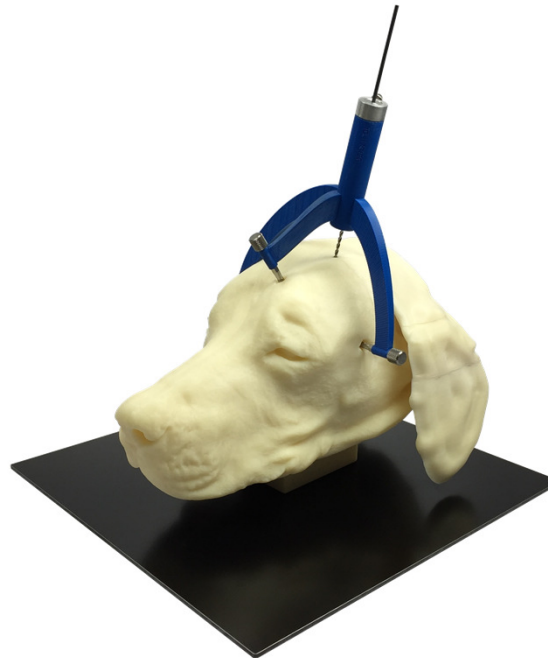




ACCURACY OF A NEW MRI-BASED PATIENT-INDIVIDUAL STEREOTACTIC BRAIN BIOPSY DEVICE IN THE DOG



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Aim of the study

- development of a new patient-individual MRI-based stereotactic brain biopsy device for dogs
- determination of the accuracy of the device in targeting predefined intracranial points using a biopsy needle
- evaluation if patient body weight or depth of the target point influences the accuracy



Materials and methods

heads of canine cadavers classified in two groups

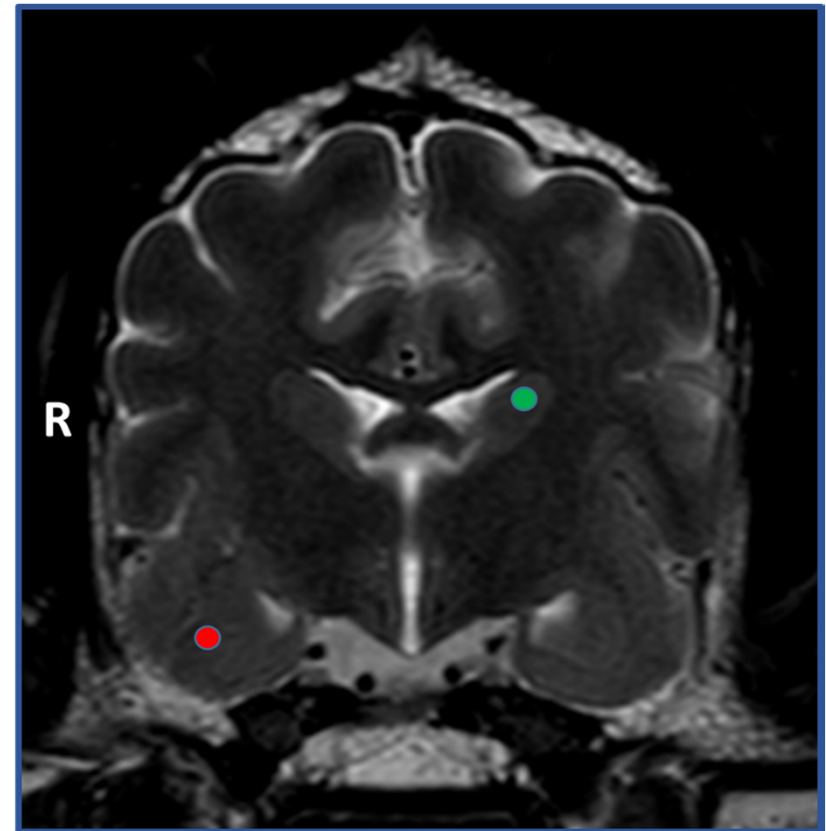
- group 1: small dog breeds, weight < 15kg
- group 2: large dog breeds, weight > 20kg

two target points

- left - caudate nucleus
- right - piriform lobe

requirements for trajectories

- without penetration of ventricles
- entry on brain surface in a gyrus



T2W transverse MR image of the brain of a healthy doberman



Procedure I

Placement of bone anchors



Attaching of markers to bone anchors



position bone anchors:

two bone anchors:

zygomatic arch on each side

third bone anchor:

occipital protuberance (small dogs) or paramedially over the frontal sinus (large dogs)



marker:

plastic cylinder with diluted gadolinium

dilution:

1ml Dotarem in 250ml
physiological NaCl
(Chen et al. 2012)

