



Incidence of meniscal and osteochondral lesions in patients undergoing delayed anterior cruciate ligament reconstruction

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Objective: Unreconstructed anterior cruciate ligament (ACL) tears cause repeated incidences of giving-way and rotational-translational instability. The aim of this study was to test our hypothesis that delayed surgical treatment of patients with ACL tears, especially those with high Tegner activity levels, results in more severe and complicated meniscal and osteochondral lesions with potential affect on the outcome.

Methods: This study included 385 patients who underwent arthroscopic ACL reconstruction between 2001 and 2009. Patients' arthroscopic video records or MRI scans and patient files at the time of surgery were analyzed. We defined severe meniscal and osteochondral lesions which could negatively affect the outcome and labeled them meniscal lesions affecting outcome (MLAO) and osteochondral lesions affecting outcome (OLAO). The relation between MLAO, OLAO, time since injury and Tegner activity levels were statistically analyzed.

Results: The incidences of MLAO and OLAO grew statistically higher as time elapsed between the injury and surgery increased ($p=0.001$, $p<0.05$; $p=0.001$, $p<0.05$). The relation between the Tegner activity score, MLAO and OLAO risk were found to be statistically insignificant ($p=0.317$, $p=0.184$, $p>0.05$).

Conclusion: Delays in ACL reconstruction surgery result in an increase in the incidence of meniscal and osteochondral lesions which have the potential to negatively affect the surgical outcome.

Key words: ACL reconstruction; meniscal lesion; osteochondral lesion; Tegner activity level.

Unreconstructed tears of the anterior cruciate ligament (ACL) cause instability and the feeling of insecurity during activities. Delayed surgical reconstruction or intense sports activity during conservative treatment can cause repeating incidences of giving-way. Those episodes of giving-way and chronic rotational-translational instability are consequences of ACL deficiency and result in additional knee pathologies. Among these pathologies are meniscal tears, osteochondral lesions and ligament tears.

Thus, not only people with clear indications for ACL reconstruction, but people with sedentary life styles who are candidates for conservative treatment may also be under risk of concomitant knee pathologies.

There are several studies on meniscal tears and osteochondral lesions secondary to chronic ACL deficiency.^[1-5] In these studies, data concerning time since injury, activity level of the patient, type of meniscal tears and osteochondral lesions and clinical results are interpreted to find a certain relation

between these factors. When the hypothesis, aims, study plans and research data of these studies are analyzed in detail, individual studies have different weak points. The most important common problem is the inability to fully observe the results of people with ACL tear who do not receive medical treatment. Another weak point which is rarely mentioned in these studies is the uncertainty on whether meniscal tears and osteochondral lesions are results of the same trauma which caused ACL tear, or if they are caused by instability following ACL deficiency.

We have observed that delaying surgery causes additional meniscal pathologies or osteochondral lesions which adversely affect the outcome of ACL reconstruction. Our hypothesis was that if surgical treatment of patients with ACL rupture, especially those with high Tegner activities, is delayed, additional meniscal and osteochondral lesions may develop and may have negative effect on the outcome. To test this hypothesis we defined the meniscal and osteochondral lesions which negatively affect the results and labeled them meniscal lesions affecting outcome (MLAO) and osteochondral lesions affecting outcome (OLAO) (Table 1 and 2). People with isolated ACL rupture were identified using MRI scans and video records obtained during the arthroscopic surgery belonging to the time of initial injury. We aimed to analyze the relation between time passed since injury, activity levels of the patients and resulting meniscal and osteochondral lesions.

Patients and methods

This retrospective study was conducted among 385 patients who underwent arthroscopic ACL reconstruction in Uludağ University Department of Orthopaedics and Traumatology between 2001 and 2009. All operations were performed by the same surgeon. Of the 385 patients, those who were diagnosed post-traumatically with isolated ACL tear and developed additional meniscal or osteochondral lesions prior to reconstruction surgery were included in this study. Physical examination, patient history, early post-traumatic MRI scans or diagnostic arthroscopy conducted at the time of injury were used to determine the singularity of the ACL rupture. Subjects with additional ligamentous, meniscal or osteochondral injuries were excluded to ensure that MLAO and OLAOs occurred during the period between the ACL tear and surgical reconstruction.

