

INVESTIGATION ON THE INSERTION OF THE MEDIAL MENISCUS IN THE KNEE JOINTS IN THE BULGARIAN POPULATION

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Summary

The insertion sites of the menisci are of significant biomechanical and clinical importance. There are four basic types of varieties in the insertion of cornu anterior of the medial meniscus to the tibia, as well as there are some rare variations described by us before. We established that in the classical type I cornu anterior inserted to anterior intercondylar area, medial and in front of the insertion of the anterior cruciate ligament was found in 124 preparations. Type II cornu anterior is inserted a little bit laterally to the scope of the medial tibial condyle towards anterior intercondylar area was found in 36 preparations. Type III amounted to 29 preparations. Type IV was comparatively a few. Types V and VI were fewer than type IV. We describe a variety which was not mentioned by the other authors till now. It was not firmly insertion of the cornu anterior to the tibia in that type like the types IV and VI. It is clear, that there are considerable varieties in the insertion sites of the menisci. That must be always taken into account when clarifying the causes for obscure pain in the knee joint, as well in surgical interventions on the menisci, especially at the arthroscopic interventions.

Key words: knee joint, meniscus, insertion

Introduction

The knee joint menisci are structures with important role for the functions of the joint. The human joint menisci have semilunar shape and they are situated between the relatively flat tibial surface and the convex condyle of the femur. Medial meniscus is more open with a bigger curve diameter and represents half of a ring. Lateral meniscus is more closed in shape and represents a full circle. It has a smaller curve diameter and is smaller in size than the medial one [1, 2]. Medial meniscus has a bigger diameter than the lateral one. Its anterior part is thinner and narrower than its posterior part. The insertion sites of the menisci are of significant biomechanical and clinical importance [3]. There are four basic types of varieties in the insertion of cornu anterior of the medial meniscus to the tibia. It can be inserted to anterior intercondylar area, medial and in front of the insertion of the anterior cruciate ligament. This is the commonest type called also type I or the classical type. There are some more basic types of varieties. Type II when cornu anterior is inserted a little bit laterally to the scope of the medial tibial condyle towards anterior intercondylar area. In type III cornu anterior is inserted a little bit in front of the usual insertion at the front scope of the tibia and type IV, which is rare. In type IV cornu anterior does have not firmly insertion to the

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tibia. These varieties especially III and IV, may be having significance in the cases of an atypical pain in the anterior part of the knee joint and at the transplantation of the medial meniscus [4]. The data about these varieties in the Bulgarian population are limited and that is why we decided to undertake this study.

Materials and Methods

We used 201 knee joints taken from corpse material of the Department of Anatomy, Medical University, Sofia. We also carried out arthroscopic observations in the Clinic of Common Orthopaedics SHATO "Gorna Banya". The bodies were dissected according to the routine techniques and special attention was paid to the articular apparatus. We established 7 groups, having in mind the way of insertion of the menisci.

Results

We established that type I - meniscus inserted to anterior intercondylar area, medial and in front of the insertion of the anterior cruciate ligament, was found in 124 preparations (Figure 1). The cornu posterior is inserted to the posterior cruciate ligament and posterior intercondylar eminence in the middle of the tibia seen from the back.

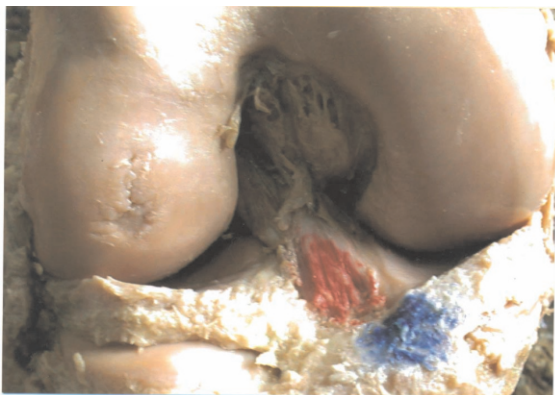


Figure 1. Meniscus the classical type I. A cornu anterior of the medial meniscus is inserted to anterior intercondylar area medial and in front of the insertion of the anterior cruciate ligament.

Type II cornu anterior is inserted a little bit laterally to the scope of the medial tibial condyle towards anterior intercondylar area (Figure 2) was found 36 preparations. The insertion usually is carried out by a wide fibrous band with regular or wavy pace. These bounds are strong enough to allow the meniscus to preserve its position during knee joint overload.

