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Role of Gradient Echo Sequence in Delineation of Thenar Muscles Anatomy

Sabrilhakim Sidek¹, Mohd Shukry Mohd Khalid¹, Muhammad Rozaidi Roslan², Shahrul Naim Sidek²

¹Medical Imaging Unit, Faculty of Medicine, Universiti Teknologi MARA (UiTM), Sg Buloh Campus, Sg Buloh, Selangor, Malaysia, ²Mechatronics Engineering Department, Kulliyah of Engineering, International Islamic University Malaysia (IIUM), Kuala Lumpur, Malaysia

Objectives: Magnetic Resonance Imaging (MRI) is known to be the imaging modality of choice to assess human muscles anatomy superior to other modalities (eg: ultrasound and CT scan) due to its excellent ability to differentiate soft tissue contrast, good spatial resolution and wider field of view with no radiation effect. To date, proton Density (PD), T1W and T2W sequences are been utilised to assess muscular structures. However, delineation of each thenar muscle which are small in size can be difficult using these sequences. Therefore, in this case study, we utilised gradient echo sequence i.e. DESS 3D sequence to delineate each thenar muscles of the hand of a healthy male subject in two different thumb positions and comparison was made between PD, T1W and T2W 3D sequence images.

Methods: Magnetic resonance imaging was performed using a MAGNETOM Aera 1.5 Tesla scanner (Siemens Healthineers, USA). The imaging protocol included coronal three dimensional Double Echo Steady State (DESS 3D), PD, T1W and T2W, each with reconstruction of axial and sagittal views. Each acquisition sequence was performed for each full abduction and adduction of the thumb of the right hand. The thenar muscles observed were adductor pollicis, flexor pollicis brevis, abductor pollicis brevis and opponens pollicis muscles.

Results: We found that thenar muscles anatomy can be better delineated and differentiated using DESS 3D sequence. Comparing to other sequences, acquisition time for DESS 3D was also faster. Other small muscles of the hand such as hypothenar, interossei and lumbricals muscles were also better delineated using this sequence. Furthermore, DESS 3D sequence was also useful to assess cartilage of joints of the hand.

Conclusions : Gradient echo sequence plays an important role in delineation of thenar muscles anatomy as well as other small muscles of the hand.

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Keywords : Magnetic Resonance Imaging, Gradient Echo Sequence, Muscle, Thumb, Hand