

The synovial plicae in the knee joint

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ABSTRACT

Objectives: To investigate and evaluate the prevalence of 4 kinds of synovial plicae named according to patella, which are inferior, medial, lateral and superior.

Methods: We evaluated plicae in 318 knee arthroscopies through video records, obtained from January 1994 to December 2002 in the Arthroscopy Unit, Department of Orthopedic Surgery, Faculty of Medicine, Trakya University, Edirne, Turkey. In addition, we also investigated plicae in 7 bilateral knee cadavers.

Results: In the arthroscopic evaluation, the prevalence of infrapatellar synovial plica was 194 (61%), mediopatellar

plica was 302 (95%), lateral patellar plica was 66 (20.7%) and suprapatellar plica was 184 (57.8%). We found that there were 8 (57%) infrapatellar synovial plicae, 13 (92%) mediopatellar plicae, 7 (50%) lateral patellar plicae and 6 (42%) suprapatellar plicae in 14 cadaveric knees.

Conclusions: We observed a high prevalence of lateral plicae and mediopatellar plicae on the cadavers and the people with arthroscopic diagnosis, and believe our results can contribute to knee anatomy and surgery.

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Thin synovial membranes separate the synovial cavities of knee joints. In embryogenic life the absorption of these membranes can be incomplete, and these septa may persist through fetal development. These septa, which continue into the adult life, are called the synovial plica. It has been suggested that synovial plicae are one of the causes of anterior knee pain in children and adolescent.¹ These synovial folds cause some pathological conditions that are indistinguishable from other internal derangements of the knee.^{2,3} André Vesalius a Belgian physician and anatomist was the first person to describe the infra-patellar plica,^{4,5} and Japanese authors^{6,9} clearly described the other synovial plicae of the knee joint. However, they did not attach any major pathological importance to these structures. In 1950, Pipkin was the first author to focus attention on a plica as a cause of knee symptomatology.^{10,11} We can identify 4 types

of synovial plicae according to their relationship with the patella: infrapatellar, mediopatellar, lateral patellar and suprapatellar plicae.^{3,12-14} The plicae vary widely in both structure and size, they can be fibrous or fatty.¹⁵ The aim of this study is to define the arthroscopic and anatomic cadaveric prevalence for the plicae in the knee joint.

Methods. We evaluated video recordings of 318 knee arthroscopy, obtained between January 1994 and December 2002 in the Arthroscopy Unit of the Department of Orthopaedic Surgery, Faculty of Medicine at Trakya University, in terms of the existence of plicae. One hundred and thirty-seven were men and 181 of them were women; and comprised patients referred to the department of orthopaedics with anterior knee pain. The mean age was 42.8 years, with a range of 82-16 years. One hundred and

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fifty of the knees were right, 134 were left, and 12 (total 24) were bilateral. The same orthopedic surgeon performed all arthroscopies. We noted and recorded the types of the plicae during the arthroscopy using anteromedial and anterolateral portals. A team of anatomists and orthopedic surgeons evaluated all the records together. In the cadaveric study, for the evaluation of the plicae, we sagittally transected the quadriceps tendon, patella and patellar tendon, and turned inside out the medial and lateral parts of the transected patella to obtain full vision of all of the plicae. We then investigated the infrapatellar, mediopatellar, lateral patellar and suprapatellar plicae separately. In this study, we dissected 14 cadaveric knees to evaluate the prevalence of the synovial plicae. We investigated 7 cadavers, 6 were males and one was female. The mean age was 48.5 (range 40 to 60) in the cadavers. The infrapatellar plica (plica synovialis infrapatellaris, inferior plica, anterior plica or ligamentum mucosum) originates from the intercondylar notch, widens as it extends distally in front of the anterior cruciate ligament (ACL) to insert the inferior of Hoffa's fat pad.¹⁶⁻¹⁹ The infrapatellar plica is often very hard to differentiate from the ACL for an inexperienced examiner. It is mostly seen as a thin, chord-like, fibrous band.²⁰ (Figures 1 & 2). Mediopatellar plica, in other words, plica synovialis mediopatellaris is found along the medial wall of the joint originating superiorly, extending obliquely and inferiorly to insert Hoffa's fat pad and anterior of the medial meniscus.²⁰⁻²² The lateral patellar plica, or plica synovialis lateralis, is a synovial fold found along the lateral wall of the joint originating superiorly, extending inferiorly and inserting to the synovium of the infrapatellar fat pad.²¹ The suprapatellar plica runs obliquely downward from the synovium at the anterior aspect of the femoral metaphysis to the posterior aspect of the quadriceps tendon, inserting above the patella.²³ The experimental protocol was approved by the Ethical Committee of the Faculty of Medicine at Trakya University.