Patients' arthroscopic video records, patient files and MRI scans obtained prior to the surgery were analyzed to identify any new meniscal and chondral lesions. All MRIs were reviewed by the same radiologist in our institution. The time between injury and surgical reconstruction was noted. Patients were evaluated using the Tegner activity score.^[6] Lesions were defined as MLAO or OLAO using the criteria listed in Tables 1 and 2. These criteria were based upon the presence/absence of a sound method of treatment for the lesion observed. Lesions which are not amenable to surgical intervention, which are known to complicate the rehabilitation period, and those which necessitate complex treatment methods, such as meniscal transplantation, autologous chondrocyte implantation, and whose results are yet to be tested by prospective trials were defined as lesions affecting outcome.^[7] Outerbridge Grade 1, 2 and 3 lesions were defined as superficial, where Grade 4 lesions were defined as deep defects.^[8]

For statistical analysis, Mann-Whitney U and logistic regression tests were used. Relations between OLAO, MLAO, time since injury and Tegner activity levels were statistically analyzed.

Results

None of the patients had either an MLAO or OLAO at the time of diagnosis. Forty-nine of the 385 patients were found to have concomitant ACL tear and chondral or meniscal lesion at the time of surgery. The mean age of patients was 33 ± 1 (range: 17 to 47) years. Forty-two (%85.7) of the subjects were male and 7 (%14.3) were female. The mean time between injury and operation was 28 ± 6 (range: 2 to 224)

Table 1. Criteria for meniscal lesions affecting the outcome.

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- Flap or radial tears extending to meniscosynovial junction
 - Flap or radial tears complicated by horizontal tears
 - The handle part of bucket handle tears ruptured or degenerated
 - The corpus part of bucket handle tears complicated with horizontal tears or degenerated
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Table 2. Criteria for osteochondral lesions affecting the outcome.

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- Osteochondral lesions; Grade 4 and larger than 4 cm² or deeper than 7-8 mm
 - Osteochondral lesions; Grade 4 involving 2-3 compartments
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months. The mean Tegner score was 5.8 ± 0.2 (range: 2 to 9). The types of meniscal tears and osteochondral lesions are outlined in Tables 3 and 4. Sixteen of the meniscal lesions were found to be MLAO and 8 of the osteochondral lesions were OLAO.

The incidences of MLAO and OLAO grew statistically higher as time elapsed between the injury and surgery increased ($p=0.001$, $p<0.05$; $p=0.001$, $p<0.05$). The relation between the Tegner activity score and MLAO and OLAO risk was not statistically significant ($p=0.317$, $p=0.184$, $p>0.05$).

Table 3. Types of meniscal lesions.

Meniscal lesions	(n)
Radial	31
Flap	27
Longitudinal	14
MLAO	16

Table 4. Types of osteochondral lesions.

Osteochondral lesions	(n)
Superficial (Outerbridge 1-2-3)	15
Deep (Outerbridge 4)	8
OLAO	4

Discussion

In this observational, retrospective study, we found that an increased time between injury and surgery increases the incidence of meniscal and osteochondral lesions which may adversely affect the treatment outcome. A limitation of this study was that patients with torn ACLs, who do not seek medical treatment, could not be included.

When deciding on ACL reconstruction, each patient needs to be regarded individually. Several factors, such as occupation, additional injuries and occurrence of recurrent instability should be taken into consideration. A patient's eligibility for reconstruction depends on his/her compliance and progress. Misdiagnosis, non-compliant patients and delayed surgery may increase the risk of additional pathologies, such as MLAO and OLAO.

