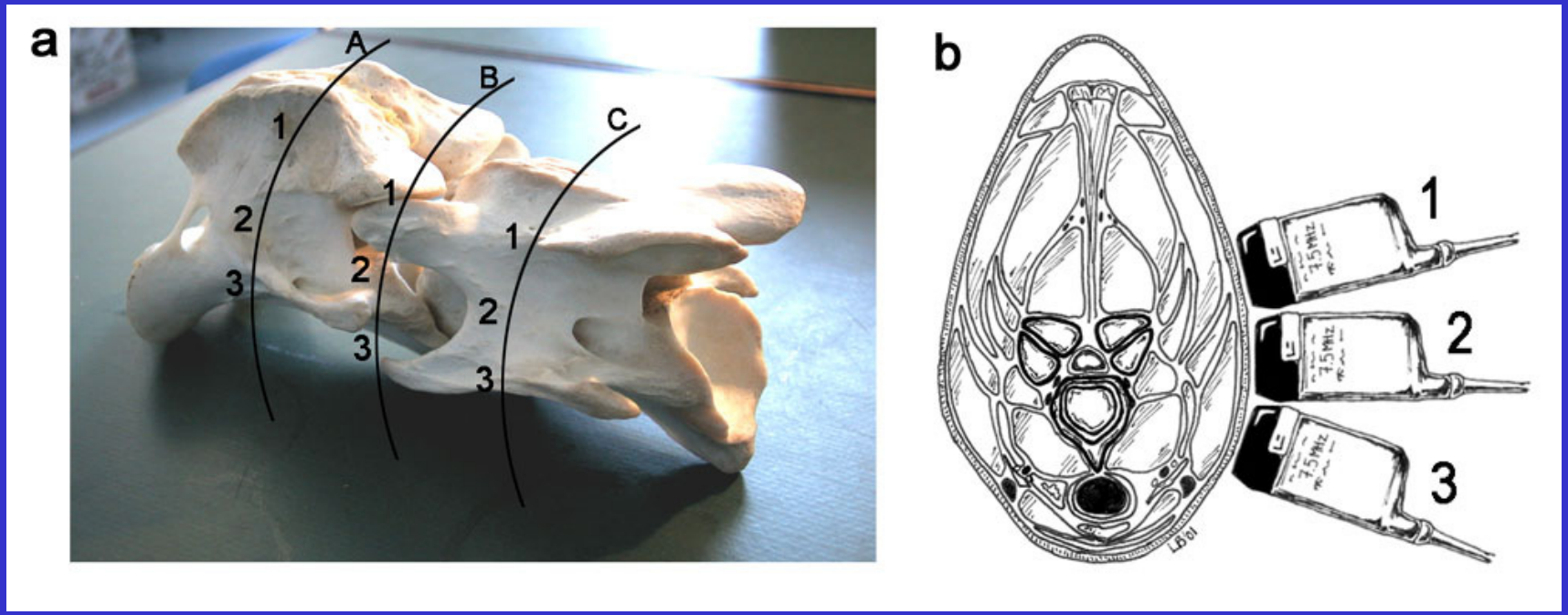
8 clinical normal horses

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

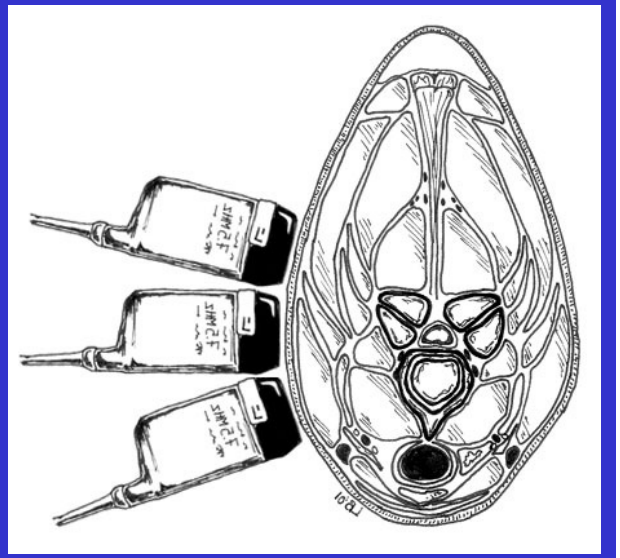
mid-vertebrae

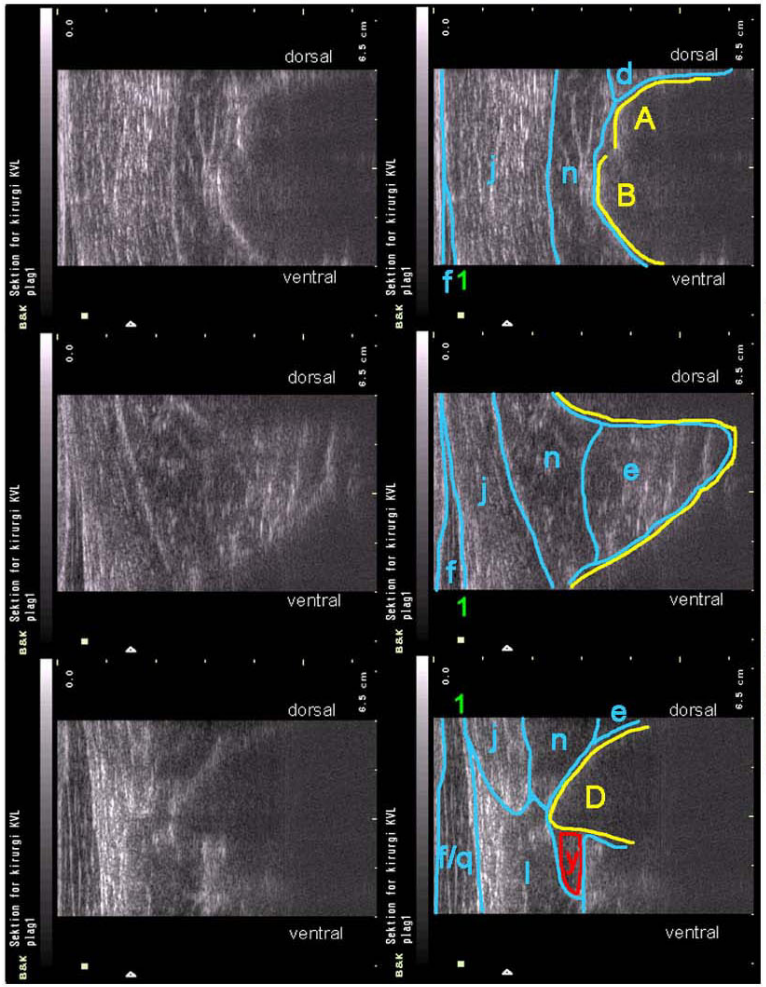
Frozen cross-sections

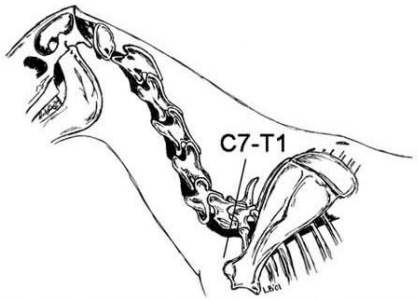
Dissection

Results

Facet joint







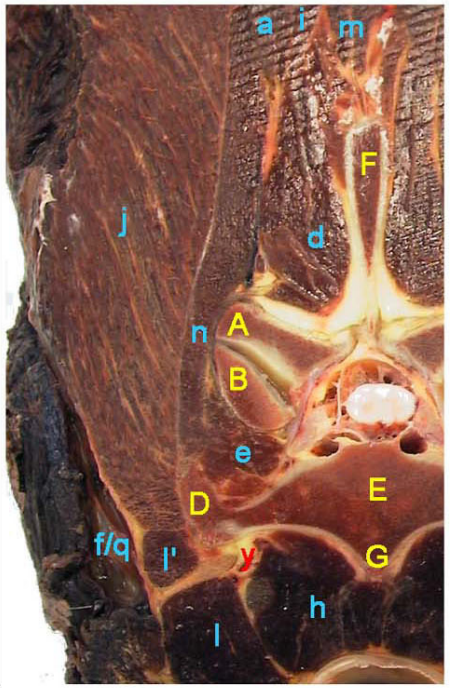


Fig 13: Identifiable structures on ultrasound images and anatomical cross section at the level of C7-T1. Muscles: M. splenius (a), *mm. multifidii cervicii* (d), *mm. intertransversarii cervicii* (e), *m. brachiocephalicus* (f), *m. longus colli* (h), *m. semispinalis capitis* (i), *m. serratus ventralis 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

