Feasibility of MR guided direct arthrography

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Introduction

Direct MR arthrography is increasingly the preferred imaging investigation for diagnosing subtle intra-articular joint pathology, such as labral tears in the shoulder and hip. Current techniques require X-ray fluoroscopic guidance for initial joint puncture and introduction of contrast medium, followed by transfer to an MR system and subsequent joint imaging. The disadvantages of this approach include use. A technique that allows the procedure to be entirely carried out using an MR system would overcome the disadvantage of needing adjacent radiology facilities and using ionising radiation. This has been previously described using low field strength open systems [1,2] and on a 1T closed system with in room display [3] but not using 1.5T whole body closed bore MRI systems that make up the majority of the installed base used for musculoskeletal imaging worldwide. These “closed” systems in general provide higher performance for both fast and high spatial resolution musculoskeletal imaging. This work develops a method using animal joint simulations and demonstrates the feasibility of performing the initial needle placement and contrast medium injection on a standard commercial 1.5T MR system using in room scanner control and display, with adaptations that are simple to implement, that allows a direct arthrogram to take place in a single MR examination.

Methods

A strategy was developed based on in-room direct control of the MR system and the current approaches used for CT & X-ray fluoroscopic interventions i.e. to confirm the position of the target and needle using interval imaging but to modify the needle position and perform the injection with the patient just outside the bore of the magnet. Interactive MR fluoroscopy (IMRF) with a range of susceptibility contrast would allow needle location demonstration: T2w or T2/T1w contrast for observing the injection of lignocaine and T1w imaging for demonstrating the dilute gadolinium used in the joint injection phase. The ability to use thick section “projection” imaging to monitor contrast medium dispersal during the injection phase was also considered desirable.

Results

Evaluation criteria included success or failure of joint puncture, number of needle passes, degree of extravasation and duration for the contrast medium dispersal during the injection phase was also considered desirable.

Conclusions

This work demonstrates the feasibility of performing direct MR arthrography using an “all-in-one” single MR examination on a commercial 1.5T closed bore MRI system, avoiding the need for X-ray fluoroscopic facilities but exploiting the available imaging performance of a standard MR system. The use of an in room control and display system simplifies the positioning of the needle and allows rapid confirmation of an intra-articular injection. Further patient studies will be performed as a part of this feasibility study to refine the technique.

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References

5 Butts K et al, JMRI 1999;9:586-595.
6 Butts K et al, JMRI 1999;9:586-595.
7 Butts K et al, JMRI 1999;9:586-595.
8 Butts K et al, JMRI 1999;9:586-595.
9 Butts K et al, JMRI 1999;9:586-595.
10 Butts K et al, JMRI 1999;9:586-595.