Analysis of femoral torsion in patients with recurrent patellar dislocation

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INTRODUCTION: Increased femoral anteversion has been suggested as a risk factor for patellar instability. However, femoral torsion in patients with patellar dislocations (PD) has not yet been fully investigated. The purpose of this study was to evaluate the characteristics of femoral torsion in patients with PD.

METHODS: Femoral torsion was evaluated in 43 femurs of the 30 patients with recurrent patellar dislocation (RPD) using computed tomography (CT) (RPD group). The femoral neck anteversion was assessed by measuring the angle between the femoral head-neck line and the posterior condylar (PC) line. The femoral torsion was further analyzed.at three levels (Femoral neck level, mid-shaft level, and distal level) according to the method reported by Seitlinger et al [1]. For control, 36 femurs of 18 patients with anterior cruciate ligament injuries were evaluated (control group) and compared with the RPD group. Further, the RPD group was divided into the HighT-RPD group (19 femurs) with FNAA > 25° and the LowT-RPD group (24 femurs) with FNAA < 25°. A comparison was conducted among the three groups: the HighT-RPD, the LowT-RPD, and the control (C) group. These data were statistically compared by using the Student's t-test and Kruskal-Wallis test ($p < 0.05$).

RESULTS: The mean femoral anteversion in the RPD group was significantly higher than that in the C group (21.9° ± 11.7° vs 9.8° ± 8.9°. $p < 0.01$). The mean femoral neck-torsion was significantly higher in the RPD group than that in the C group (35.1° ± 9.8° vs 29.4° ± 7.7°, $p < 0.01$) while there was no significant difference in mid and distal levels between the two groups (Figure 1). In the three groups comparison, both femoral neck and mid-shaft torsion were significantly larger in the HighT-RPD group compared to the LowT-RPD and C groups, with no significant difference between the LowT-RPD group and the C group (37.8° ± 7.9° vs 31.2° ± 9.4° vs 29.4° ± 7.7°, $p < 0.01$. -18.5° ± 9.9° vs -21.9° ± 10.7° vs -25.5° ± 11.6°, $p < 0.05$). There was no significant difference in distal torsion among the three groups (Figure 2).

DISCUSSION: Increased femoral neck anteversion and proximal torsion were suggested as risk factors for recurrent patellar dislocation. Moreover, among patients with recurrent patellar dislocation, those with larger proximal femoral torsion and smaller counter-directional torsion at the shaft exhibited greater femoral torsion. Increased femoral torsion has been reported to be associated with patellar instability[2] and poor clinical outcomes after medial patellofemoral ligament reconstruction and tibial tubercle transfer for RPD[3]. Investigating at which position of the femur excessive torsion occurs will be helpful in determining the correction position when performing derotational osteotomy.

SIGNIFICANCE/CLINICAL RELEVANCE: Increased femoral neck torsion could be a risk factor for patellar dislocations and femoral neck torsion may be a predominant pathological component of the increased torsion. However, the contribution of femoral torsion to the pathology of RPD still remains to be investigated.

REFERENCES: [1] Seitlinger G. Am J Sports Med. 2016 [2] Diederichs G. Am J Sports Med. 2013 [3] Chen X. Orthop J Sports Med. 2023

IMAGES AND TABLES:

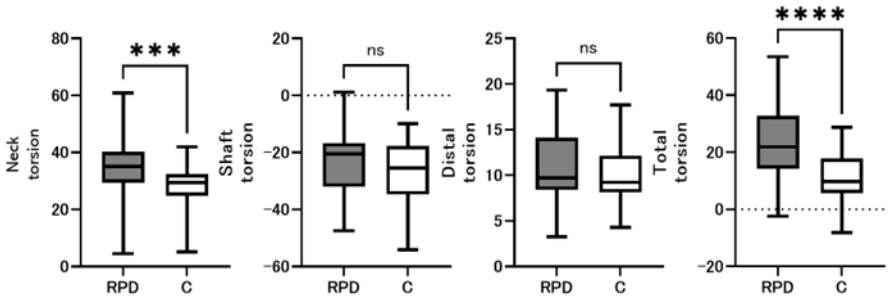

Figure1. Comparison of each torsion of the femur among the two groups. Statistically significant difference between groups: ***$p < 0.001$, ****$p < 0.0001$.

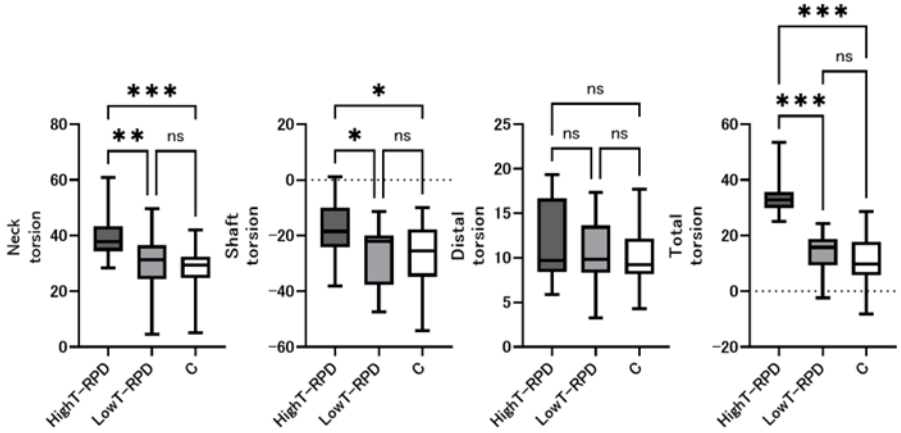

Figure2. Comparison of each torsion of the femur among the three groups. Statistically significant difference between groups: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.