Evaluation of sagittal T2W versus STIR sequences in the localisation of canine IVDD with low-field MRI

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INTRODUCTION

Sagittal T2-weighted sequences (T2W) are the mainstay of spinal protocols in MRI, with regards to initial lesion localisation. This presumptive localisation guides the more focussed acquisition of additional sequences when further characterising the pathology in question. We regularly employ the use of short tau inversion recovery (STIR), as anecdotally STIR can be useful in identifying IVDD (or associated spinal cord pathology) in instances where sagittal T2W has proved unrewarding. We hypothesised that STIR would provide better sensitivity than T2W in the detection of IVDD during preliminary sagittal screening. This retrospective study was designed to determine if sagittal STIR could be considered as an alternative to T2W in low-field MRI spinal protocols.

MATERIALS AND METHODS

Dogs (n=113) who underwent spinal MRI (0.4T Hitachi) at DWR between January 2010 and October 2014 were retrospectively recruited. The test population (n=94) inclusion

criteria required both T2W and STIR sagittal sequences, an MRI diagnosis of IVDD, and surgical confirmation of IVDD and disc localisation. Control patients (n=19) with unremarkable MRI findings were included in the study. The T2W and STIR images were randomised and blindly-reviewed by a board-certified radiologist and neurologist. Both interpreters independently reported the suspected location of IVDD and extent of cord compression (reflecting the location that would be recommended for further MRI evaluation in a clinical setting), extrusion versus protrusion, visible secondary pathology, and their diagnostic confidence.

RESULTS

IVDD location was correctly identified more frequently with T2W (125/188) versus STIR (108/188). Fewer false negative diagnoses were obtained with T2W (5/188) versus STIR (8/188). Fewer false positive diagnoses were made with STIR (13/38) versus T2W (14/38). STIR accurately localised IVDD in 42.9% patients (27/63) where T2W had previously resulted in mis-localisation or false negative diagnosis. Consequently, had both STIR and T2W been reviewed in combination, the sensitivity for IVDD localisation would have risen to 80.9%.

CONCLUSION

Our hypothesis was rejected. The sensitivity for IVDD localisation was better for sagittal T2W than comparable STIR sequences. We cannot therefore recommend replacing T2W with STIR in spinal protocols. The study however highlights that STIR is capable of identifying disc pathology otherwise inconspicuous in T2W. We therefore conclude that sagittal STIR should be considered a useful adjunct to sagittal T2W during lesion localisation in spinal MRI.

Randomized controlled evaluation of techniques for ultrasound-guided fine needle aspiration of the liver

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INTRODUCTION

Ultrasound-guided fine needle aspiration (FNA) is well established as a relatively safe technique for the cytological sampling of abdominal organs. However, there is some controversy over exact technique; specifically whether suction (aspiration) should be applied during sampling. Potentially, aspiration can result in greater blood contamination, but conversely, non-aspiration may result in a lower cell harvest. Limited evidence

from human medicine suggests that non-aspiration may be the better technique for some organs. However, direct comparisons in abdominal organs such as the liver are lacking for both human and veterinary patients.

AIMS

To compare the quality and diagnostic value of cytological samples from the liver obtained by the two different FNA methods and determine if one technique is superior to the other.

METHODS

Dogs that required ultrasound-guided FNA of the liver as part of their normal clinical investigation were recruited and randomly assigned to one of two groups for sampling by an aspiration (Asp) or non-aspiration technique (Non-Asp). Obtained slides were blindly reviewed by external cytopathologists unaware of the technique used. Cytological reports were reviewed for their overall diagnostic value, with cell harvest/cellularity, cell preservation and haemodilution also recorded. Chi-squared statistical analysis was performed to determine if there was a significant difference in the prevalence of diagnostic samples between the groups. Sample size calculations estimated at least 117 dogs were required.

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RESULTS

A total of 119 dogs were recruited (65 Non-Asp and 54 Asp), with a median age of 9.9 years (interquartile range 7.2–11.3 years). Overall, 88.2% (95% confidence intervals 82.4–94.0) of the samples were diagnostic. There was a significant difference ($P=0.037$) in the prevalence of diagnostic samples between the Asp (81.5%; 95%CI 71.1–91.8) and Non-Asp groups (93.9%; 95%CI 88.0–99.7). Non-diagnostic samples were significantly associated with lower cellularity, poorer cell preservation and

more severe haemodilution ($P<0.001$ for all). However, no significant difference in the prevalence of these specific variables was found between the Asp and Non-Asp groups.

CONCLUSIONS

For fine needle sampling of the liver a non-aspiration technique is considered superior to aspiration, resulting in a greater proportion of diagnostic samples.

Can CT measurements of femoral varus be performed reliably, even between reconstructions?

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Excessive femoral varus has been implicated in the aetiology of canine medial patellar luxation. Several reports have demonstrated that malpositioning for radiography in terms of either femoral elevation or rotation can have marked effects on the measured varus angle. Three-dimensional reconstruction of CT images offers the clinician the possibility to eliminate these positional confounders. Although one recent study reported good repeatability for measurements made from a single reconstruction, we are not aware of previous reports of reproducibility of varus measurements between reconstructions, a situation with more real-life applicability. Inter-reconstruction reliability can be considered a proxy for scan-rescan reliability, for which little information is available in either the veterinary or human literature.

CT scans of 20 canine femora underwent 3D reconstruc-

tion by 3 independent observers. Reconstruction spin and tilt data were used to assess reconstruction variability. Two observers of differing experience levels made 3 independent readings of femoral varus using their own reconstructions, and measurement reliability was assessed using the repeatability coefficient. The repeatability coefficient represents the interval within which two measurements on the same patient are expected to fall in 95% of cases. Coordinate data from one set of reconstructions and the spin and tilt data obtained above were used to specify a model to predict the effect of reconstruction variability on varus measurements.

Intra-observer repeatability coefficients were 2.4° and 2.6°, and the interobserver repeatability coefficient was 3.5°. Reconstruction variability yielded a spin-tilt ellipse area of 0.59 deg², and spin and tilt variation were considerably lower than that which has been reported for human femoral scans. Surprisingly, reconstruction variability produced minimal effects on simulated varus measurements in contrast to previous experimental reports. Possible explanations include changing landmark appearance which cannot be modelled and different magnitudes of femoral subtense (procurvatum) in our specimens compared to previous reports.

CT varus measurements can be performed with clinically relevant levels of precision both within and between reconstructions, regardless of experience level. Provided strict reconstruction criteria are followed, reconstruction variability will be low and likely to have little influence on the values obtained.