

Determination of Maturity in the Siberian Sturgeon (*Acipenser Baerii*) Using Magnetic Resonance Imaging

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Introduction

The ‚Lötschberg-Basistunnel‘ drains 20°C warm water from the mountains which endangers natural fish species such as the trout. Instead of cooling the water by technical means, the heat energy is used in a tropical greenhouse for the production of fruit and thermophile fish. The main interest in the elevation of the Siberian sturgeon, an endangered bone fish species, is caviar - the roe of the female fish.



Until the female sturgeon develops maturity up to eight years pass, but there is no phenotypic differentiation between females and males and no possibility to determine maturation of the roe. Therefore diagnostic imaging helps to evaluate maturation and determine gender.

Hypothesis

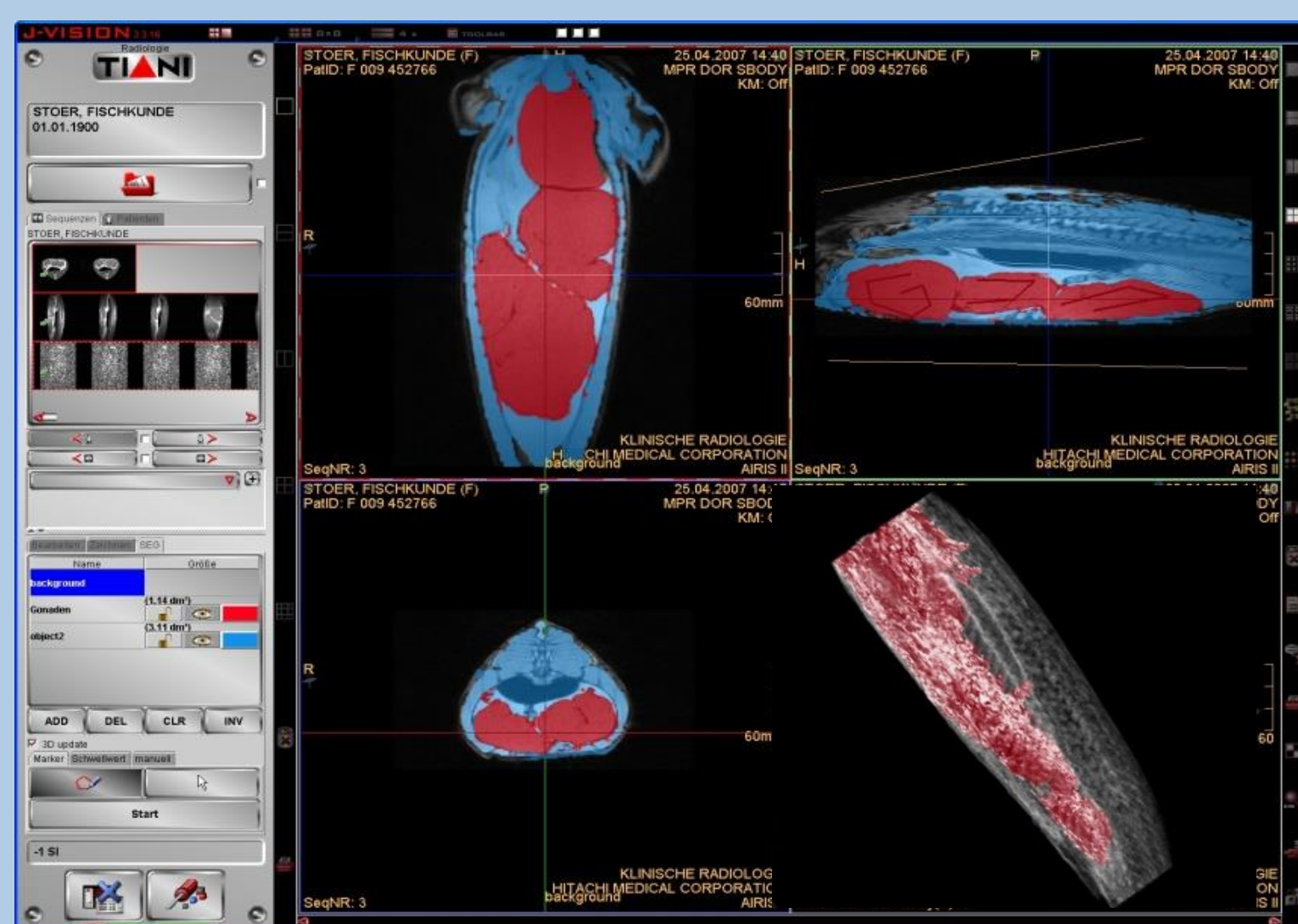
Ultrasound is the current imaging method to evaluate development of the roe, but exact volume determination is not possible.