Type III cornu anterior is inserted a little bit in front of the usual insertion at the front scope of the tibia was found in 29 preparations. In the fourth basic type a cornu anterior is inserted to the tibia with loose

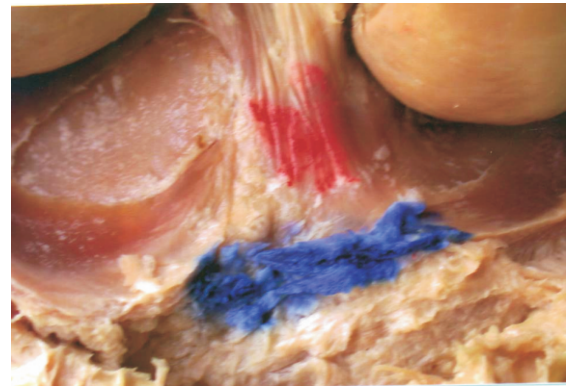


Figure 2. Type II cornu anterior is inserted a little bit laterally to the scope of the medial tibial condyle towards anterior intercondylar area.

connective tissue. It does not have a firm insertion to the tibia, which is typical for all described types till now. The number of the menisci of the type IV amount to 5.

We described in our previous investigations types V and VI, and we found respectively 3 and 2 preparations belong to these types. Type V is the type in which the cornu anterior of the medial meniscus is inserted to the anterior cruciate ligament, whereas in type VI the cornu anterior of the medial meniscus is inserted to the transverse ligament. A cornu anterior extended directly into the transverse ligament without a strong insertion to the tibia like a type IV.

In our investigations it was the first time for us to find medial meniscus, whose cornu anterior is inserted to the internal surface of the knee joint capsule without a strong insertion to the tibia (Figure 3). Hypermobility of that newly discovered type meniscus was great, like the types IV and VI. Only one of the preparations belonged to the newly discovered type meniscus. We did not find in the Bulgarian population the other 3 described in the bibliography, rare observed varieties in the insertion of the cornu anterior of the medial meniscus types VII, VIII and IX. Type VII - the cornu anterior of the medial meniscus is inserted to infrapatellar synovial fold. Type VIII - the cornu anterior of the medial meniscus is inserted to the lateral condyle of the femur attended the anterior cruciate ligament and was completely separated from the ligament. Type IX - the cornu anterior of the medial meniscus is inserted to the exceptionally rare observed third intercondylar tubercle of Parsons.

The variety described from us can be accepted to new type that is type X. It has to be noted, that the coronal ligaments of the corresponding lateral meniscus were rather thinner.



Figure 3. A newly discovered variety - type X: the cornu anterior of the medial meniscus is inserted by only coronal ligaments to the internal surface of the joint capsule. There is not a strong insertion to the tibia.

Discussion

The varieties on the menisci insertion have a significant importance to clear some unclear clinical symptoms. These varieties, especially types III and IV, maybe have an importance in the explanation for the atypical knee joint pain in the anterior part of the knee. That also influences the transplantation of medial meniscus. Type III subjects, especially are usually incapable to resist to peripheral extrusion of the medial meniscus in knee joint overloading. In this way increases the risk of anterior subluxation and in some cases pain occurs the anterior part of the knee [4]. Arthroscopy is shown that approximately in 10.9% of the population there are variants in the insertion of the cornu anterior of the medial meniscus, which are different from the well known [5, 6]. That is why the novel variety, reported by us in which cornu anterior of the medial meniscus is inserted to the internal surface of the knee joint capsule is of great importance. The cornu anterior of the medial meniscus have not a strong inserton to the tibia in the the types IV, VI and X. These are varieties in which a hypermobility of the meniscus is found during flexion and extension in the knee joint. That leads to a pain in the anterior part of the knee joint in a part of the population. This is probably the cause for the isolated damages in the medial meniscus without some preceding trauma of the knee [7]. The varieties of in the insertion of the cornu posterior of the medial meniscus are extremely rare. It is important to mention, described by Bhargava

and Ferrari in 1998 year variety in which cornu posterior is connected to the anterior cruciate ligament and in this way maintains traction to the anterior cruciate ligament. One of the interesting facts is that the cornu posterior of the medial meniscus is the part of the menisci as a whole, which undergoes the most significant degenerative changes connected with aging [8]. The results of our experiments show that there a great percentage of variations in the insertion of the menisci. That must be always taken into account when clarifying the causes for the pain in the knee joint and in surgical interventions on the menisci in different types of traumas.

Conclusions

The varieties on the menisci insertion have a significant importance to explain some unclear clinical symptoms. That must be always taken into account when clarifying the causes for the pain in the knee joint and in the surgical interventions on the menisci in different types of traumas. That also influences the transplantation of medial meniscus. The new variant reported by us in whom the cornu anterior of the medial meniscus is inserted by coronal ligaments to the internal surface of the joint capsule has great importance. This the variation in which a hypermobility of the meniscus is found during flexion and extension in the knee joint which may lead to a pain in the anterior part of the knee joint.

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