Purpose: One strategy for reducing the amount of time required to MR scan the volume required for radiation treatment planning of the head and neck region (top of head to apex of lung) is to divide this volume into three consecutive scans using different scan volumes, fields of views, and resolutions. Unlike CT, MR image positions are reconstructed relative to the isocenter of magnetic field. Thus for different scan volumes, the MR couch moves the volume of interest to the isocenter. Couch movement error must be quantified if several consecutive MR datasets are to be coalesced accurately along the cranial-caudal axis. A QA phantom was constructed to quantify MR couch movement error.
Methods and Materials: The phantom consists of three pieces of 2mm acrylic material arranged in a figure "N" within a hollow, acrylic box filled with distilled water. The angles within the N were designed to detect longitudinal shift errors of 1mm. Geometric accuracy of the QA phantom was evaluated using CT. Using a Philips 3T Archieva MR scanner, the phantom was imaged in sections using different resolutions, field of views, couch positions and varying couch loads.
Results: A couch shift error of 0.3±0.4mm and 0.8±0.3 mm was measured for 5cm and 10 cm movements, respectively with 95kg load. For no load, the corresponding values were 0.1±0.2mm and 0.3±0.4mm. Three consecutive scans of the QA phantom acquired with different sequences and FOVs (240~360mm) and resolution (0.95x0.95x1mm3 and 1x1x2mm3) were accurately 'stitched' into one data set using the quantified couch shift correction.
Conclusions: The QA phantom developed for this work could be used to quantify absolute MR couch shift and geometrically correct for any couch error in the coalescing of consecutive MR scans. It may be useful as a daily QA tool for MR simulation.