



Accuracy of a new MRI-based Patient-Individual Stereotactic Brain Biopsy Device in the Dog



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Speaker Disclosure

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Thomas Flegel

FINAL DISCLOSURE:

Supported by a Grant of the University of Leipzig, Germany

One of the co-authors (D. Winkler) is engaged with accompany intending to commercially distribute the device (NEUROtec)

UNLABELED/UNAPPROVED USES DISCLOSURE:

None

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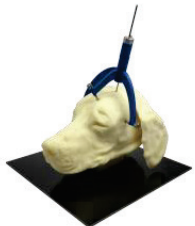
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Introduction

currently used brain biopsy systems:

- limited accuracy
- high initial purchase cost
- difficult to apply to some skull types
- several risk of surgical errors



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Aim of the study

testing procedural accuracy of a new patient-individual biopsy system:

- general accuracy in targeting predefined intracranial points
- influence of:
 - patient size
 - depth of target point within brain

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Material and methods I

22 canine cadaver heads:

group I:	<15 kg BW	Bichon Frise, Chihuahua, Dachshund, French Bulldog, Havanese, Pug, Coton de Tulear, Shih Tzu, Yorkshire Terrier
group II:	>20 kg BW	Bernese Mountain Dog, English Bulldog, German Shepherd, Husky, Labrador Retriever, mixed breed dogs


2 target points for every brain:

- caudate nucleus
- piriform lobe

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Material and methods II

attachment of 3 bone anchors
MRI and CT visible



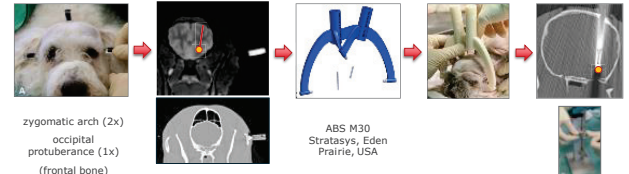
zygomatic arch (2x)
occipital protuberance (1x)
(frontal bone)

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Material and methods II

attachment of 3 bone anchors **T2 transversal MRI/CT** **construction of biopsy device** **attachment of biopsy device to skull and needle placement** **CT with biopsy needle in place**

MRI and CT visible

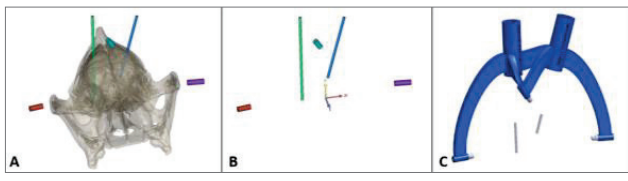


zygomatic arch (2x)
occipital protuberance (1x)
(frontal bone)

ABS M30
Stratasys, Eden Prairie, USA

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Construction of biopsy device



A Mimics 16.0 (64bit), Materialise, Leuven, Belgium

B 3matic (32bit), Materialise, Leuven, Belgium
MATLAB R2014a, Mathworks, Natick, USA

C Solid Works 2014 (64bit), Dassault Systèmes, Vélizy-Villacoublay, France

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Results: accuracy

Median deviation between anticipated target point and biopsy needle tip position in mm (n=44)

	Small breed dogs <15 kg	Large breed dogs >20 kg	total
target point I caudate nucleus			
target point II piriform lobe			
total			0.84 0.09 - 2.76 SD: 0.42

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Results: accuracy

Median deviation between anticipated target point and biopsy needle tip position in mm (n=44)

	Small breed dogs <15 kg	Large breed dogs >20 kg	total
target point I caudate nucleus	0.50*	0.96*	0.57
target point II piriform lobe	0.84	0.93	0.85
total	0.47	0.95	0.84 0.09 - 2.76 SD: 0.42

* significant difference
P=0.045

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Discussion

- median deviation off anticipated target points: < 1 mm (median 0.84; SD: 0.42)

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Discussion

- median deviation off anticipated target points: **< 1 mm** (median 0.84; SD: 0.42)
- accuracy of currently used biopsy systems:

Koblik et al. 1999	3.5 mm	(mean; SD: 1.6)
Moissonnier et al. 2000	2.9 mm	(mean; SD: 1.08)
Troxel and Vite 2008	0.9 mm	(mean; SD: 0.9)
Chen et al. 2012	1.79 mm	(mean; SD: 1.87)
Taylor et al. 2013	2.9 mm	(mean; 95% CI 2.9-4.3)
Rossmeis et al. 2015	1.55 mm	(median; range: 1.1 – 3.4)
Squires et al. 2014	< 3mm	
- can be applied to all skull types

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Conclusions

Advantages

- accurate
- no need to purchase an expensive biopsy system
- can be used on a case by case basis
- easy to perform
- minimizes potential surgical error

Disadvantages

- several days delay between biopsy decision and procedure
- patient has to wear bone anchors during that time, potential risk of bone anchor displacement
- dependence on device supplier

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