Results. After the arthroscopic evaluation of 318 knees, we found 302 (95%) mediopatellar plicae, 194 (61%) infrapatellar synovial plicae, 184 (57.8%) suprapatellar plicae, and 66 (20.7%) lateral patellar plicae. In the cadaveric knees, we found 13 (92%) mediopatellar plicae, 8 (57%) infrapatellar synovial plicae, 7 (50%) lateral patellar plicae, and 6 (42%) suprapatellar plicae. The prevalence of lateral plica (arthroscopic 20.7%, cadaveric 50%) and the prevalence of mediopatellar plica (arthroscopic 95%, cadaveric 92%) in our series are higher than the general data.^{2,4,17,20,24}

Discussion. We found a 20.7% prevalence of lateral patellar plica on arthroscopic examination, and 50% at cadaveric dissection. There has been little information in the literature describing the lateral synovial plica. Sung-Jae and Wahn-Sub¹⁶ found a 1.3% prevalence at the lateral plica, and Dupont found a 1-3%.²⁴ Kurosaka et al²¹ reported a case study on lateral synovial plica syndrome, and mentioned the difficulties in diagnosing this clinical problem. In our opinion, the prevalence of lateral patellar plica is higher than reported in the literature when we use Tindel's 2 diagnostic criteria of plicae as a guide for

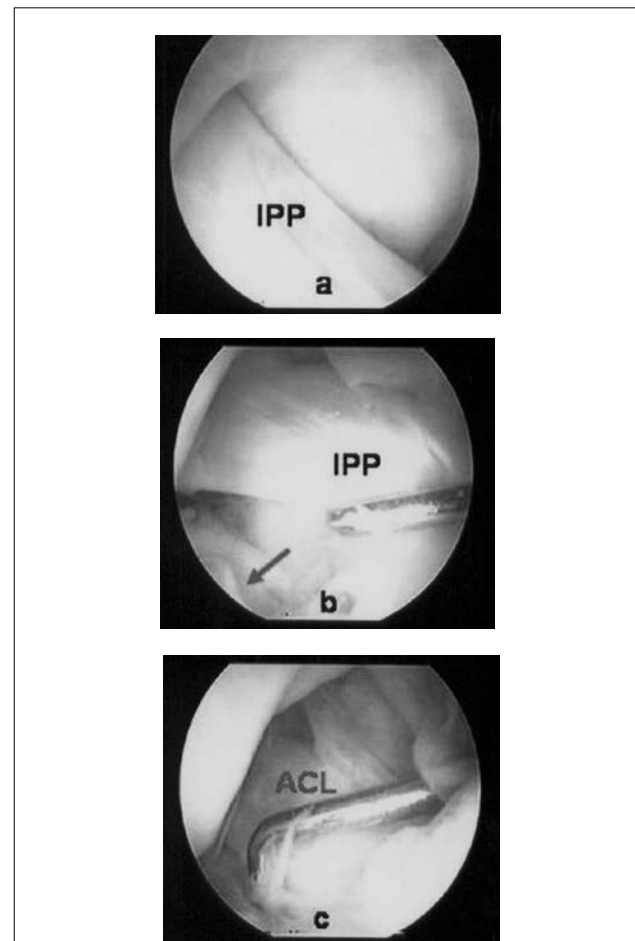


Figure 1 - a) Arthroscopic view of the infrapatellar plica which covers the whole intercondylar notch and blocks vision of anterior cruciate ligament and posterior cruciate ligament. b) The view of the intercondylar notch with the infrapatellar plica at Figure 1a was pulled away with a probe (arrow: anterior cruciate ligament) and, c) The view of the ACL after partial resection of the infrapatellar plica seen at Figure 1a. ACL - anterior cruciate ligament, IPP - infrapatellar plica.

diagnosis.¹⁴ We could not see the lateral plicae because of the structure of the lateral femoral condyle and the natural barrier made by Hoffa. In this study, we found the mediopatellar plica in a similar prevalence clinically and anatomically. The mediopatellar plica is the most common symptomatic plica and the one, which we usually implicate in symptoms describing the plica syndrome. The patient with mediopatellar plica often complains about pain in the region over the plica.^{14,15,25} In the literature, the prevalence of the mediopatellar plicae varies between 27-72%.^{2,14,24,26} The prevalence we found was higher. The plica encountered most commonly during arthroscopy, is the infrapatellar plica in the literature,^{2,14} with prevalence ranging between 50-86%.^{24,26} We found a prevalence of 61% in arthroscopic, and 57% in cadaveric examination.

In conclusion, we demonstrate that the prevalence of lateral plicae was 20.7%, and the prevalence of the mediopatellar plicae was 95% at arthroscopic evaluation. Additionally, the prevalence of lateral plicae was 50%, and the prevalence of mediopatellar plicae was 92% in the cadaveric knees.

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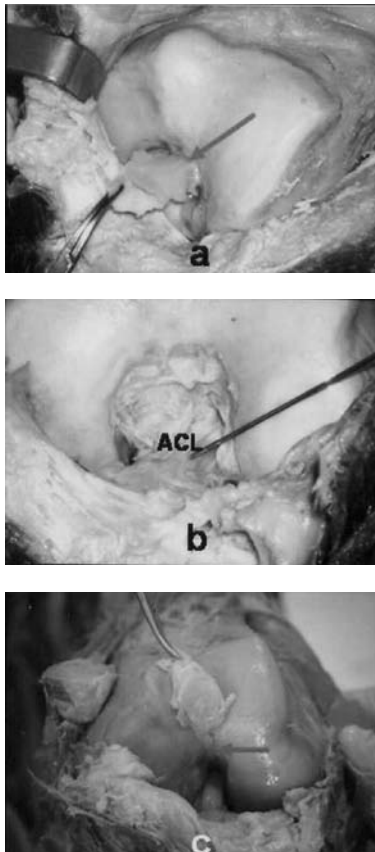


Figure 2 - The cadaveric view of **a)** a wide hypertrophic infrapatellar plica after the dissection of Hoffa's fat pad (arrow: infrapatellar plica), **b)** the ACL after the dissection of the infrapatellar plica seen at Figure a. and **c)** a thin infrapatellar plica with Hoffa's fat pad. (red arrow: infrapatellar plica). ACL - anterior cruciate ligament.

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