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LIGAMENTOUS TEAR CONCOMITANT WITH TIBIAL CONDYLAR FRACTURE

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Many authors do not discuss ligamentous injuries at all in their reports on fractures of the tibial condyles (Hohl & Luck 1956, Jensenius et al. 1961, Wolf & White 1963, Jacobsen 1963, Barrington & Dewan 1965, Fryjordet 1967, Poulsen & Tophøj 1969); others consider them unimportant (Caldwell 1936, Cave 1948, Smillie 1970). At the Clinic for Orthopaedics and Traumatology, University Central Hospital, Helsinki, particular attention has been paid to this combination of injuries, which was present in the series described in this paper.

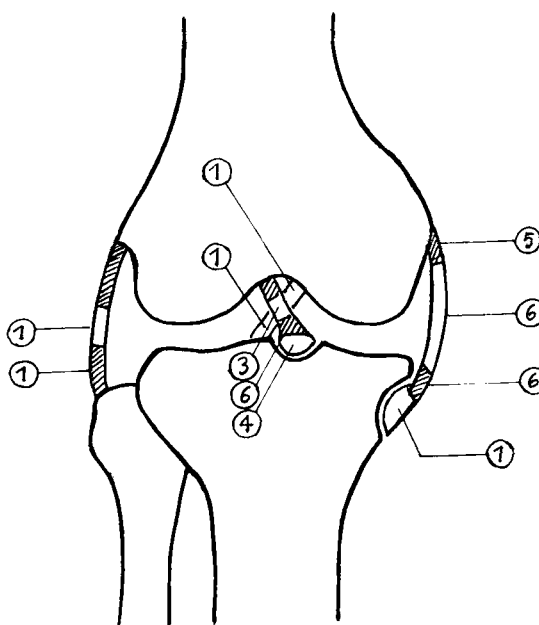
MATERIAL

From 1962–1967, 291 patients with tibial condylar fractures were treated in our clinic. Of these, 196 were followed up after an average of $4\frac{1}{2}$ years. The mean age of the patients was 52 years. The treatment results for the fractures are analysed separately (Bakalim & Wilppula 1971).

The treatment of the tibial condylar fractures was operative in 91/196 patients. At the same time, primary repair of total ligamentous tears was performed in 24 patients. A total of 33 ligaments were sutured (Table 1, Figure 1).

The exposure routinely employed in our clinic in the surgery of condylar fractures allows extensive exploration of the joint. Hence, tears of the cruciate ligaments could be diagnosed by inspection at operation. Tears of the collateral ligaments were sometimes suspected preoperatively owing to local tenderness and/or the presence of haematoma and instability. The diagnosis was verified under anaesthesia in the initial operative phase, by inspection during operation, or when the stability was tested after fixation of the fracture. If necessary, the ligament involved was then separately exposed.

Figure 1. Location of 35 tears in 33 ligaments repaired in connection with operative treatment of tibial condylar fractures in 24 patients. In two cases the medial collateral ligament showed a superficial and a deep tear at different levels.



The condylar fractures are shown in Table 1. The distribution of the different fractures is the same as in the whole series of tibial condylar fractures mentioned above (Bakalim & Wilppula 1971). According to the classification introduced by Hohl & Luck (1956), the mono-condylar fractures were of the local depression type in 10 cases, total depression type in 4, split type in 6, and undisplaced in one case. Tears of the medial collateral ligament were most frequent and usually (13/16) occurred in conjunction with fracture of the lateral condyle. Repair of the cruciate ligaments was performed in 13/24 patients. This was the only ligamentous injury in 6 of these cases, while the remainder also showed tears of the collateral ligament. In addition to ligamentous tears, many patients also showed extensive injury to the capsule. In two cases a rupture of the posterior capsule was repaired on separate posterior exposure. One patient also showed avulsion of the patellar ligament.

The torn ligaments were sutured with either chromic catgut or synthetic fibre. Insertion ruptures and avulsion fractures were fixed with sutures to their freshened sites. The cruciate ligaments were repaired by transosseous sutures. In two cases the medial collateral ligament

showed a superficial and a deep tear at different levels, which were separately sutured. All operations were performed under general anaesthesia, and the limb was exsanguinated. Usually these cases were not treated as emergency cases. The majority of the patients (19) were operated upon two or three days after the accident, the remaining 5 four to eleven days after. The fractures were fixed with Ackerman's bolt or a screw and in cases of depression fracture the cancellous bone defect resulting from elevation was filled with a bone graft. In 10 patients a torn meniscus was removed. Postoperatively the limb was immobilized in a plaster cast with the knee in slight flexion for an average of 8.5 weeks. Full weight-bearing was allowed after an average of 11.7 weeks.

