

Unusual Mechanism of Knee Ligaments Injury

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ABSTRACT

Background: Abduction-traction injury of the knee is uncommon. The construction workers and parachutists are usually the victims. It occurs from falling head first with sudden block to ankle during fall without any compression at the knee causing disruption of the major ligaments of the knee. The menisci and the osteochondral surfaces of tibia and femur usually escape injury.

Aim: To highlight an unusual mechanism of serious injury to knee causing ligaments damage only.

Methods: This study included 20 patients of knee instability and was carried out at Department of Orthopedics, Prince Motaib bin Abdul Aziz Hospital, Sakaka Saudi Arabia from 30th March 2014 to 30th March 2016. The adult male patients aged 22-35 years who sustained abduction traction injury to the knee were included. The damage was purely ligamentous. All patients were subjected to surgery at our higher centers. The regular follow-up and full rehabilitation program was carried out at our hospital so we were able to interview the patients and those present at the scene of accidents. We focused mainly the unusual mechanism of traction-abduction injury to the knee.

Results: The arthroscopic reconstruction of anterior cruciate ligament/posterior cruciate ligament and the acute repair of grade III complete tear of medial collateral ligament were the mainstay of treatment followed by full physical rehabilitation program. All patients had returned to normal daily activities in 4-6 months following surgery. The rate of complications was minimal. Two patients had mild residual anteromedial instability while one patient developed knee stiffness in otherwise stable knee. There was no neurological deficit.

Conclusion: The knowledge of mechanism of any injury is of significance in deciding the mode of management. The possibility of abduction-traction injury should be kept in mind when the knee injuries subsequent to fall from height are reported especially in construction workers and parachute jumpers.

Keywords: History of fall from height, Head downward, Entrapment of ankle in ladder,

INTRODUCTION

In literature there are reports of isolated injuries of menisci, ligaments or osteochondral surfaces of knee.^{1,2} Patterns of combined injuries are also observed.³⁻⁵ Different combinations of injuries can be attributed to a common mechanism.⁶ One must concentrate on exact mechanism of injury in order to establish a correct diagnosis. The description of precise mechanism may not be very simple for the patient owing to the presence of multiple forces that act simultaneously on the knee in the short time during which the injury is sustained. Patient's cooperation is important in recalling his movements, position of the injured knee and the direction of any external force. Most knee injuries occur in the weight bearing position. The meniscal tears or osteochondral fractures are the result of compression and rotation forces while ligamentous damage is caused by rotation and abduction or adduction

movements. The main emphasis of our study is on an unusual mechanism of knee injury which causes extensive ligamentous damage in the absence of compression and rotation forces.

PATIENTS AND METHODS

This study consists of 20 building construction workers who fell from ladder with head downwards and ankle entangled in the ladder during fall. The age range was 22-35 years. All were males. The study was carried out at Department of Orthopedics Prince Motaib bin Abdul Aziz Hospital, Sakaka Saudi Arabia from 30th March 2014 to 30th March 2016. All patients initially reported to us but were operated after complete work up at higher centers. Ten patients had injured the right knee and 10 the left knee. The surgery was preceded by arthroscopy and was done within 3-15 days after the injury. About two weeks after the surgery all these patients consulted us for rehabilitation program and regular follow-up. We interviewed the patients focusing on the mechanism of injury. The patients and their colleagues who were present at the site of accident recalled the chain of events with one thing in common i.e. fall from ladder with head downwards and ankle entangled in the

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ladder causing serious injury to ipsilateral knee. We felt that some unusual mechanism was responsible for the purely ligamentous injury of their knee which demanded surgery. The operative findings included tears of anterior cruciate ligament, medial collateral ligament and posterior oblique ligament in each case. In five patients post-capsule and in four the posterior cruciate ligament also were torn. In our series of patients there was no injury to lateral collateral ligament or lateral menisco-tibial ligament. The arthroscopic reconstruction of anterior cruciate ligament/posterior cruciate ligament and the acute repair of grade III complete tear of medial collateral ligament were the mainstay of treatment followed by full physical rehabilitation program. The follow-up period was 9-24 months.