Aim of this preliminary study was to evaluate Magnetic Resonance Imaging (MRI) as a feasible, non-invasive and repeatable method for estimating roe volume and to compare the results with roe weight as determined post mortem.

Materials & Methode

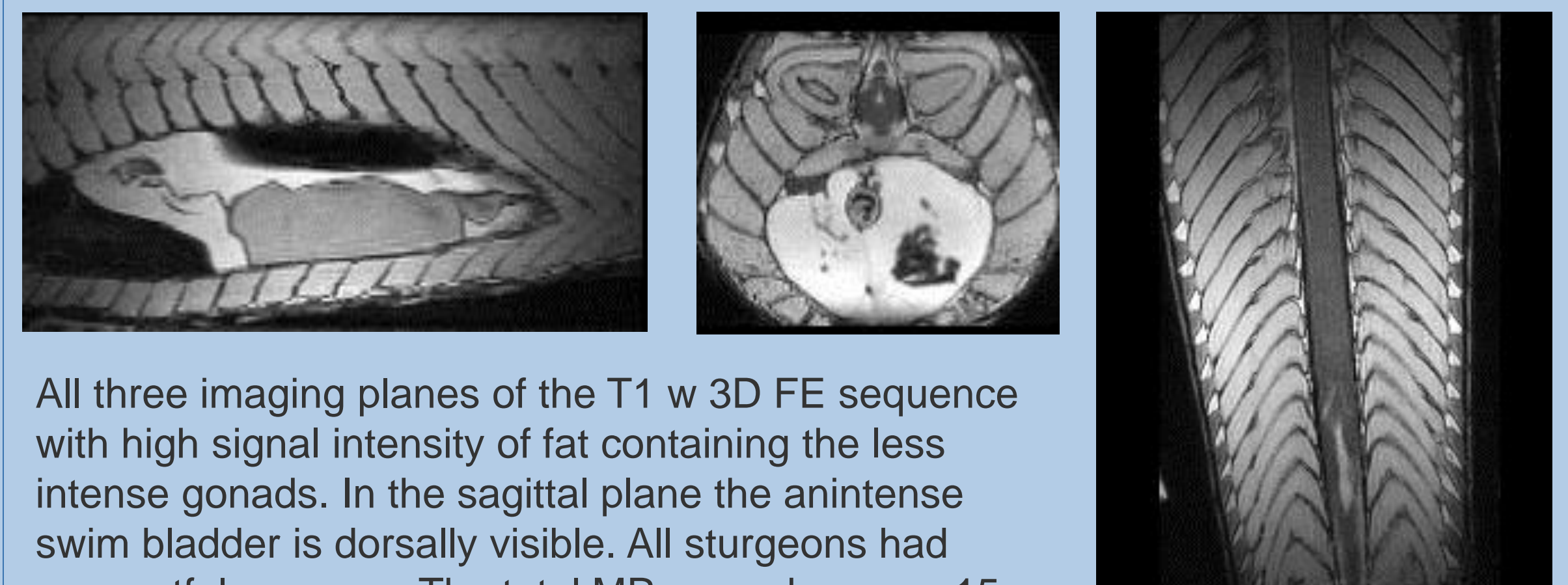
Five sturgeons were examined under general anaesthesia with Aqui-S (isoeugenol). During the scan they were wrapped into a wet towel to keep the skin humid. In all fishes a high resolution, isotropic 3D T1 weighted field echo sequence was performed.



Screen of the 3D workstation: semi-automatic volume determination of gonads and scanned body by region growing and threshold segmentation.

Within 10 d after MR examination the sturgeons were slaughtered and the carcass weight and weight of the gonads was measured. The gonad/carcass percentage was compared to the gonads/ body percentage resulting from the MRI.

Results



All three imaging planes of the T1 w 3D FE sequence with high signal intensity of fat containing the less intense gonads. In the sagittal plane the anintense swim bladder is dorsally visible. All sturgeons had uneventful recovery. The total MR procedure was 15 minutes per sturgeon.

Percentage of gonads to bodyweight in comparison to gonads volume to body volume.