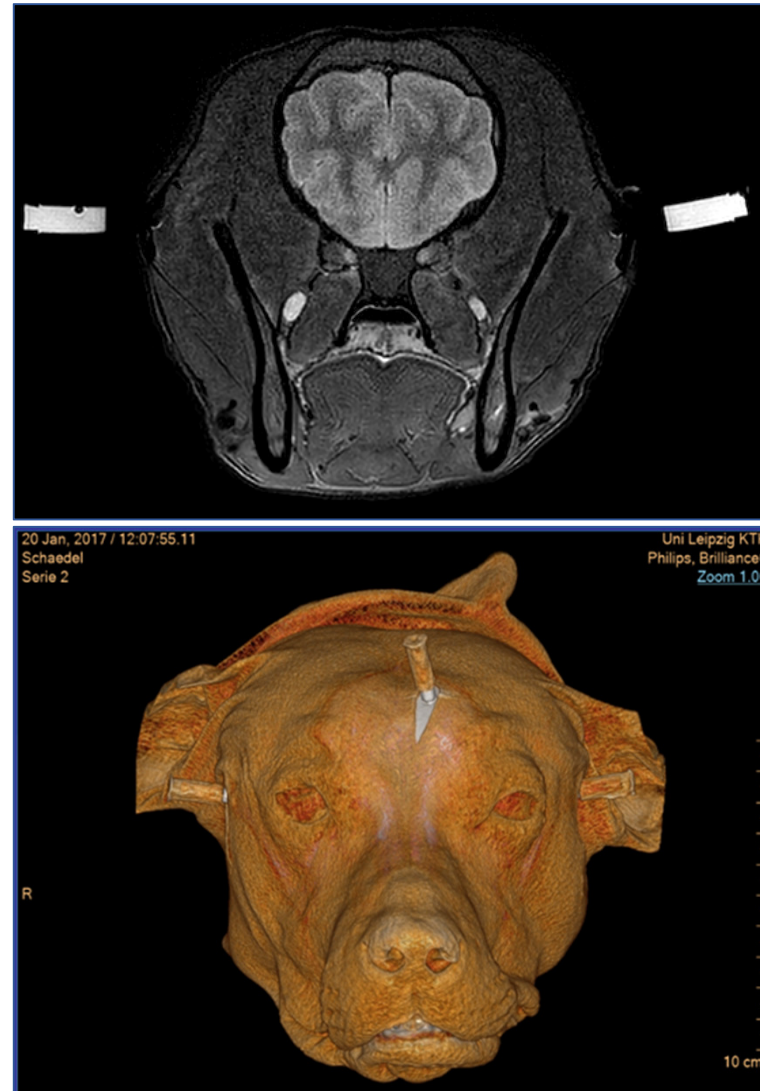


Procedure II

MRI



CT





Procedure III

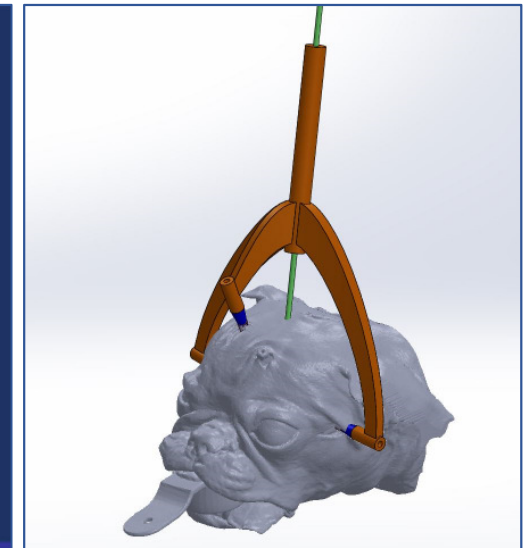
Planning of biopsy trajectories on MR-Images



Construction of the virtual biopsy frame based on MRI



3D print of the frame



3D-printer:

- Stratasys Fortus 900mc
- accuracy of +/- 0.1 mm x-y plane
- slice thickness 0.1778 mm (distance in z-direction)

material:

