

MENISCAL INJURY DUE TO FATIGUE

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ABSTRACT

Objective: The purpose of the present study was to review a group of patients with meniscal injuries resulting from structural failure unrelated to trauma or degenerative problems to which was given the name "meniscal injury due to fatigue". **Material and Method:** Evaluations were made on 140 patients with meniscal injuries without any apparent cause, who were therefore considered to have meniscal injuries due to fatigue. Among these, 85 patients were male and 55 were female. The medial meniscus was the most affected site (92% of the cases). **Results:** All these

injuries were diagnosed by means of clinical examination and magnetic resonance imaging. The patients underwent meniscectomy by means of arthroscopy and the results were divided into two types: good and poor. Poor results were found in 27% of the cases, among which nine patients progressed to idiopathic osteonecrosis. **Conclusion:** We conclude that injuries due to fatigue must be assessed as injuries caused by failure and, therefore, constituting a syndromic pathological condition that may progress to idiopathic osteonecrosis.

Keywords: *Meniscus. Fatigue. Osteonecrosis.*

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INTRODUCTION

Knee menisci have a critical role in absorbing and distributing load. These are anatomical structures exposed to trauma and aging, just as the structures composing a joint.

Meniscal injury may occur:

- as a part of rotational or flexion trauma,
 - as an evolution of joint degeneration process, or
 - as a spontaneous injury resulting from progressive structural failure, without correlation with trauma or degenerative process.¹
- Despite of its various etiologies, symptoms, clinical manifestations and treatment are similar. When associated to knee instability or to late-stage arthrosis, meniscal injury is assessed as a result of a more important pathology.

The group of patients presenting meniscal injury resulting from structural failure with no relation to trauma, or to degenerative problems, we chose to name it as meniscal injury due to fatigue because of the absence of correlation with an evident causal factor and of the similarity of symptoms of fractures due to fatigue.¹

the objective of this study is to assess this group of patients with meniscal injury due to fatigue, their characteristics and evolution after meniscectomy.

MATERIALS AND METHODS

Initially, we studied the evolution of treatment on 435 patients with isolated meniscal injury submitted to arthroscopic meniscectomy at the Institute of Orthopaedics and Traumatology at University of São Paulo's Hospital das Clínicas. These patients presented at baseline with signs of meniscal injury, confirmed by magnetic resonance imaging (MRI).

All patients with isolated meniscal injury were submitted to X-ray images at front and lateral positions of their affected knees; patients

with signs of osteoarthritis at X-ray such as joint pinching and axis deviation were excluded from this study.

Of the 435 patients, 261 were males (60%) and 174 were females (40%). The prevalent age group (in decades) was 50-59 years (34.7%). The most frequently affected side was the right one (53.3%). The most commonly injured meniscus was the medial one (81.8%), with lateral meniscus being injured in 18.2% of the patients. Both menisci were injured in 6% of the patients. The distribution by age group is described on table 1.

Table 1 – Distribution of patients according to age group, in the global group and fatigue group.

	40-49	50-59	60-69	> 70	TOTAL
GROUPS					
GLOBAL	119	151	103	62	435
FATIGUE	32	53	42	13	140

The clinical examination was based on joint interline palpation maneuvers: at first with knee flexed at 90 degrees and then associated to flexion-extension movements.

Meniscal injury diagnosis was clinically provided and confirmed by MR (Figure 1) and by arthroscopy during meniscectomy in all patients. (Figure 2)

the kind of meniscal injury according to its location varied a lot according to the etiology, but no correlation was clearly established, except for patients with the so-called injury due to fatigue.

We considered three groups of patients according to the etiology based on clinical history of meniscal injury:

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Figure 1 – Magnetic resonance image showing meniscal injury.

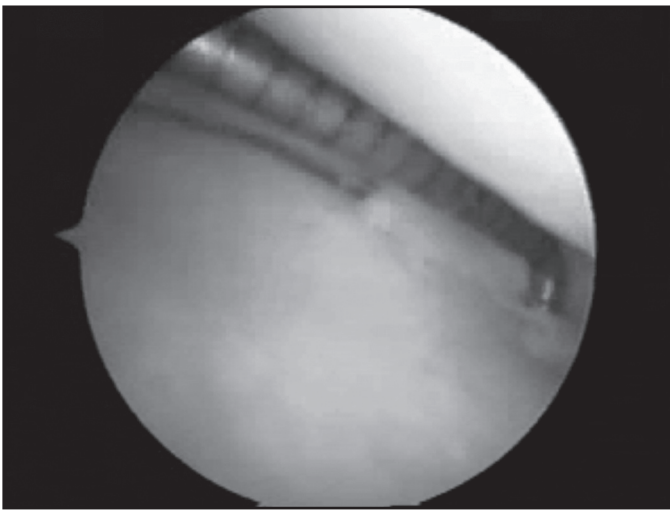


Figure 2 – Arthroscopy showing radial meniscal injury on the region of medial meniscus' posterior horn.

I – traumatic injury - constituted of patients with a clear clinical history of trauma reported in a given moment.