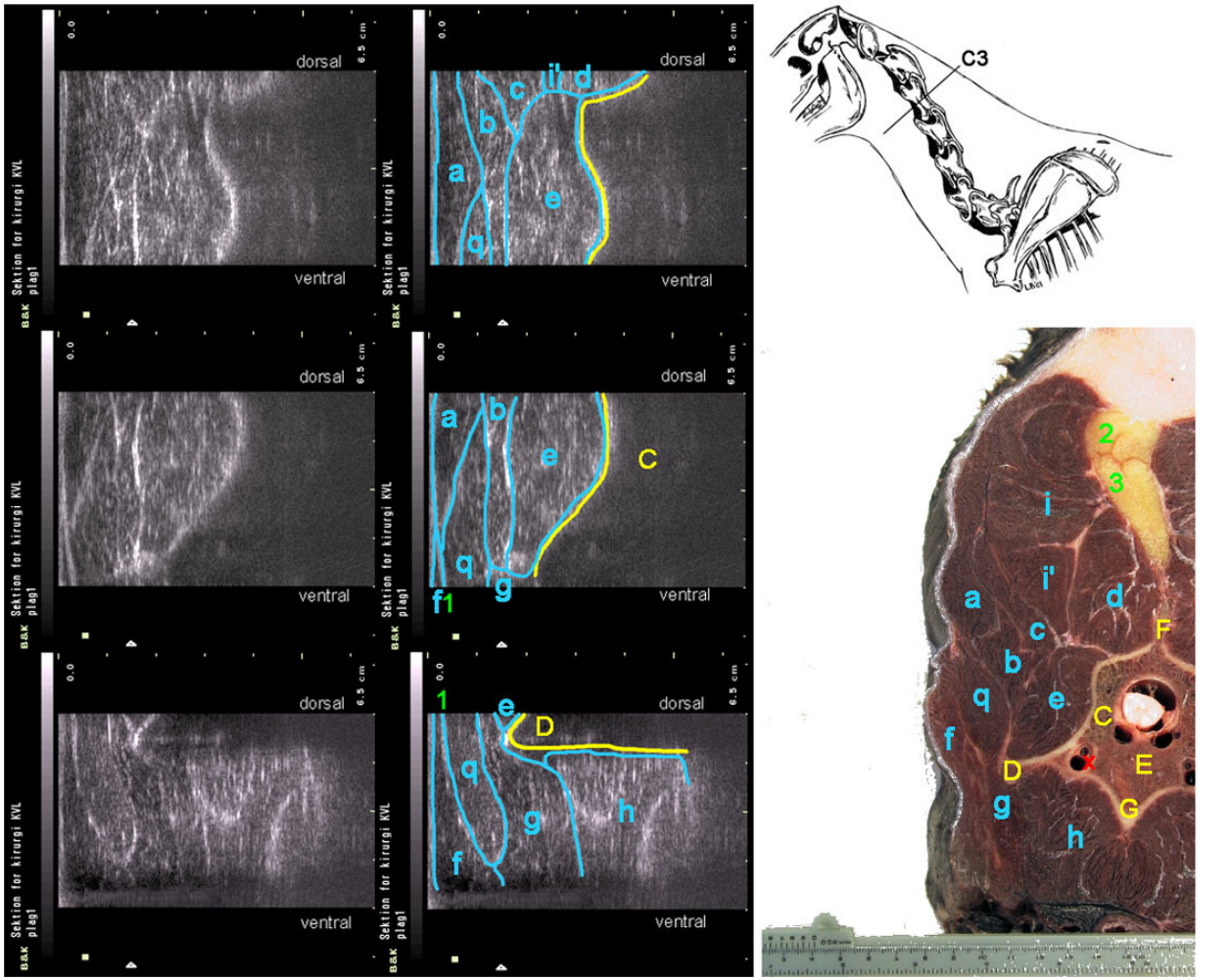
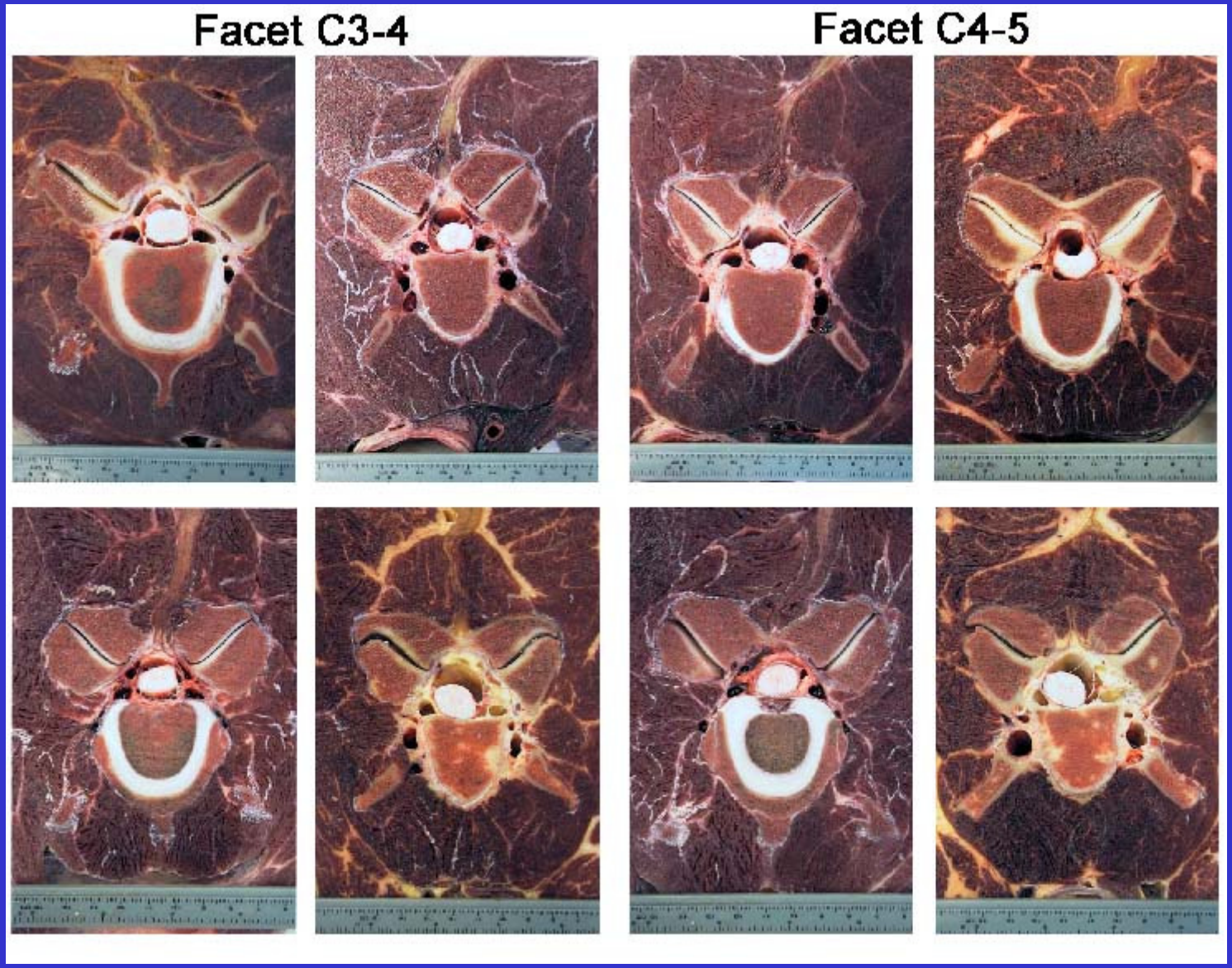