- synthetic material ABS M30 of the firm Stratasys



Procedure IV

Attaching the frame to bone
anchors



Incision of skin, preparation to
the periosteum, mini burr hole
in the skull





Procedure V

Adjusting depth of the biopsy needle



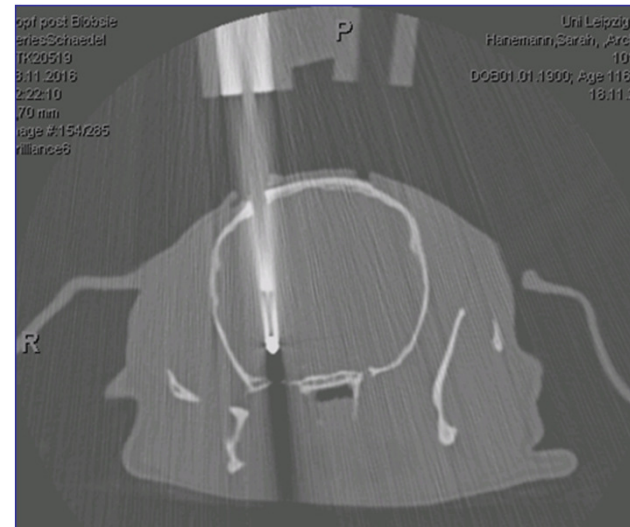
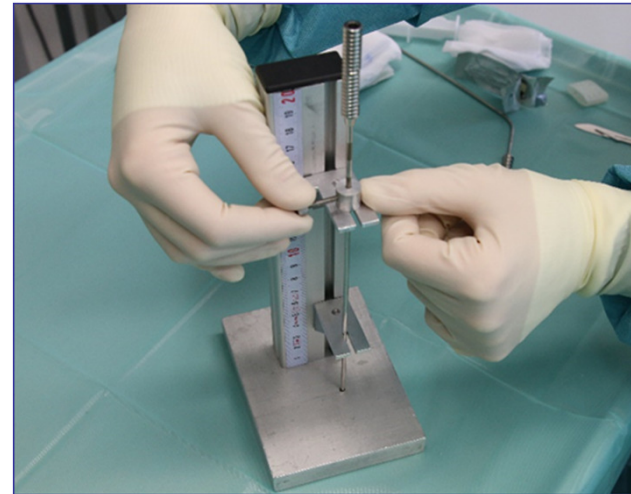
Insertion of the biopsy needle to the target point and second CT-Scan of the head with biopsy needle in place



Fusion of planning-CT and CT with needle in place



Determination of the target point deviation between setpoint and actual value





Results I

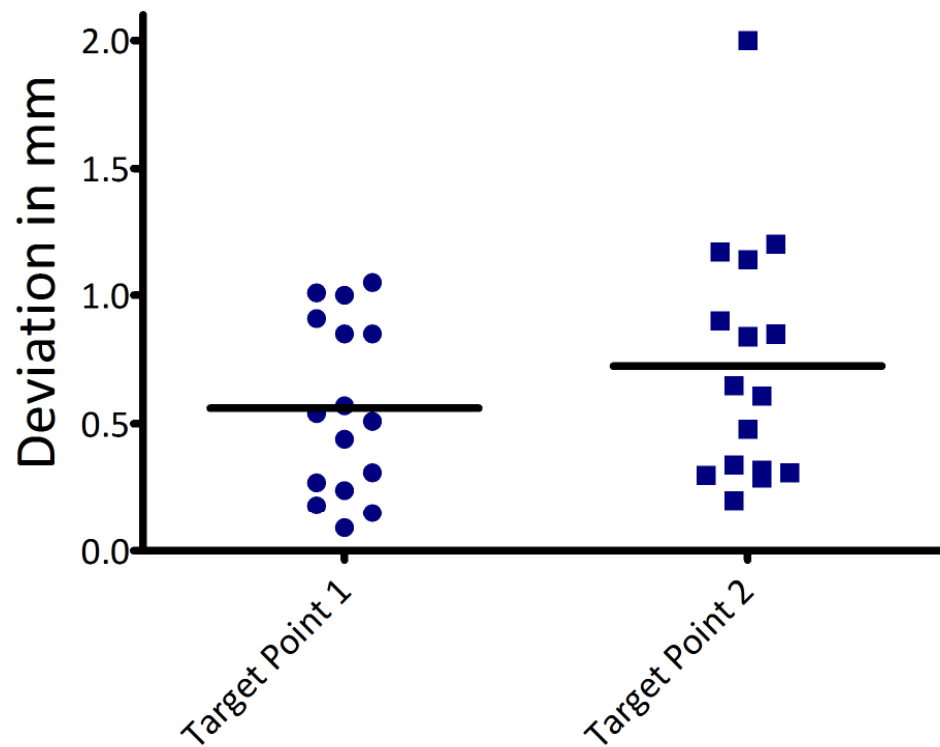
Deviation in mm of target points with patient-individual stereotactic brain biopsy frames

	Group 1	Group 2
mean accuracy target point 1	0.49	0.68
mean accuracy target point 2	0.72	0.73
mean accuracy of all points of the group	0.61	0.71
minimum	0.09	0.27
maximum	2.00	1.20



Results II

Deviation in mm of all target points with patient-individual stereotactic brain biopsy frames



Group 1+2	
mean accuracy target point 1	0.56
mean accuracy target point 2	0.73
mean accuracy all target points	0.64
STD deviation all target points	0.42
minimum	0.09
maximum	2.00

Conclusion

- easy handling
- accuracy at least as good as in other brain biopsy devices
- less expensive than other rigid frame or optical tracking biopsy systems
- use on clinical patients in planning