II – degenerative injury – constituted of patients with history without an accurate onset of symptoms. The complaint was insidious and progressive at first.

III – injury due to fatigue – constituted of patients reporting an acute onset of symptoms, without trauma or effort justifying injury.

Table 2 shows the distribution of patients according to injury etiology.

Table 2 – Injury diagnosis according to etiology

Etiology	Number	%
Trauma	194	44.60%
Degenerative	101	23.22%
Fatigue	140	32.18%
Total	435	100.00%

One hundred and forty patients had meniscal injuries with no apparent cause and were regarded as having meniscal injury due to fatigue, being the object of this study.

The characteristics of this group of patients were the following :

- Gender: 85 male patients and 55 female patients
- Affected side: The right side was affected in 84 patients; the left one was affected in 56.

- Medial meniscus was the most involved one, in 92% of the cases (128 patients) and the lateral meniscus was involved in 8% of the cases (12 patients).

In this group there were no cases of involvement of both menisci.

The kind of medial meniscal injury was radial at the transition between posterior horn and meniscal body in 98 patients (76.5%); all other injuries were located at the posterior horn. Lateral meniscal injuries were classified as many kinds, thus a more frequent type could not be identified.

The distribution by age group is described on table 1 and the graphical representation of the distribution by age groups is shown on Figure 3.

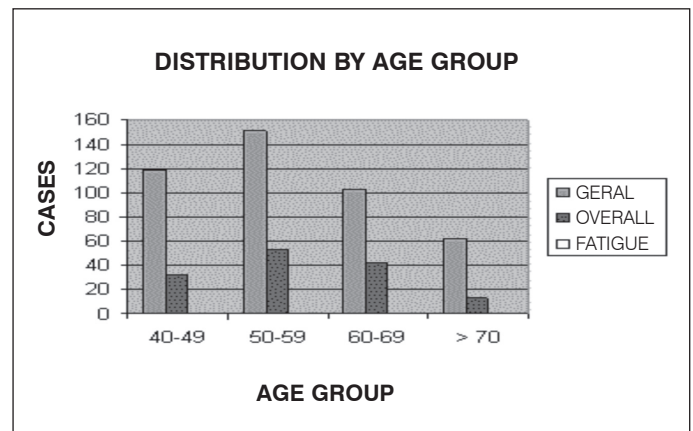


Figure 3 – Distribution of the number of patients (cases) with meniscal injury into age groups

The patients were submitted to meniscectomy via arthroscopy and were followed up for at least 48 months.

Follow up was provided by means of visits at intervals of at least half a year, in which the patients were assessed by one of the authors.

RESULTS

We considered only two kinds of outcomes: good – meaning a significant symptom improvement and return to pre-injury activities; poor – no symptoms or complications improvement.

We considered the evolution of patients in the three groups divided by etiology at the completion of 48 months.

Table 3 describes the results of the treatment provided in these patients with isolated meniscal injury by arthroscopic meniscectomy.

Considering the group in study (injury due to fatigue), we found poor results in 27% of the cases. Of these, nine evolved to idiopathic osteonecrosis of the knee at femoral condyle, and all these injuries were at medial femoral condyle.

Table 3 – Arthroscopic meniscectomy outcome in patients with isolated meniscal injury, considering the three groups divided according to patients' clinical characteristics.

RESULTS		
traumatic	194	
good	179	92.27%
poor	15	7.73%
total	194	100.00%
degenerative	101	
good	58	57.43%
poor	43	42.57%
total	101	
fatigue	140	
good	102	72.86%
poor	38	27.14%
total	140	100.00%

DISCUSSION

Isolated meniscal injury more commonly occurs in patients at the fifth decade of life or in older patients. It is a very frequent event in medical offices, deserving our attention for some years.²

By assessing the group of 435 patients submitted to meniscectomy due to isolated meniscal injuries, 140 cases (32% of our sample) called our attention, which have been labeled as of unclear etiology. The most interesting fact was that nine patients evolved to femoral condyle osteonecrosis belonging to this group.

We chose to study this group separately and compared to the overall group in order to check the possibility of clearly identifying patients with meniscal injury due to fatigue.

In classical identification items, we found that medial meniscus injuries are more frequent in the fatigue group than in the global group. The kind of injury (radial) occurring in 76.5% of the cases was quite characteristic, because we could not establish an injury pattern in the global group.

Other items like age, gender, and side are similar to the ones found for the global group.

When studying isolated traumatic meniscal injuries in young patients, Terzidis et al.³ describe vertical injuries in 77.5% of the cases. They do not mention radial injuries in patients having traumatic meniscal injuries. The authors found that, in the group of patients with traumatic injuries, 30% of the injuries occurred on lateral meniscus.³

Christoforakis et al.⁴ found, in 497 consecutive meniscectomies, that horizontal cleavage injuries are highly correlated with degenerative meniscal injury.

Harper et al.⁵ describe the challenges of providing a diagnoses of radial meniscal injury by MR. By comparing the arthroscopic findings, the authors found that 37% of the patients with radial meniscal injury, as confirmed by arthroscopy, had their injuries undiagnosed by MR.

