Lateral Meniscus Extrusion on MRI of Anterior Cruciate Ligament Injury is Likely Complicated by Lateral Meniscal Posterior Root Tears

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INTRODUCTION:

In previous studies, lateral meniscus posterior root tears (LMPRTs) have been identified as a combined injury with anterior cruciate ligament (ACL) rupture in 6.7–20.4% of patients. In addition, LMPRTs are associated with meniscal extrusion and rotational instability and have been linked to degenerative changes in the knee.

LMPRT repair restored the tibiofemoral loading profile to an intact state. If repair is not performed in the acute phase after injury, complete suturing is difficult to achieve, and acute complete LMPRT repair is recommended before ACL reconstruction. However, it is difficult to diagnose complete LMPRT based on physical and magnetic resonance imaging (MRI) findings alone. In addition, even with an intact meniscal root, various degrees of LM extrusion are usually observed in association with ACL tears. Therefore, LM extrusion (LME) has not been demonstrated as an indicator of LMPRT.

We hypothesized that preoperative LMEs would be larger in patients with complete LMPRTs associated with ACL injuries than those with partial LMPRTs with ACL deficiency. Thus, the purpose of this study was to investigate the relationship between preoperative LME, provide an arthroscopic evaluation of LMPRT in ACL-injured knees, and determine the complete LMPRT cut-off value from preoperative LME.

METHODS:

This retrospective case series was approved by the ethics committee of our hospital, and all patients provided informed consent before participating in the study. Patients with a history of LM or knee surgery were excluded from the study. Age, sex, height, body weight, and body mass index were recorded for each patient, in addition to the interval from injury to MRI, MRI to surgery, and injury to surgery. A total of 45 patients were included in the study, 35 with LMPRTs with concomitant ACL injuries and 10 with intact lateral menisci with ACL injuries between February 2011 and July 2021.

The most widely used classification of La Prade divides the LMPRTs into five types. Using this classification, 35 patients were divided into two groups, partial (type 1) and complete (types 2–5) LMPRTs, based on arthroscopic findings at the time of ACL reconstruction. LME was measured using MRI as the distance from the lateral edge of the tibial plateau cartilage to the outer border of the LM (Figure 1).

All statistical analyses were performed using same software package. Data were presented as mean and standard deviation. The Student's t-test was used to analyze quantitative data, and the chi-squared test was used to analyze qualitative data. Statistical significance was set at $P < 0.05$. LME was measured three times with a 2-week interval between each measurement, and the average was calculated. The observers were blinded to previous observations. The optimal LME cut-off associated with the degree of LMPRT was determined using the receiver operating curve (ROC) and by calculating the Youden index (J).

RESULTS:

A total of 35 LMPRTs were classified using the morphological classification system; 17 knees (10 male and 7 female) were classified into the partial LMPRT group and 18 (9 male and 9 female) into the complete LMPRT group. Patients in the complete LMPRT group had 3 radial tears (type 2), 11 bucket-handle tears (type 3), and 4 oblique tears (type 4). There were no cases of avulsion fractures (Type 5). Ten knees (10 male and 10 female) were classified into the intact lateral meniscus group. There were no significant differences between the three groups in terms of the relevant characteristics of the participants (Table 1).

On MRI evaluations, preoperative LMEs were larger in complete LMPRTs associated with ACL injuries than that in intact lateral menisci with ACL injuries and partial LMPRTs with ACL injuries (Figure 2). The ROC analysis identified the optimal cut-off point of the preoperative LME as 2.2 mm, which had a sensitivity of 78% and specificity of 71% for complete LMPRT (Figure 3).

DISCUSSION AND CONCLUSION:

If a preoperative MRI of ACL injury reveals LME over 2.2 mm, there is a high possibility of complete LMPRT complications, and meniscal repair in the acute phase should be considered before ACL reconstruction.

Figure 1 : MRI-based measurement of the LME(left knee)

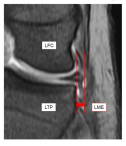


Figure 2 : Preoperative Lateral meniscus extrusion

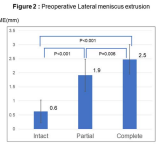
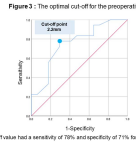


Figure 3 : The optimal cut-off for the preoperative LME



This cut-off value had a sensitivity of 78% and specificity of 71% for the complete LMPRT.

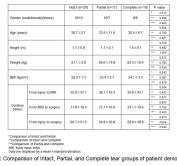


Table 1 : Comparison of Intact, Partial, and Complete tear groups of patient demographics