Correlation of Magnetic Resonance Cholangiography with Fluoroscopic Retrograde Cholangiography and Corrosion Casting in Dogs– A Post-mortem Pilot Study

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INTRODUCTION

In human medicine, magnetic resonance cholangiography (MRC) allows visualization of hepatobiliary ducts, helping to diagnose hepatobiliary diseases and aiding surgical planning. [1,2] In veterinary medicine, however, data evaluating the diagnostic value of MRC are limited. MRC has been used so far only in one experimental study in dogs,[3] a feline model of chronic pancreatitis,[4] and in cats with spontaneous cholangitis or pancreatitis[5] revealing its potential for visualizing biliary ducts of both species.

Aim

To assess the feasibility of MRC for dogs by comparing its images with fluoroscopic retrograde cholangiography (FRC) and corrosion casting (CC).

MATERIALS & METHODS

Study population:

- Donated bodies of 8 adult dogs, euthanized with owners' consent for diseases unrelated to the study
  - Median age 13.5 years (range: 9-15)
  - Median weight 15 kg (range: 7-23)

Direct assessment of biliary ducts

- **Necropsy and histology**

Postmortem MRI / MRC:

- **Coil:** Human head coil
- **Positioning of the dog:** Dorsal recumbency
- **MRI procedure:**
  - 1.5 Tesla MRI system (Ingenia, Philips, The Netherlands)
  - T1 and T2 turbo spin echo (TSE) sequences to localize the region of interest
  - Three-dimensional (3D) TSE-MRC to visualize biliary tract anatomy

Postmortem FRC:

- Cannulation was performed via major papilla
- Iodine contrast medium was injected to fill the biliary tract
- Fluoroscopic images were obtained

Postmortem CC:

- Vinyl polysiloxane (VPS; Express™ 2 VPS Impression Materials; 3M ESPE AG; Germany) was injected into the biliary system

Diameter measurements in 3D-TSE-MRC, FRC and CC:

- Using ImageJ 1.45 (Bethesda, Maryland, US)
- Measured diameters:
  - Gallbladder (GB; fundus, body, neck)
  - Cystic duct
  - Common bile duct (CDB; at papilla and extrahepatic ducts' junction)

Statistical analysis:

- Spearman correlation coefficient (r) to evaluate relationship between MRC and FRC or casts

RESULTS

NECROPSY:

- 7 dogs: no evidence of biliary tract disorders
- 1 dog: acute extrahepatic cholestasis and focal destructive cholangitis

