

Quantitative MR Imaging of the Temporomandibular Joint Disc Using UTE

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Purpose: The temporomandibular joint (TMJ) is a complex synovial joint and consists of the mandibular condyle, articular eminence, and fibrocartilaginous disc. Proper functioning of the articulating components is essential for mastication and speech.^{2,5} MRI is the diagnostic tool utilized to evaluate TMJ disorders (TMJDs) as it provides excellent tissue contrast using high resolution surface coils.^{1,3,5} However, quantitative evaluation of the TMJ disc is seldom used. Due to relatively short T2 nature of the disc, techniques such as ultrashort time-to-echo (UTE) can be beneficial for capturing MR signal before the decay.⁶ **The objective of this study was to compare UTE T2* values of TMJ discs in normal and symptomatic subjects.**

Methods: Samples: Unilateral TMJ of asymptomatic (n=5, 3F, 2M, 37 ± 18 yrs, mean ± SD) and symptomatic (n=3, 2F, 1M, 52 ± 9 yrs) subjects were evaluated. **MRI:** Subjects were imaged at 3T (GE Signa HDx) using a 3" surface coil adjacent to the TMJ, in a sagittal-oblique plane. Two-dimensional UTE T2* sequence were used: TR=300 ms, TE=0.01, 4, 9, 13 ms, field of view=80 mm, scan time=4 min. **Image Processing:** Region of interest (ROI) representing the TMJ disc was selected and fit mono-exponentially to determine the average T2* value for each subject. **Statistics:** UTE T2* values between subject groups were determined using ANOVA.

Results: Using the UTE T2* sequence, the TMJ disc (Fig.1A, star) is depicted with a high signal intensity at the shortest TE of 0.01 ms (Fig.1A) and with lowered signal intensity at longer TEs of 3 ms (Fig.1B) and 8 ms (Fig.1C). Fitting was typically very good (Fig.1D), and there was a distribution of T2* values within a whole TMJ disc, as seen in a color map of T2* values (Fig.1E). The group mean UTE T2* values (Fig.1D) of asymptomatic and symptomatic subjects were 7.4 ± 1.5 ms and 14.0 ± 4.7 ms, respectively, showing a slightly higher (ANOVA p=0.15) values for the symptomatic subjects.

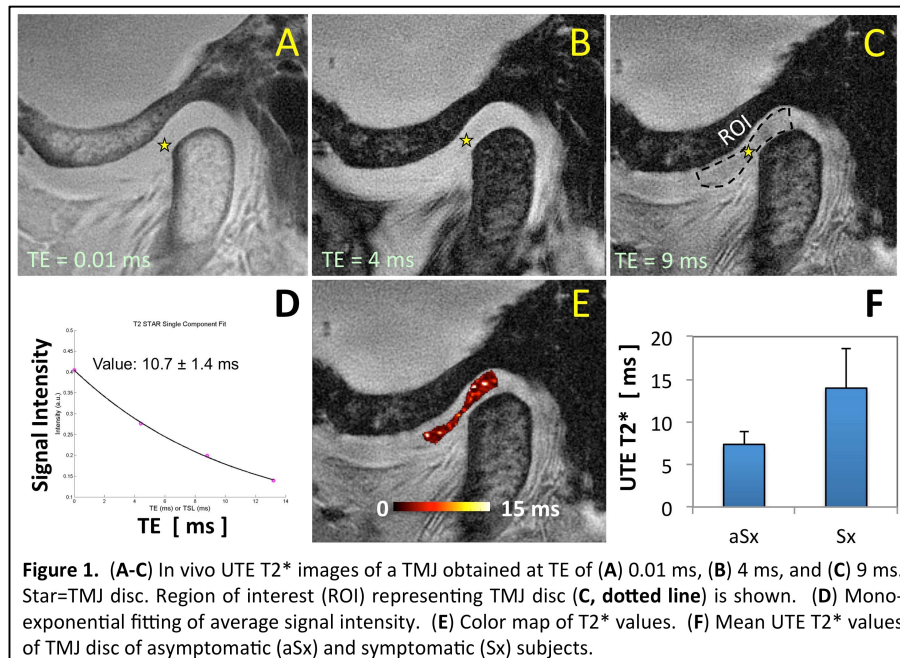


Figure 1. (A-C) In vivo UTE T2* images of a TMJ obtained at TE of (A) 0.01 ms, (B) 4 ms, and (C) 9 ms. Star=TMJ disc. Region of interest (ROI) representing TMJ disc (C, dotted line) is shown. (D) Mono-exponential fitting of average signal intensity. (E) Color map of T2* values. (F) Mean UTE T2* values of TMJ disc of asymptomatic (aSx) and symptomatic (Sx) subjects.

Discussion: Although evaluated in a very small number of subjects, this study demonstrates feasibility of UTE T2* evaluation of the TMJ disc in vivo with high image quality, performed in a relatively short acquisition time. There was a trend of large difference in the mean T2* values between normal and symptomatic subjects, suggesting the TMJ disc may be altered in TMD, and UTE T2* evaluation may be used as a tool for early diagnosis of TMJ disc.

Conclusion: These results show feasibility of in vivo quantitative MR evaluation of TMJ disc using the UTE T2* technique, which may provide sensitive and objective measure of TMJ disc degeneration in TMD patients.

References: (1) Bag+ World J Radiol 6:567,2014. (2) Bae+ Skel Rad 43:1217, 2014.(3) Geiger+ Skel Rad 43:19, 2014. (4) Willard+ Arc Oral Biol 57:599, 2012. (5) Aiken+ Magn Reson Clin N Am 20:397, 2012. (6.) Chang+ JMRI 1,2014.