Table 1. Primary repair of the ligaments of the knee in the operative treatment of 91 tibial condylar fractures

Repaired ligament	Location of fractures			Total
	Medial condyle	Lateral condyle	Bicondylar	
Medial collateral	--	9	1	10
Lateral collateral	--	--	1	1
Medial collateral and anterior cruciate	1	4	--	5
Medial collateral and both cruciates	1	--	--	1
Lateral collateral and anterior cruciate	1	--	--	1
Anterior cruciate	1	3	1	5
Both cruciates	1	--	--	1
	5	16	3	24

In 2 cases a ligamentous tear observed at operation was left un-repaired. The posterior cruciate ligament was involved in one of these cases, the medial collateral ligament in the other. In 3 patients with condylar fractures both the fracture and a diagnosed tear of the medial collateral ligament were conservatively treated by immobilization in a plaster cast.

RESULTS

At follow-up the stability of the ligaments was estimated by current clinical tests, using the other knee as control. A positive "drawer sign"

was considered as evidence of insufficiency of the cruciate ligaments. Abduction and adduction tests were performed separately with the knee in full extension and in 20 degrees flexion. If on inspection and palpation the opening of the joint space was found to be larger than in the unaffected knee, this was considered as evidence of collateral insufficiency. Arthrography or radiographic examination under stress were not performed.

The total functional end result in the knee was considered as acceptable if full extension and flexion over 90 degrees were present, the tolerance and strength of the limb were sufficient for the patient's occupational work or for activities appropriate for his age, and the knee was subjectively stable. This being the case, slight objective instability was accepted. If all of these criteria were not fulfilled, the result was classified as unacceptable.

Ligamentous insufficiency was considered as severe if the patient himself complained of instability of the knee, which was objectively attributed to the ligaments and regarded as the main cause of the unacceptable result.

Table 2. Ligamentous insufficiency of the knee following fracture of tibial condyles

Insufficient ligament	Location of fracture			Primary treatment of fracture		Primary suture of ligaments	Condylar deformity at follow-up		Severe ligamentous insufficiency	Total
	Medial condyle	Lateral condyle	Bicondylar	Conservative	Operative		-	+		
Medial collateral	1	12	5	8	10	1	9	9	6	18
Lateral collateral	1	1	1	1	2	-	2	1	-	3
Medial collateral and anterior cruciate	2	1	1	1	3	-	4	-	-	4
Lateral collateral and anterior cruciate	1	-	1	2	-	-	2	-	-	2
Anterior cruciate	6	1	3	7	3	1	6	4	1	10
Posterior cruciate	-	1	-	1	-	-	1	-	-	1
Both cruciates	1	1	-	-	2	2	2	-	2	2
	12	17	11	20	20	4	26	14	9	40

At follow-up 40/196 knees (20 per cent) were rated as instable according to ligamentous insufficiency (Table 2). The age distribution of the patients showing instability of the knee was not remarkable. Ligamentous insufficiency was about as frequent under 50 years of age ($16/92 = 17.5$ per cent) as over this age ($24/104 = 23$ per cent).

Table 3. Ligamentous insufficiency of the knee at follow-up

Method of treatment	No. of cases	Ligamentous insufficiency		Total
		Without condylar deformity	With condylar deformity	
Primary suture of ligaments and operative treatment of fractures	24	4	—	4
Operative treatment of fracture only	67	9	7	16
Conservative treatment	105	13	7	20
	196	26	14	40

Insufficiency was observed in 4 patients in whom torn ligaments had been repaired in the acute stage. Three conservatively treated, immediately diagnosed ligamentous tears were stable after healing, and the functional result was acceptable. Those two cases in which a torn ligament diagnosed at operation was left unrepaired showed instability, and the result was classified as unacceptable.

The relationship between ligamentous insufficiency as observed at follow-up and the presence of deformity of the articular surface (depression over 3 mm) is shown in Table 3. In the whole series of condylar fractures ligamentous insufficiency occurred as often in the knees showing condylar deformity ($14/76 = 18$ per cent) as in those with no deformity ($26/120 = 21.5$ per cent).

The ligamentous insufficiency was mostly slight. It was the main cause of an unacceptable result in 9 patients ($9/196 = 4.5$ per cent). The ligamentous tear had been repaired in the acute stage in 2 of these cases. In 5, only the fracture had been operatively treated, and 2 had been conservatively treated. Five patients showed no condylar deformity.