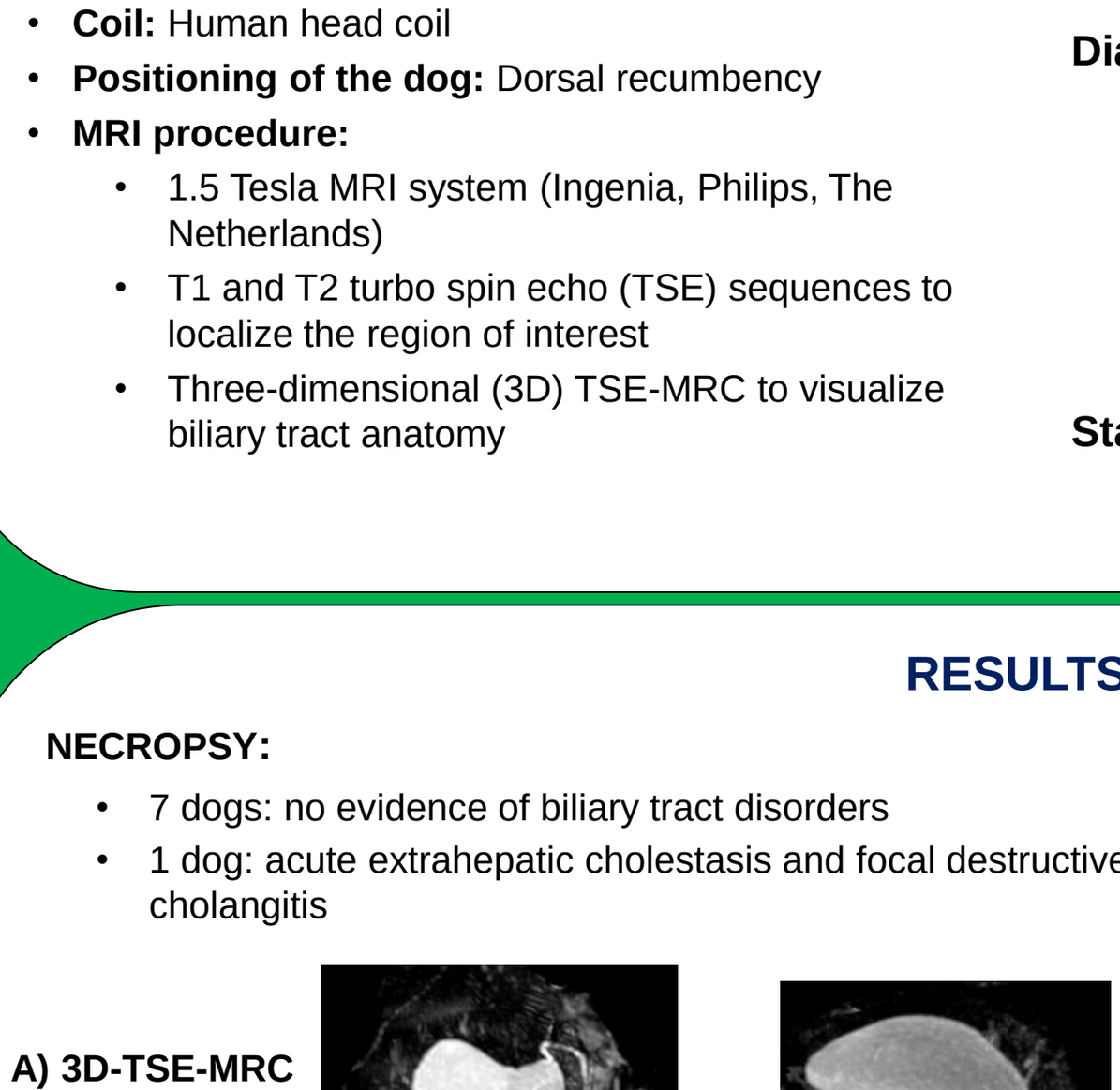

Figure 1 (A-C): Images of a dog with no evidence of biliary tract disorders.

Figure 2 (A-C): Images of a dog with acute extrahepatic cholestasis and focal destructive cholangitis.

- **MRC** presented the same biliary structures as FRC or CC

	Mean diameter in MRC (mm)	Mean diameter in FRC (mm)	Mean diameter in CC (mm)
GB neck	6.78	7.76	6.80
Cystic duct	2.70	3.40	3.00
CBD at papilla	1.48	1.93	1.60

- MRC versus FRC
  - Very strong positive correlation for measuring GB neck (r: 0.85, p: 0.011)
- MRC versus CC:
  - Strong positive correlation for measuring cystic duct (r: 0.76, p: 0.037)
  - Very strong correlation for measuring CBD at papilla (r: 0.86, p: 0.008)

CONCLUSIONS AND DISCUSSION

- MRC can be regarded as a diagnostic modality that in comparison to FRC and CC allows an accurate imaging and measurement of the biliary duct system in dogs
- Larger clinical studies, including dogs without and with biliary tract disorders are warranted to assess the overall diagnostic value of MRC

REFERENCES

1. Mesrur HA. Magnetic resonance cholangiopancreatography. Semin Roentgenol 2008; 43(4): 282–9
2. Maurea S, et al. Comparative diagnostic evaluation with MR cholangiopancreatography, ultrasonography, and CT in patients with pancreatobiliary disease. Radiol Med 2009; 114: 390–402
3. Heo J, et al. Dynamic secretin-enhanced magnetic resonance cholangiopancreatography and pancreatic ultrasonography in normal dogs. Proceedings of the American College of Veterinary Radiology, Annual Scientific Meeting. Las Vegas, October 18–21, 2012. p. 105.
4. Marolf AJ, et al. Hepatic and pancreaticobiliary MRI and MR Cholangiopancreatography with and without secretin stimulation in normal cats. Vet Radiol Ultrasound. 2011; 52(4): 415-421
5. Marolf AJ, et al. Magnetic resonance (MR) imaging and MR cholangiopancreatography findings in cats with cholangitis and pancreatitis. J Feline Med Surg. 2013; 15(4): 285–94