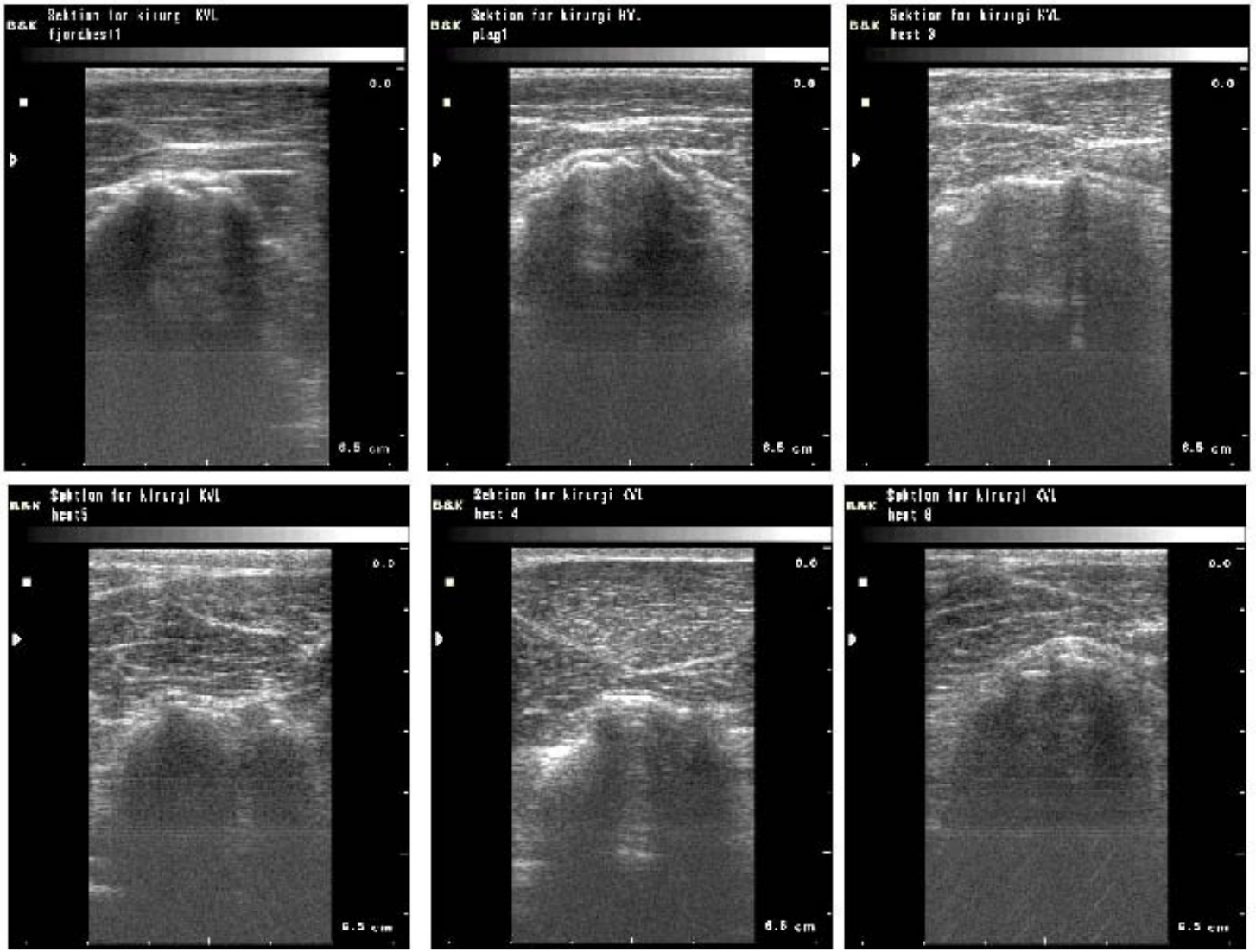
Fig 5: Identifiable structures on ultrasound images and anatomical cross section at the level of C3. Muscles: M. splenius (a), *m. longissimus atlantis* (b), *m. longissimus capitis* (c), *mm. multifidii cervicii* (d), *mm. intertransversarii cervicii* (e), *m. brachiocephalicus* (f), *m longus capitis*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