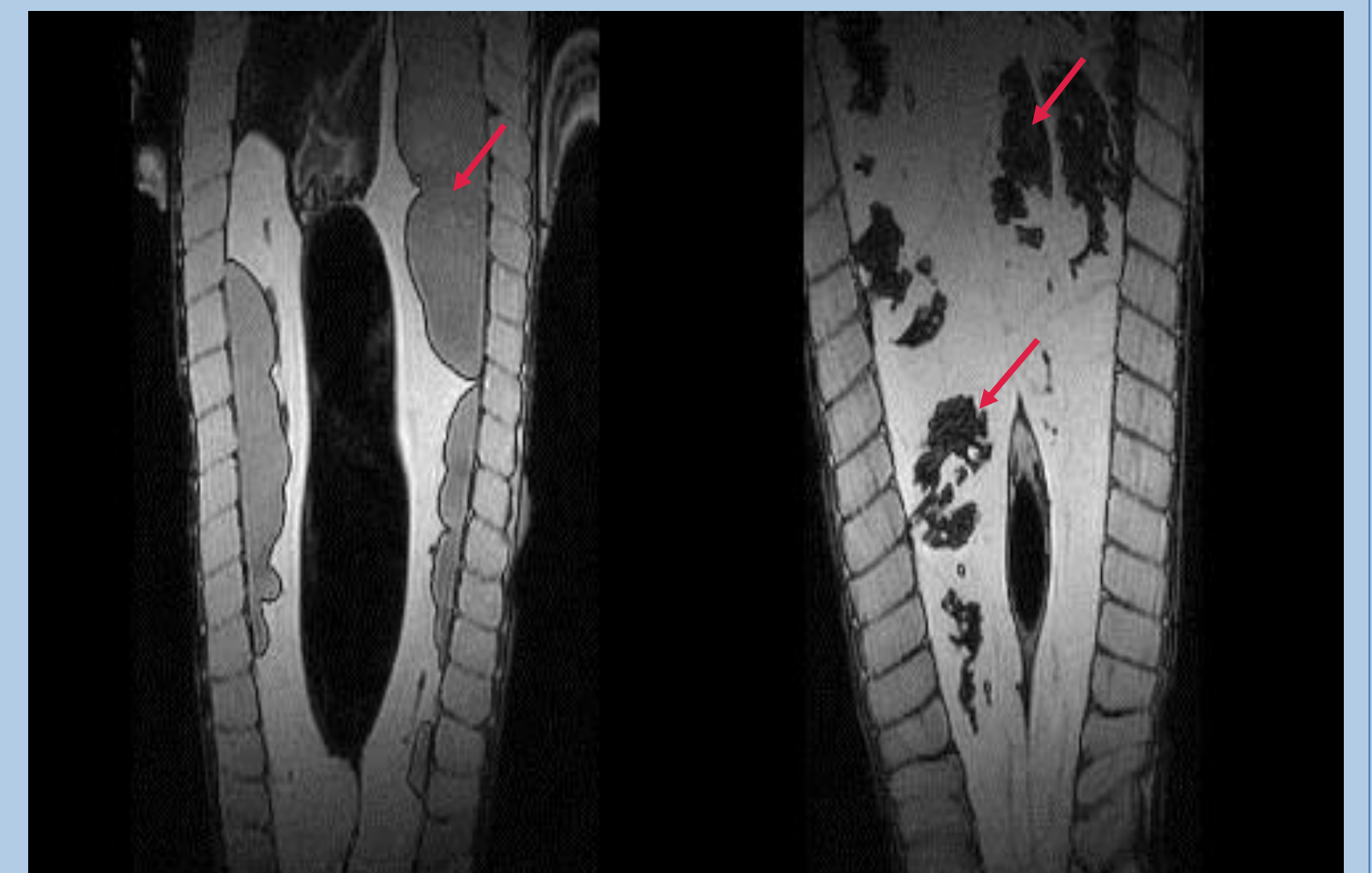
Sturgeon	1	2	3	4	5
Weight gonads/ carcass (in%)	12	18	22	6	20
Volume gonads/ body (MRI) (in %)	16	21	22	0.6	3
Ratio between weight and volume percentages	0.75	0.86	1	10*	6.67**

*Small gonads in a hermaphrodite (post mortem examination)

**Feathered gonads, post mortem separation from fat not possible

Discussion

The resulting volume segmentation promises MRI to become a useful tool in gonad volume estimation. Statistical evaluation was precluded with the low number of animals in the preliminary study.



Differentiation of roe (↙) from surrounding fat in the dorsal plane, even if the gonads were small and feathered (left image)

Conclusion

The difference in volume and gonad percentage of weight to MR-volume in animals with small gonads reflects the difficulties in post-mortem separation of fat vs. gonad tissue, thus suggesting MRI as the gold standard method evaluating ultrasound as a clinical method to determine maturation.



Bon appétit!

