

LESION OF THE ANTERIOR CRUCIATE LIGAMENT AS THE CAUSE OF LOCKED KNEE

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Knee injuries are most common among the young, physically active people. Immediately after a knee injury, pain, swelling and flexion contracture occur to a smaller or greater extent. Flexion contracture or a locked knee can occur when there is a mechanical barrier inside the joint. Apart from true and, from the mechanical point of view, a justifiable locked knee, there is also a pseudo-locked knee. A pseudo-locked knee is a condition in which there is a limitation of full knee extension and absence of lateral lower leg rotation, and it is not caused by a mechanical factor – no internal structures are blocked inside the joint. The aim of the study was to determine the frequency of lesion of the anterior cruciate knee ligament in patients with a locked knee. At the Orthopedic Surgery Department at the Military Hospital in Niš, during the period from May 16, 2009 to September 21, 2010 there were 85 knee arthroscopies performed on patients exhibiting clinical signs of a locked knee. Arthroscopically, it was found that the most common cause of a locked knee in the analyzed group was the lesion of the anterior cruciate ligament (complete, partial, and in combination with the lesion of the meniscus) in 35 (41,2%) examinees, and in 21 (24,7%) examinees the cause of a locked knee was the lesion of the medial meniscus. *Acta Medica Medianae* 2016;55(4):92-96.

Key words: *Locked Knee, Arthroscopic, Anterior Cruciate Ligament*

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view, that is a true locked knee. The causes of a mechanical locking of the knee are most often meniscus lesions or the presence of loose bodies (4).

Apart from true and, from the mechanical point of view, a justifiable locked knee, there is also a pseudo-locked knee. A pseudo locked knee is a condition in which there is a limitation of a full knee extension and the absence of the lateral lower leg rotation, and it is not caused by a mechanical factor – no internal structures are blocked inside the joint (5). A pseudo locked knee is caused by a lesion of cruciate ligaments, swelling, a contusion of the fat pad, lesion of the medial patellar plica, lesion of the popliteal muscles, etc. (6-10).

Introduction

Knee injuries are most common among the young, physically active people (1). This type of injury most often occurs in the distortion mechanism, and it leads to a damage in one or more structures within the knee (2, 3).

Immediately after a knee injury, pain, swelling and flexion contracture occur to a smaller or greater extent. Flexion contracture or a locked knee can occur when there is a mechanical barrier inside the joint. From the mechanical point of

Aim

Our aim was to determine the frequency of the lesion of the anterior cruciate knee ligament in patients with a locked knee.

Subjects and methods

The target group of the study were the patients from the Department of Orthopedic Surgery, Military Hospital in Niš, showing the clinical signs of a locked knee who underwent arthroscopy.

There were 85 knee arthroscopies performed on patients exhibiting clinical signs of a locked knee at the Department of Orthopedic Surgery, Military Hospital in Niš, in the period from May 16, 2009 to September 21, 2010. (Picture 1)



Picture 1.: Locked Knee

A clinical diagnosis was based on patient history, clinical examination of the patient, and standard knee radiographies in both directions.

The results of the study were systematized, presented in tables and charts (Excell 2003, Word 2003), and statistically processed by methods of descriptive and quantitative analyses (SPSS 16.0 for Windows 2007). The comparison of absolute frequencies was done using the χ^2 test or the Fisher's test of exact probability.

The comparison of diagnostic clinical examinations and the results of arthroscopy as the gold standard was carried out on the basis of contingency table 2x2, in which the examinees were classified as positive or negative based on the gold standards and clinical examinations.

For the assessment of the accuracy of the tested diagnostic methods, the tests of diagnostic sensitivity, specificity, diagnostical efficiency, positive predictive value (PPV), negative predictive value (NPV), likelihood ratio for a positive result (LR+), and likelihood ratio for a negative result were used.

Results

In the period from May 16, 2009 to September 21, 2010, there were 85 knee arthroscopies performed on patients with clinical signs of a locked knee (Picture 1) at the Department of Orthopedic Surgery, Military Hospital in Niš.

All the examinees were male. The average age of the examinees was $24,68 \pm 5,95$. The youngest examinee was 20, and the oldest one was 45 years old.