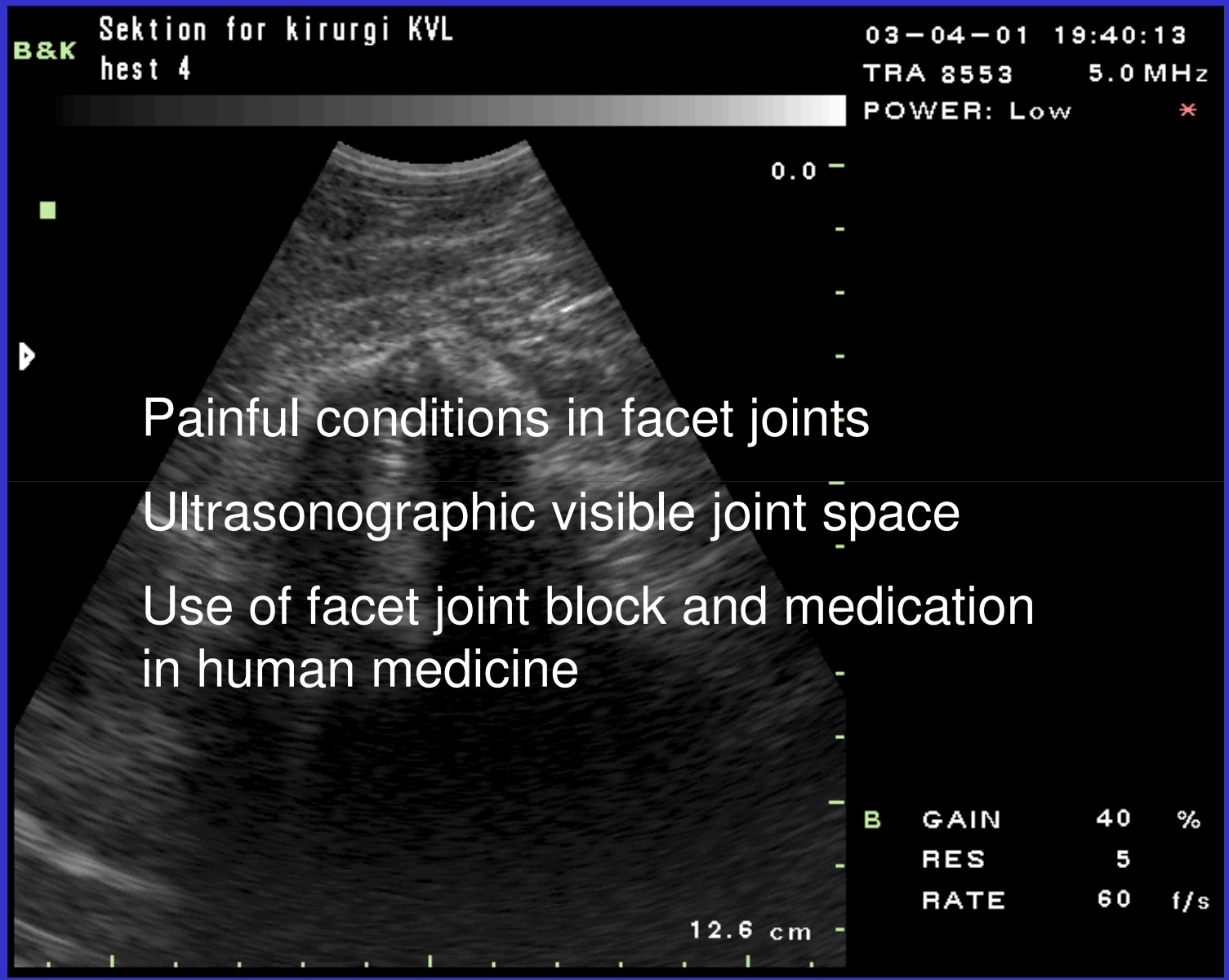
Variation on cross-sections



Ultrasonographic variation

Facet C3-4





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

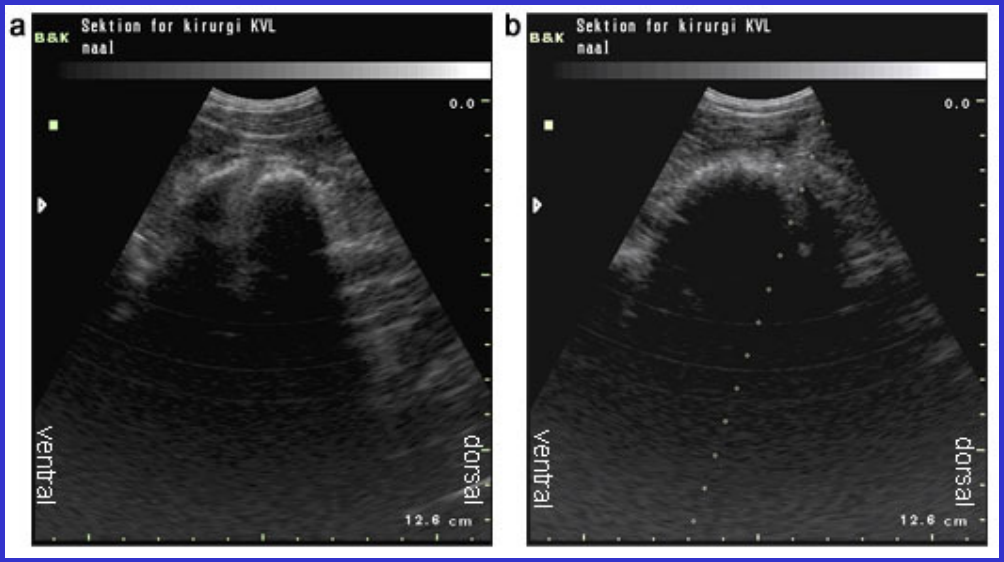
Investigate different factors influence on the result