In this study, we used MRI scan and diagnostic arthroscopy to detect patients with isolated ACL

tears. MRI sensitivity is 95% for meniscal lesions.^[9] This may cause misdiagnosis of certain meniscal pathologies. However, it is very unlikely that these misdiagnosed lesions are MLAO. If an osteochondral lesion is amenable to surgical treatment, which necessitates a thorough examination concerning Outerbridge classification, lesion size and location, it does not adversely affect the outcome of ACL reconstruction.^[10,11] The same is true for meniscal lesions which may be treated with partial meniscectomy or meniscal suturing.^[12-14] In our study, we came up with a new definition for meniscal and osteochondral lesions. We hypothesized that in the presence of the criteria mentioned in our new definition, meniscal and osteochondral lesions may affect the treatment outcome. Further studies focusing on the treatment outcome of patients with these lesions are necessary. We plan to report the long term results of subjects with MTAO and OLAO in further studies.

Several studies have tried to explain the mechanism responsible for concomitant meniscal and chondral lesions by examining their location and types.^[15,16] In their cross-sectional study, Murrell et al. examined the incidence of meniscal and chondral lesions secondary to delayed ACL reconstruction and found that a delay in surgery increases the incidence of these lesions.^[17] Papastergiou et al.^[18] and Church et al.^[11] conducted similar studies in which they grouped the patients according to time elapsed since injury and found that the incidence of meniscal lesions were lower in the early operation group. They concluded that early treatment decreased the risk of additional pathologies.

Several studies focusing on concomitant meniscal tears and ACL are based on MRI studies. Yoo et al. performed serial MRI scanning of ACL deficient patients and concluded that a delay in surgical reconstruction resulted in increased meniscal tear incidence.^[19] Naranje et al.^[20] conducted a prospective trial using MRI. They arthroscopically examined the incidence of meniscal pathology in ACL deficient patients and studied the efficiency of MRI in detecting these lesions. They concluded that ACL deficient subjects have a higher incidence of posterior horn medial meniscal tear.

In the current literature, two studies state that early post-traumatic MRIs and diagnostic arthroscopies show that ACL tears are isolated entities and

accompanying meniscal and chondral lesions are acquired post-injury. Among these studies, De Roeck et al.^[21] noted that meniscal tears are strongly associated with ACL rupture and a poorer outcome following reconstruction surgery. The delay in diagnosis and a prolonged waiting period for reconstruction can worsen surgical outcomes in ACL deficient knees. Tayton et al.^[22] studied 2,205 patients diagnosed using MRI or arthroscopy and underwent ACL reconstruction. They examined the additional pathologies occurring during the waiting period and noted that longer waiting periods resulted in increased incidence of meniscal tears.

It is more difficult to diagnose intrasubstance or partial ACL tears or isolated anteromedial-posterolateral band tears than complete ones. If these lesions are not managed surgically there is a great chance that recurring unstable episodes will result in additional pathologies. These patients need to be informed about this risk of additional pathologies if surgery is avoided.

Delayed surgery results in certain anatomical changes, such as prominent intercondylar eminences, obscured or faded anatomical landmarks, and a widening of the base of the notch resulting in shallowing. These were observed in our series as well and can complicate the surgical procedure.

In our study, a delay in ACL reconstruction surgery resulted in meniscal and osteochondral lesions which have the potential to negatively affect the surgical outcome. This negative affect needs to be proven by prospective and long-term studies. The meniscal and osteochondral lesions of the patients clearly occurred not at the injury time but during the period between ACL injury and surgical reconstruction. In the absence of operation during the acute phase, accompanying lesions need to be carefully examined. In these cases, diagnostic arthroscopy is indicated. Following diagnosis, a treatment algorithm needs to be clearly defined. Patient compliance and timing of surgery is vital to achieve good results. Recent studies reveal that with proper surgical technique and rehabilitation, arthrofibrosis following acute reconstruction may not be as common as previously stated, although best results are still achieved in the subacute or subchronic phase, and full extension must be achieved prior to surgery.^[23,24] If surgery is indicated following the acute phase, early reconstruction must be the method of choice.

In cases where surgery is delayed for any reason, a thorough examination with advanced imaging studies or diagnostic arthroscopy is necessary to rule out accompanying lesions, and the patient needs to be put into a rehabilitation program to prevent the occurrence of additional pathologies.

Conflicts of Interest: No conflicts declared.

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