After taking their clinical diagnoses, physical examinations of the patients were performed using the standard tests. All the patients had knee radiographs taken too.

Clinical diagnosis of a suspect lesion of the medial meniscus was present in most of the cases, the exact number of cases being 24 (28,2%), whereas 23 (27,1%) of the patients were diagnosed with hemarthrosis. In 15 (17,6%) cases the lesion of the anterior cruciate ligament was diagnosed, in 8 (9,4%) cases a hydrops was diagnosed, and in the same number of cases and based on radiography the presence of loose bodies in the knee joint was suspected. In 5 (5,9%) cases, lesions of the lateral meniscus were suspected, and in 2 (2,4%) cases the clinical picture was not clear and a sprained knee was diagnosed.

Clinical diagnoses of all patients in the study are shown in this chart. The lesion of the medial meniscus was found in 24 cases (28,2%), hemarthrosis was found in 23 cases (27,1%), and the lesion of the anterior cruciate ligament was found in 15 cases (17,6%). These were the most common diagnoses (Table 1).

There was a statistically significant difference in the occurrence of different clinical diagnoses in the examined population ($\chi^2=37,459$, $p < 0,001$).

Table 1: Diagnoses of examinees with locked knee upon arriving to hospital

No.	Diagnosis	Number	%
1	Laesio menisci medialis	24	28.24
2	Haemarthros	23	27.06
3	Laesio ACL	15	17.65
4	Hydrops	8	9.41
5	Corpus liberum	8	9.41
6	Laesio menisci lateralis	5	5.88
7	Distorsio genus	2	2.35
8	Total:		100

In Table 2, the structure of arthroscopic findings is shown. The most common diagnoses were lesion of the medial meniscus in 21 (24, 7), complete lesion of the anterior cruciate ligament in 14 (16,5%), and partial lesion of the anterior cruciate ligament in 15 (17,6%) patients (Picture 2).

As the cause of a locked knee, an osteochon-



Picture 2.: Lesion of ACL

dral lesion, as well as the presence of loose bodies were found in 5 (5,58%) cases each. In 4 (4,71%)

patients the presence of a hypertrophic mediopatellar plica was found. The lesion of the anterior cruciate ligament associated with the lesion of the medial together with the lateral meniscus were the causes of a locked knee in 3 (3,53%) cases each. A hypertrophic fat pad, the lesion of the lateral meniscus and a hypertrophic mediopatellar plica were the signs of a locked knee in 2 (2,35%) cases each. In 1 (1,18%) case, the signs of a gonarthrosis were determined arthroscopically. In 3 (3,53%) cases in patients exhibiting the clinical signs of a locked knee, the

Table 2 : Arthroscopic findings

No.	Diagnosis	Number	%
1	Laesio menisci medialis	21	24,71
2	Laesio ACL	14	16,47
3	Laesio ACL partialis	15	17,65
4	Corpus liberum	6	7,06
5	Laesio osteochondralis	5	5,88
6	Plica mediopatellaris Iino	4	4,71
7	Laesio ACL + menisci medialis	3	3,53
8	Laesio ACL + menisci lateralis	3	3,53
9	Synovitis	3	3,53
10	Ruptura retinaculi medialis	3	3,53
11	Mb. Hoffae	2	2,35
12	Laesio menisci lateralis	2	2,35
13	Gonarthrosis	1	1,18
14	Sine morbo	3	3,53
	Total:	85	100

arthroscopic findings of a knee were normal. It was determined that there was a statistically significant difference in the distribution of different arthroscopic diagnoses in the population in question ($\chi^2=78,553$, $p<0,001$). (Table 2).

Discussion

During the observed period of time from May 16, 2009 to September 21, 2010, 85 arthroscopies were performed on patients with a locked knee. The term „locked knee“ implies not only a disabled full extension of the lower leg, but also the absence of an external rotation of tibia on femur (11, 12).

All the examinees were male, since the study was done at the Military Hospital in Niš, where mostly soldiers in temporary military service and professional soldiers have health insurance, people who perform demanding physical training on a daily basis, and knee injuries occur most often in young physically active people (13).