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

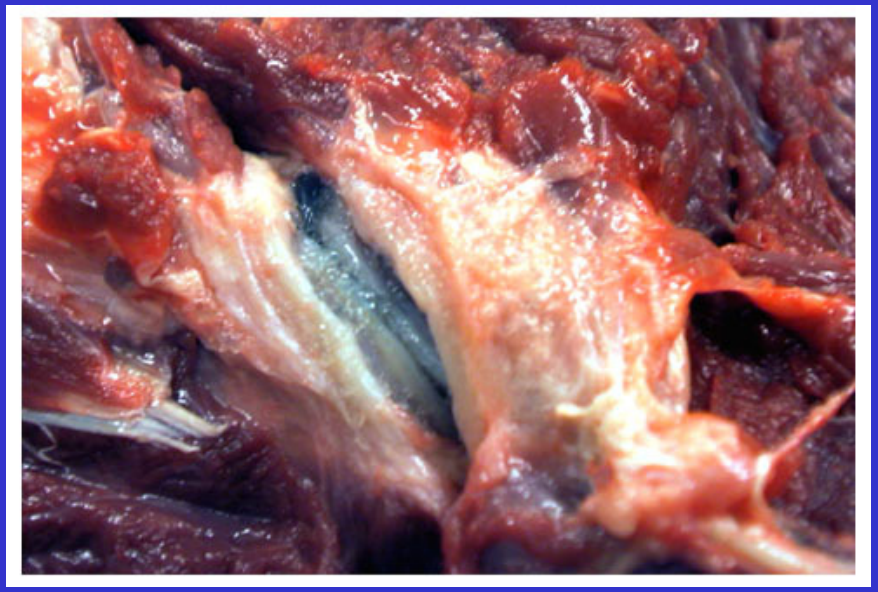
- lateral to the transducer without needle-guide attachment
- dorsal to the transducer with needle-guide attachment