We believe that radial medial meniscal injury, despite of its difficult diagnosis, is almost a pattern among patients with meniscal injury due to fatigue.

By assessing the results of treatment in the global group, we found that traumatic meniscal injuries evolve well after treatment by arthroscopic partial meniscectomy. We found 92% of good outcomes in our cases.

Meniscectomy in degenerative cases provided satisfactory results in only 57% of the cases, but we have already noticed these results.¹

By studying the evolution of patients with degenerative knee meniscal injury, Herrlin et al.⁶ compared conservative treatment with muscular balance to the treatment by arthroscopic partial meniscectomy and concluded that the results were similar.

Our patients with injury due to fatigue had good results in only 73% of the cases, and nine patients evolved to idiopathic osteonecrosis of the medial femoral condyle; perhaps, this is the worst complication of arthroscopic partial meniscectomy.⁷ (Figure 4)

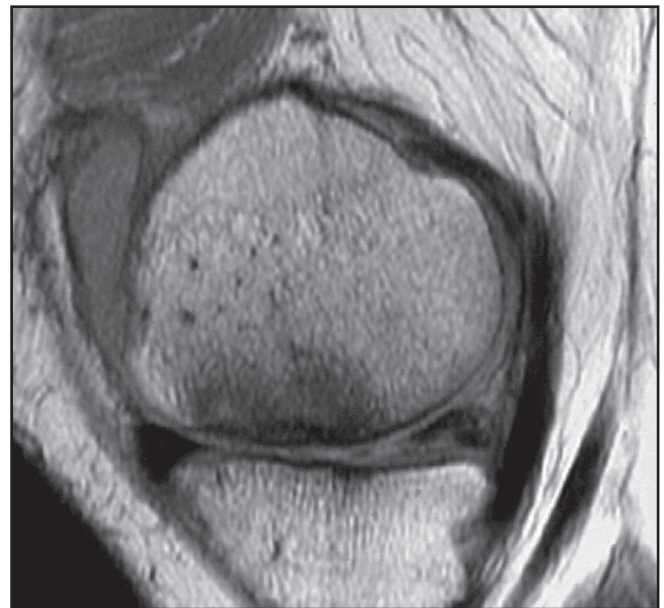


Figure 4 – Magnetic resonance image showing idiopathic osteonecrosis of the medial femoral condyle and medial meniscus injury.

Muscolo et al.⁸ describe five cases of osteonecrosis after medial meniscectomy and conclude that this complication may occur in older patients.

Pape et al.⁹ correlated the occurrence of osteonecrosis with patients' age and osteoporosis and not with meniscectomy in six patients. We couldn't characterize age as an important factor in the genesis of injury due to fatigue as well as in the occurrence of idiopathic osteonecrosis.

Zanetti et al.¹⁰ found a correlation between the so-called idiopathic knee osteonecrosis with osteoporosis in 32 patients, eight of them males.

We didn't study the occurrence of osteoporosis in patients with idiopathic osteonecrosis in our sample.

By studying the histology of 14 femoral condyles with osteonecrosis, Yamamoto et al.¹¹ found that bone necrosis does not occur, but fracture by stress, with signs of callus formation and repair tissue. In fact, there is no necrosis but a fracture by stress resulting from a structural failure.

Amatuzzi et al.¹² describe knee osteonecrosis and suggest trauma as a potential etiology. The authors also correlate the occurrence of osteonecrosis with meniscal injury.

Nakamura et al.¹³ describe a case of subchondral fracture of the femoral condyle after meniscectomy. The authors found in this case an identical image to the so-called idiopathic osteonecrosis at MR. The occurrence of idiopathic osteonecrosis in patients with signs of structural failure without correlation with meniscectomy is relatively frequent.

NaryCleuz et al.¹⁴ describe the association of femoral condyle osteonecrosis with fracture by stress in four patients. In the group of patients studied here, none had been submitted to meniscectomy. Idiopathic osteonecrosis symptoms are identical to those of the meniscal injury due to fatigue: Sudden onset of pain without traumatic cause¹²; and the MR image is equal to that found in patients who had idiopathic osteonecrosis after meniscectomy.

Patients with osteonecrosis due to vasculitis or to other causes have completely different symptoms. MR images of the so-called secondary osteonecrosis are totally distinct, even for its location, which is more frequently seen at lateral condyle.

We believe that the so-called idiopathic knee osteonecrosis is a result of structural failure process that led the meniscus to develop a radial injury. We understand that the so-called idiopathic osteonecrosis would be a fracture of the femoral condyle due to fatigue and should be named as *fracture by failure or fracture due to fatigue*. The name osteonecrosis seems to be inappropriate, since there is no osteonecrosis in a large portion of the cases, being confused with osteonecrosis resulting from other non-traumatic pathologies.⁷

CONCLUSION

The group of patients with the so-called meniscal injury due to fatigue should be assessed as patients presenting the first symptoms of failure of osteocartilaginous structure of knee joint. They should be treated as having a syndromic pathology that may evolve to idiopathic osteonecrosis.

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