The lesion of the anterior cruciate ligament was a clinical diagnosis in 15 patients. In 14 (93,4%) cases the diagnosis was confirmed. Among those patients, 5 (33,4%) patients were diagnosed with a complete lesion of the anterior cruciate ligament. A partial lesion of the anterior

cruciate ligament, a combined lesion of the anterior cruciate ligament and the medial or lateral meniscus were found in 3 (20%) patients each. In 1 (6,7%) patient an isolated lesion of the medial meniscus was diagnosed.

Based on the obtained results, a high specificity (98%) and a positive predictive value (93,3%) of the tests were confirmed, favoring the lesion of the anterior cruciate ligament. Aside from the 14 cases mentioned above, there were also 21 lesions in patients that had not been diagnosed with the lesion of the anterior cruciate ligament preoperatively. For that reason, a low sensitivity (40%), negative predictive value (70%) and diagnostic accuracy of 74,1% of the tests were determined. That suggested that the clinical diagnosis was accurate in identifying the present lesion of the anterior cruciate ligament, however with common false negative results. That could have happened in patients with recent knee injuries (14).

It is difficult to test a recent knee injury because of the swelling, patient's defensive attitude and limited movability. A loss of the ability to perform complete extension makes difficult a full clinical examination difficult, since complete knee extension is necessary for the lateral pivot shift test, a test which has the highest sensitivity in the diagnosis of injury to the anterior cruciate ligament (12, 15).

In this way, a false image of a locked knee is created, imitating the incarcerated lesion of the medial meniscus and that is when the cause of a locked knee is determined arthroscopically. Moreover, a partial or complete rupture of the anterior cruciate ligament leads to the clinical signs of a locked knee. A partial lesion of the anterior cruciate ligament is the cause of muscle knee spasm as a defense mechanism in order to prevent further damage to the ligaments (14, 16).

Noyse and DeHaven determined arthroscopically, in separate studies, that the most common cause of a locked knee in patients who have acute swelling and a locked knee was a partial or complete lesion of the anterior cruciate ligament, which matched the results of our own study (17, 18).

The lesion of the anterior cruciate ligament (partial or complete) alone or combined with the lesion of the medial or lateral meniscus in 35 (41,2%) cases was found to be the most common cause of a locked knee. When there is a lesion of the anterior cruciate ligament, the limitation of knee movement occurs as a result of hemarthrosis due to insertion of a torn ligament in the space between the knee joint surfaces or as a result of the neuromuscular reflex and muscle spasm, which causes the knee to flex under the angle of 30 to 50 degrees in order to prevent further damage of the ligament, which represents a pseudo locked knee (14). The insertion of a torn anterior cruciate ligament in the space between the knee joint surfaces is rare, and it can occur only if there is a complete lesion of the anterior cruciate ligament in

the femoral attachment. In that case, a true or mechanical locked knee is diagnosed (19-21).

Conclusion

In patients with a locked knee, a lesion of the medial meniscus has been arthroscopically found in 21 (24,7%) patients, complete lesion of the anterior cruciate ligament in 14 (16, 47%), partial lesion of the anterior cruciate ligament in 15 (17,65%), lesion of the anterior cruciate ligament with the lesion of the medial meniscus in 3

(3,53%), lesion of the anterior cruciate ligament with the lesion of lateral meniscus in 3 (3,53%), osteochondral lesion in 5 (5,78%), and loose joint body in 6 (7,06%) patients.

Arthroscopically, it was established that the most common cause of a locked knee in the studied group was a lesion of the anterior cruciate ligament (complete, partial, and combined with a meniscal lesion) in 35 (41,2%) examinees, and in 21 (24,7%) examinees the cause of a locked knee was a lesion of the medial meniscus.

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Novine u medicini

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doi:10.5633/amm.2016.0413**LEZIJA PREDNJE UKRŠTENE VEZE KAO UZROK
BLOKADE KOLENA***Dušan Đorđević¹, Zoran Golubović^{2,3}, Snežana Đorđević Žunčić⁴,
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Ključne reči: blokada kolena, artroskopija, prednja ukrštena veza

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