

# Knee Cartilage MRI T2 and T2\* Characteristics of Professional Rugby Players

Qi Zhao<sup>1</sup>, Tianze Liu<sup>2</sup>, Yazhen Cui<sup>1</sup>, Nian Wang<sup>3</sup>

<sup>1</sup>Jimei University, Xiamen, China, <sup>2</sup>Changhai Hospital, Shanghai, China, <sup>3</sup>Indiana University, Indianapolis, IN, United States

Email of Presenting Author: [420622197@qq.com](mailto:420622197@qq.com)

**Disclosures:** Q. Zhao: None. T. Liu: None. Y. Cui: None. N. Wang: None.

**INTRODUCTION:** Rugby, as one of the most popular competitive sports, suffers increasing number of knee joint injuries during high-intensity training<sup>1,2</sup>. Knee cartilage defects in rugby players remains a problem in orthopedic practice. Magnetic resonance imaging(MRI) enables quantitative assessment of morphological abnormalities, not only including thickness, T2 values also as imaging biomarker of cartilage quality and injury<sup>3</sup>. Meantime, T2\* values may increase the sensitivity to cartilage degeneration in particular close to the cartilage bone interface<sup>4</sup>. Therefore, we assumed that T2, T2\* and thickness could be used as parameters for detecting knee joint cartilage damage in rugby players.

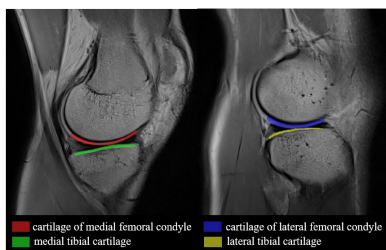
**METHODS:** Forty professional rugby players (female 21, male 19) and forty controls (female 19, male 21) were scanned using Multi-Echo Spin Echo sequence for T2 and Fast Low Angle Shot sequence for T2\* at 3.0 T. MRI T2 parameter settings as follows: FOV=160×160×160 mm<sup>3</sup>, Voxel size=0.4×0.4×4 mm<sup>3</sup>, Slice thickness=4 mm, TE=13.8, 27.6, 41.4, 55.2, 69 ms, TR=1680 ms; MRI T2\* parameter settings as follows: FOV=160×160×160 mm<sup>3</sup>, Voxel size=0.4×0.4×4 mm<sup>3</sup>, Slice thickness=4 mm, TE=4.36,11.9, 19.44, 26.98, 34.52 ms, TR=890 ms, Flip angle=60°. The knee cartilage could be divided into four zones<sup>5</sup>: cartilage of medial femoral condyle (MFC), medial tibial cartilage (MTC), cartilage of lateral femoral condyle (LFC) and lateral tibial cartilage (LTC) (Figure 1). T2 value, T2\* value and thickness were also calculated, and compared by rugby and control group. The comparison was performed using two sample t test, and significance was set at  $p < 0.05$ .

**RESULTS SECTION:** For T2 values, the rugby group was significantly higher than control group in LFC and LTC zone. Specifically, the significant difference in males was reflected in MFC, LFC and LTC zones, while the difference in females was reflected in the LFC. On the other hand, T2\* value of rugby group was significantly higher than control group in MTC and LFC zone. The thickness in the four zones was thicker in the rugby group (Figure 2).

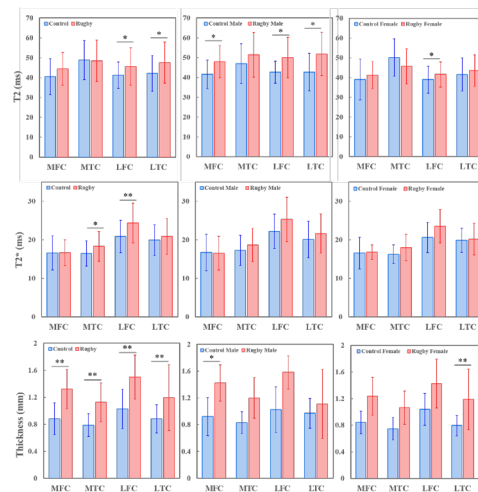
**DISCUSSION:** Our study explored the difference of knee cartilage between high-level rugby players and the control group at 3T MRI. We did find abnormal features of knee cartilage in rugby players, mainly manifested as higher T2 values in LFC and LTC, higher T2\* values in MTC and LFC, and thicker thickness of knee cartilage. Higher T2 values might be associated with osteoarthritis<sup>3</sup> and helpful to early identify players with knee cartilage degeneration<sup>6</sup>.

**SIGNIFICANCE/CLINICAL RELEVANCE:** T2 value, T2\* value and thickness may be powerful tools for investigating Knee Cartilage injury. The results of the study could provide suggestions for the prevention and treatment of knee joint injuries in rugby athletes.

**IMAGES:**



**Figure1.** Delineation of knee joint cartilage, including cartilage of medial and lateral femoral condyle, medial and lateral cartilage



**Figure2.** T2 value, T2\* value and thickness of knee joint cartilage. Significance tests were conducted to compare the four parts of cartilage between control and rugby group, and gender. MFC: cartilage of medial femoral condyle; MTC: medial tibial cartilage; LFC: cartilage of lateral femoral condyle; LTC: lateral tibial cartilage; \*  $p < 0.05$  \*\*  $p < 0.01$ .