Injectate

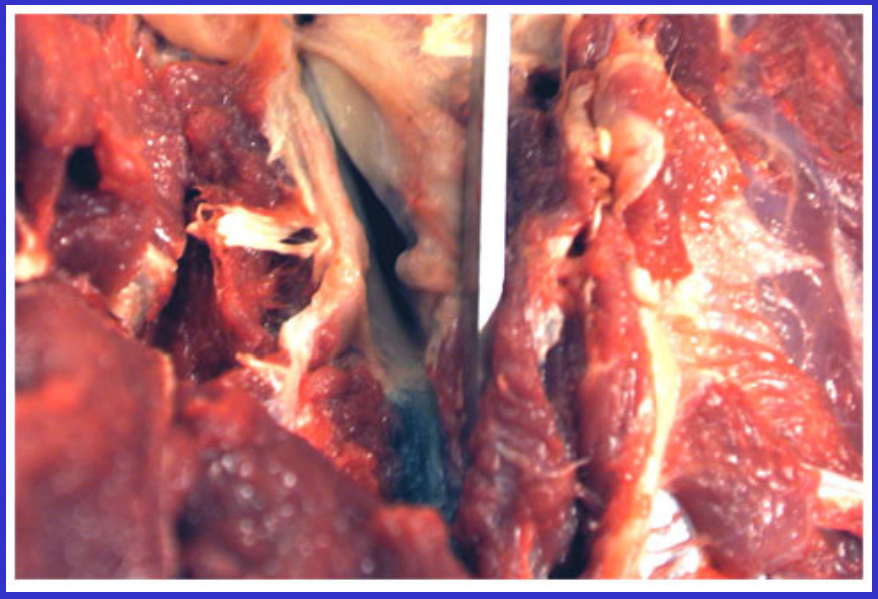
- 0.25% bromophenol blue dye, 4% agarose

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

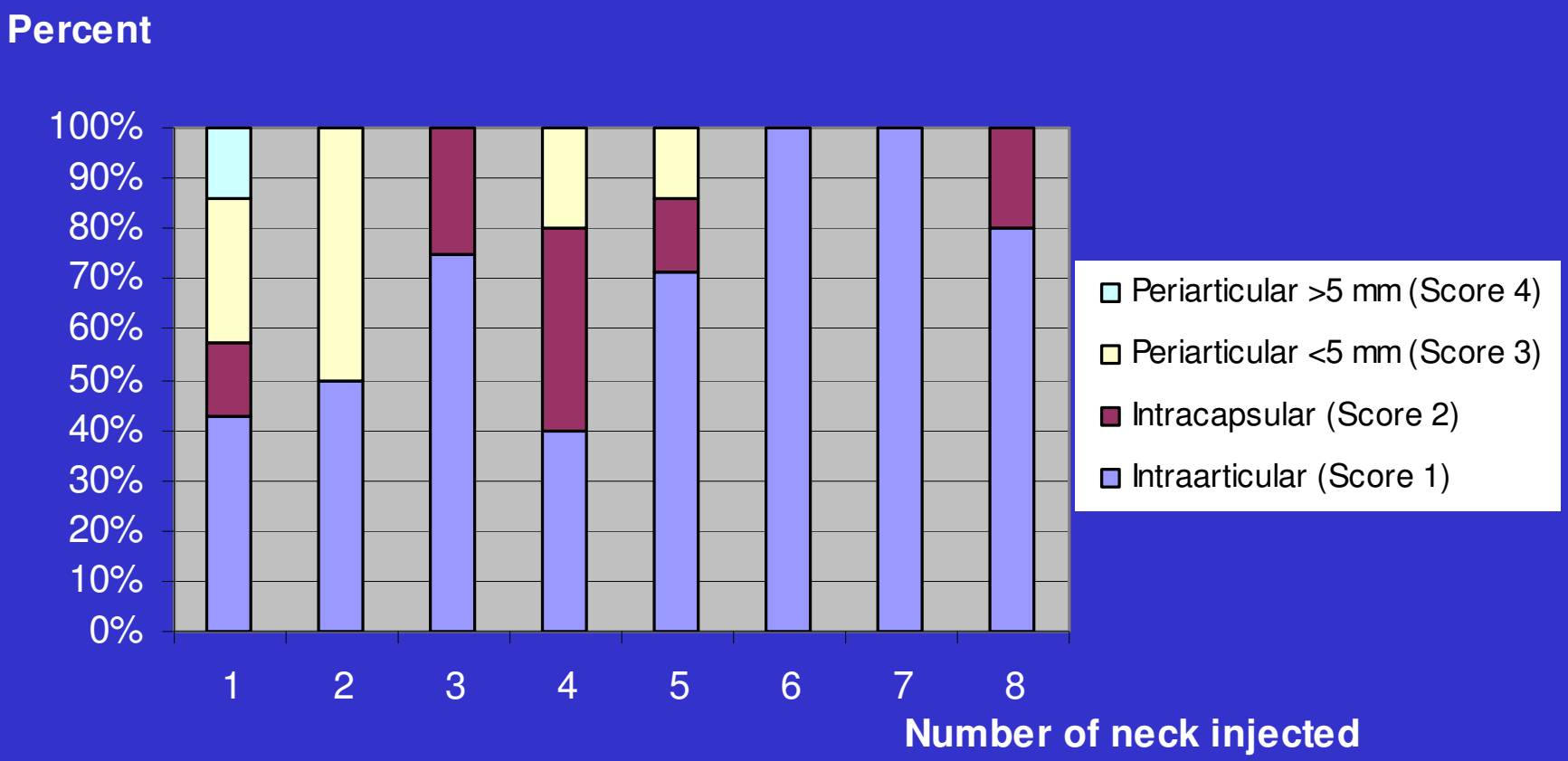
Intraarticular injections - 72% (95% CI: 66%-77%)

