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Comparison of Radiation Doses of Various Approaches of MR Arthrograms with Fluoroscopic Guided Contrast Injection

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Introduction

Magnetic resonance arthrography is an imaging technique that utilizes fluoroscopic guided injection of gadolinium contrast into a joint, thereby improving the delineation and details of intra-articular structures, and hence the corresponded pathologies for guiding of treatment. However, along with injection of contrast during fluoroscopy screening, ionizing radiation is inevitably introduced to the patients simultaneously. In order to minimize the risk of ionizing radiation for each diagnostic procedure for both the patients and radiologists, it is important to ensure the radiation doses are not only within international reference levels, but also kept as low as reasonably achievable (ALARA).

Objectives

A retrospective study was conducted to review the radiation doses of various regional arthrograms, and to evaluate the radiation doses of different approaches in shoulder arthrography.

Methodology

29 patients (mean age 40 years, range 17-73 years) were evaluated during the period from January to June 2013 for MR arthrograms of the shoulder (n=18), hip (n=4) and wrist (n=7) joints. Statistical analysis was performed on fluoroscopic screening time, dose area product (DAP) and effective dose. Effective doses were obtained from DAP with reference of dose conversion coefficient of arthroscopy as recommended by NCRP, i.e. 0.1mSvGy-1cm-2.

Result

The DAPs of shoulder, hip and wrist arthrograms were 0.87 mGycm2, 1.76 mGycm2 and 0.33 mGycm2 with the mean screening times of 0.6min, 0.7min and 1.0min respectively. The calculated mean effective doses of the three corresponding regions were 0.09mSv, 0.17mSv and 0.03mSv. For shoulder arthrograms, the DAPs of rotator interval (R.I.), low anterior and posterior approaches were 0.37 mGycm2, 1.49

mGycm2 and 0.71 mGycm2 with the mean screening times of 0.54min, 1.06min and 0.56min respectively. The corresponding effective doses were 0.04mSv, 0.18mSv and 0.08mSv. A significantly lower radiation dose were achieved with the rotator interval approach (R.I. Vs low anterior: p=0.006; R.I. Vs posterior: p=0.042). The overall mean effective dose of arthrograms at our center is 0.09mSv. Taking UNSCEAR 2008 as an international reference level of 0.17mSv, our center offers a well below radiation dose level. Radiation doses of arthrograms of our center are well compared with the international level. Rotator interval offers the lowest radiation dose for among various approaches of shoulder arthrogram.