RESULTS

Table 1: Frequency of clinical pictures among total patients (20)

Clinical picture	No.	%
Knee effusion	20	100.0
Decreased ROM	16	80.0
Meniscal injury	-	-
Medial opening in extension	8	40.0
Medial opening in flexion	20	100.0
Lateral opening in extension	-	-
Lateral opening in flexion	-	-
Anterior drawer	20	100.0
Posterior drawer	4	20.0
Antero-medial instability	20	100.0
Antero-lateral instability	-	-
Posteromedial instability	4	20.0
Posterolateral instability	-	-

Table 2: Frequency of operative findings among total patients (20)

Operative finding	No.	%
Anterior cruciate ligament tear	20	100
Posterior cruciate ligament tear	4	20
Medial collateral ligament tear	20	100
Lateral collateral ligament tear	-	-
Posterior oblique ligament tear	20	100
Posterior capsule tear	5	25
Medial menisco-femoral ligament tear	-	-
Lateral menisco-tibial ligament tear	-	-

The hospital record of all patients revealed the pre-operative clinical picture and the operative findings as shown in tables 1-2. Pre-operatively anteromedial instability was present in each case. In four patients posteromedial instability was found. There were no clinical signs of meniscal injury. There were no osteochondral fractures or fibrillation. Postoperatively all patients were involved in physical rehabilitation program. All patients resumed normal daily routine in 4-6 months following surgery. Two patients had mild

residual antero-medial instability while one patient developed some knee stiffness in otherwise stable knee but these three patients expressed their satisfaction over the treatment.

DISCUSSION

Richman and Barnes⁷ described the abduction-traction injury of the slightly flexed or almost extended knee in 1946. The force of the body weight pulling the knee downwards counteract the blocking force on the ankle pulling the knee upwards and into valgus while free-falling with the head downward. The resultant abduction-traction injury results in simple instability with medial opening of the knee in slight flexion. Richman and Barnes⁷ treated all their patients conservatively.

Anteromedial instability was present in all our patients. This most common type of complex instability is caused by lateral rotation and abduction of the tibia in semi flexed knee^{6,8}. The semi-flexed position of knee in an abduction and lateral rotation injury is responsible for laxity of lateral collateral ligament and reduction in tension of anterior cruciate ligament. Consequently posteromedial corner of the tibia rotates forward, tearing first the medial capsule, then medial collateral ligament and, if it continues, the anterior cruciate ligament also^{3,5}. The PCL usually escapes injury⁴. In the present study, 4 patients had tears of posterior cruciate ligament causing posterior medial instability in addition to anteromedial instability.

Under physiological conditions, the femoral condyles are compressed by the body weight against tibial condyles and menisci, thus preventing excessive varus/valgus movement. The ligaments are thus protected from injury. The capsule and ligaments are more prone to injury if there is less load on the joint⁹. Rotation is an important factor in overcoming the stabilizing effect of body weight. In abduction-traction injury the body weight causes knee traction, the knee ligaments are compromised and the abduction with lateral rotation readily tears the post oblique ligament, medial collateral ligament and anterior cruciate ligament. In 9 patients the stronger traction also caused the tear of posterior capsule and the posterior cruciate ligament.

Compression-rotation force usually injures the menisci, while traction with rotation (with or without abduction- adduction) tears ligaments.⁴ If the axial load is greater, the likelihood of femur rotating sufficiently to cause ligamentous injury is less but likelihood of injury to menisci or articular cartilage is higher¹⁰.

27-62% of patients with acute ligamentous injuries of the knee had associated meniscal

injuries^{11,12}. Another study showed 17% of patients with ligament injuries had associated meniscal injuries¹³ 20% of patients with acute ligamentous tears had chondral fractures or fibrillations¹¹ The weight bearing antero-lateral instability demonstrates tears of lateral meniscus in 50-100% of cases^{14,15}.

In our study there were no meniscal tears or osteochondral fractures. The injury was purely ligamentous. No compression force was involved. The results were good due to great advancement in the techniques of ligament reconstruction, high level of expertise and great cooperation extended by patients in following postoperative rehabilitation program.

CONCLUSION

Abduction-traction injury of knee is very rare but it occurs. Careful history taking with more emphasis on mechanism of injury is of paramount importance in establishing the diagnosis and deciding the mode of management. Surgery gives good results.

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