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

Periarticular injections - 11%

All (except 1) <1 mm from joint capsule

Results


Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1
2
3
4
5
6
7
8
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)

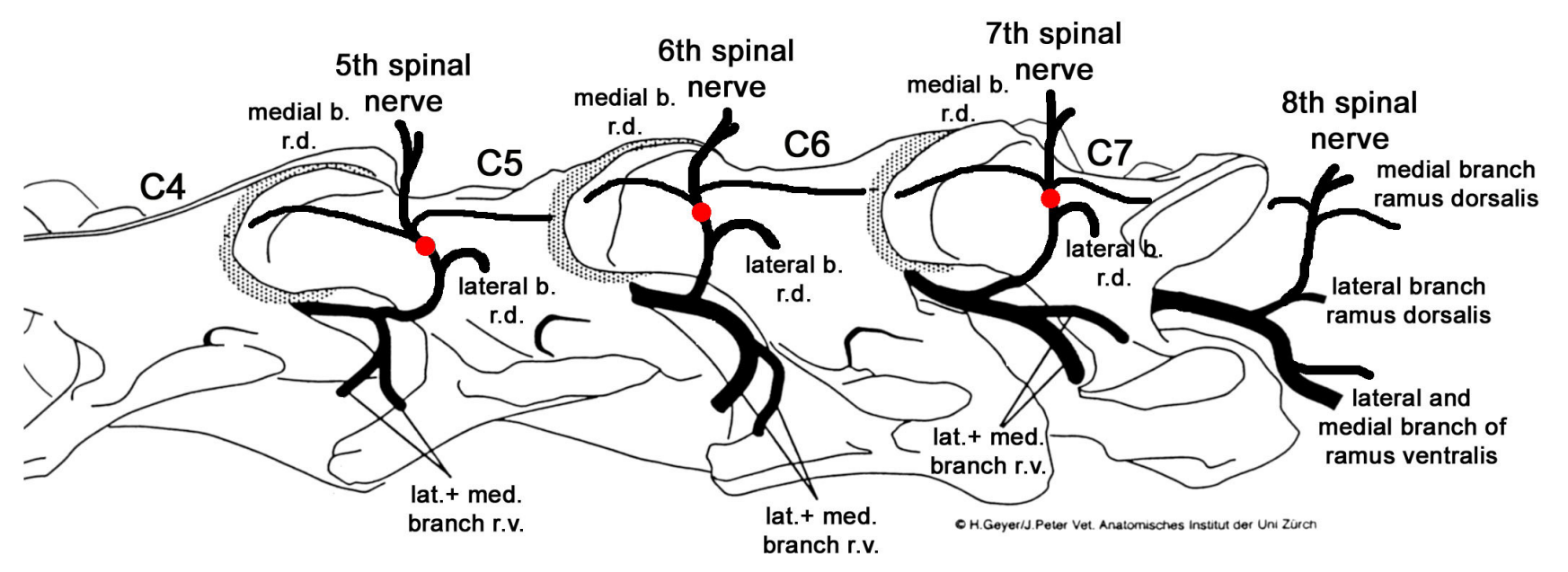
Conclusion

- 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



Modificeret fra Geyer og Peter (2001)