DISCUSSION

Clinical evaluation of the stability of the ligaments of the knee is difficult and depends on the skill of the examiner. Opinions differ, moreover, as to the importance of any one ligament in stabilizing the joint after injury. According to some authors, instability on abduction, observed with the knee extended, implies that both the medial collateral ligament and the anterior cruciate ligament are torn (Brantigan & Vooshell 1941, Palmer 1951, de Palma 1954). The view has also been expressed that a tear of the medial collateral ligament alone is best diagnosed with the knee in 20 degrees flexion (Hallén & Lindahl 1965). Other investigators, however, recommend examination of the medial collateral ligament with the knee extended (Chapchall 1959, Smillie 1970). In this study we have considered lateral instability observed with the knee in either extension or slight flexion as a sign of insufficiency of the collateral ligament alone. The condition of the cruciate ligaments was evaluated by the "drawer sign". A special problem arises when the tibial condyle is depressed, since it has been stated that this alone causes lateral instability (Hallén & Lindahl 1967). However, on the basis of an experimental study it has been advocated that an intact medial collateral ligament keeps the knee stable irrespective of a possible defect in the lateral condyle (Martin 1960). In the present study enlargement of the joint space on lateral stress as compared to the other knee was considered as a sign of insufficiency of the collateral ligament. In our opinion this simple method of evaluation gives a very reliable result, which can be used for comparison. The reliability of the result is corroborated by the fact that in this series depression of the tibial condyle did not increase the rate of ligamentous insufficiency.

The experience from the operative treatment seemed to indicate that an early diagnosis of ligamentous tears is facilitated by investigation under anaesthesia, perhaps performed during the operation, and a wide exposure.

As regards the mechanism of monocondylar tibial fractures, contradictory opinions have been expressed. It has been stated that the condyle is fractured only if the contralateral collateral ligament remains intact (Bancroft & Murray 1945). Others have maintained that condylar fractures without simultaneous rupture of the contralateral collateral ligament is impossible (Apley 1956, Watson-Jones 1962, Smillie 1970). In the present series ligamentous tear and condylar fracture were often concomitant. The most usual combination was

fracture of the lateral condyle and rupture of the medial collateral ligament, but tear of the anterior cruciate ligament and multiligamentous tears were also common.

Among 40 patients late ligamentous insufficiency was certainly due to the primary injury in 5 cases, since a tear was observed at operation. In 22 cases primary ligamentous rupture seemed highly probable, since no condylar deformity causing instability was present. In 14 cases it seems possible, however, that the ligamentous insufficiency observed as a late result was not due to a primary rupture, but developed later or was aggravated by stress due to condylar deformity. It seems natural to assume that a change in shape of the articular surface affects the mechanism of the joint in such a way that the tension in the ligaments is altered. This possibility has been discussed by some writers (Hultén 1929, Ruckhardt 1932, Lassman 1935) and seems to constitute a further indication for reduction and operative treatment of condylar fractures.

Many authors consider the ligamentous tears connected with condylar fractures so slight that no treatment is required (Caldwell 1936, Cave 1948, Smillie 1970). This is certainly true for many cases, but the relative frequency of late ligamentous insufficiency, in particular the rate of severe insufficiency (4.5 per cent) in the present series, as well as the frequency of total tears detected primarily at operation, seems to imply that it is worth striving for to diagnose total rupture of ligaments in the acute stage and to treat them operatively. The same view has been expressed before by a number of writers (O'Donoghue 1955, 1962, Solonen 1963, Helfet 1963, Hohl 1967, Solonen & Rokkanen 1967, Roberts 1968). The need of protracted subsequent immobilization in plaster has been mentioned as a contraindication to primary repair of torn ligaments (Reibel & Wade 1962). In our opinion the fear is groundless, however. Of the operatively treated patients in the present series, who were immobilized in a plaster cast for an average of 8½ weeks, the majority (20/24) had acceptable results.

CONCLUSIONS

Tibial condylar fracture and total rupture of the ligaments of the knee can be concomitant. The diagnosis of total rupture of ligaments is facilitated by investigation under anaesthesia and wide exploration of the knee. Primary repair of total rupture of the ligaments is worth striving for since ligamentous insufficiency may be very harmful.

SUMMARY

This report deals with the ligamentous tears observed in a series of 196 tibial condylar fractures. In connection with surgery of the fracture, carried out in 91 cases, torn ligaments were repaired in 24. At follow-up examination ligamentous insufficiency was observed in 40 patients. In the majority of these the ligamentous tear had not been primarily diagnosed. Ligamentous insufficiency was the main cause of a poor result in 4.5 per cent of the whole series of fractures. The importance of repair of torn ligaments in the acute stage is emphasized.

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