

END RESULTS IN CONSERVATIVELY TREATED COMPRESSION FRACTURES OF THE LATERAL TIBIAL CONDYLE

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On several occasions I was astonished by the fact that patients who reported a knee fracture of old date had slight or no trouble from the joint. Roentgenography sometimes revealed considerable deviations from normal anatomy; lack of congruence of the articular surfaces of the condyle of the femur and tibia and arthrosis deformans of varying severity. Judging by the roentgenographic findings, one might rather have expected a considerable functional disturbance from the joint.

Palmer (1951) divides fractures of the upper end of the tibia into three groups:

1) *Split fractures*. The dislodged femoral condyle tears off a wedge-shaped fragment of the tibial condyle which in turn is dislocated downwards and laterally with a varying degree of separation.

2) *Compression fractures*. Here the displaced femoral condyle does not produce a split fracture but a compression injury. A part of the articular surface of the tibia is pressed down into the spongy tissue of the epiphysis. The depressed fragment—or fragments, for there may be a mosaic-like mass—is generally surrounded by marginal fragments which mark the normal level of the articular surface but which may be displaced somewhat laterally.

3) *T or Y fractures* in which both condyles are fractured and the fracture is much comminuted.

Fractures belonging to group 2 are the most common. The discussion below refers only to this type of fracture.

Judging by the literature opinions differ widely on the most suitable treatment of these fractures. Some authors recommend surgical treat-

ment (Cubbins *et al.* 1934, Leadbetter and Hand 1940, von Bahr 1945, Palmer 1951, Perey 1952, Gylling & Lindholm 1953, Hohl 1955), others conservative treatment (Cotton, 1936, Caldwell 1936, Bick 1941, Slee 1955, Apley 1956). Bick and Slee advocate surgical treatment only in cases in which the displacement is severe.

As far as the conservative treatment is concerned, it appears that no particular method has been accepted as the method of choice, although some agreement appears to have been reached regarding certain measures. For example, all agree that an extremely long period of immobilization of the joints has an unfavourable effect on the end-results.

The purpose of this investigation was

- a) to assess the functional end-results of conservatively treated compressed lateral tibial condyle fractures,
- b) to correlate the clinical end-results with the roentgenographical end-results, and
- c) to compare the occurrence of secondary arthritic changes in the injured and healthy knee as well as in the hip and the foot joints on either side for any arthritic changes.

The material consisted of 25 inpatients (14 males and 11 females) treated before 1945 at the Department of Surgery, Malmö General Hospital¹. Most of the patients were relatively old at the time of the accident (Table 1).

TABLE 1
Age incidence of 25 patients with depressed condyle fractures.

< 30 years	30 < 40	40 < 50	50 < 60	60 < 70
2	3	9	5	6

Types of injuries.—10 had fallen from a cycle, 11 had stumbled or fallen from a height, and 4 had sustained direct injuries.

The degree of depression and lateral displacement varied. The depression as measured in the roentgenogram was never less than 3 mm.

Treatment.—Therapy had consisted of aspiration of the haemarthrosis and immobilization of the joint. No attempts had been made to reduce the dislocated lateral condyle. Most (17) of the joints had been immobilized in a splint, the remainder in plaster. As a rule (20 cases),

¹ Prior to 1945 all acute cases of fracture were handled by the Department of General Surgery. Professor H. B. Wulff, present head of that department, has kindly given me an opportunity to review the above cases in this paper.

the joint was immobilized for only at most 2 weeks. The longest period of immobilization was 8 weeks. Physiotherapy with massage and exercise was started as soon as the splint or plaster had been removed. Weightbearing was not allowed until 6 weeks after the accident and then first with the help of crutches or walking sticks.

None of the patients were in hospital for less than 6 weeks.

TABLE 2

Interval between hospitalization and re-examination of 25 patients.

Time	Number of cases
7 < 10 years	11
10 < 15 „	7
15 years and more	7

THE REVIEW

The interval between hospitalization and the review was at least 7 years (Table 2).

The review included a careful inquiry about any symptoms the patients still had. The knee as well as the hip and foot joints on either side were examined clinically and roentgenologically. Special attention was paid to the appearance of the injured knee (swelling, valgus deformity etc.) to its range of motion and to any abnormal mobility (instability). The circumference of the thigh and calves was measured for any wasting of the muscles.

Results.—The end results were assessed by the same criteria as those used by Palmer (1951). *Excellent*. Pain-free. Full function. Normal or almost normal flexion. Stable. *Good*. Moderate inconvenience after activity, good mobility, increased crepitation compared with the other side. *Fair*. Inconvenience limiting the working capacity, reduced mobility, slight deformity and instability, atrophy, marked crepitation. *Poor*. Pain even at rest, poor mobility or ankylosis, deformity, instability.

Assignment of a patient to a given group did not, of course, require fulfilment of all the criteria of the group. The most decisive factor in the classification of the cases was the severity of the patient's symptoms.

The results are given in Table 3. Satisfactory functional results (*excellent* + *good*) were noted in 17 (68 per cent) cases.

In 2 patients the results were *poor*. One of them was a labourer (insurance case) who was 54 years old at the time of the accident. He had moderate depression of the joint surface. At the review he reported that

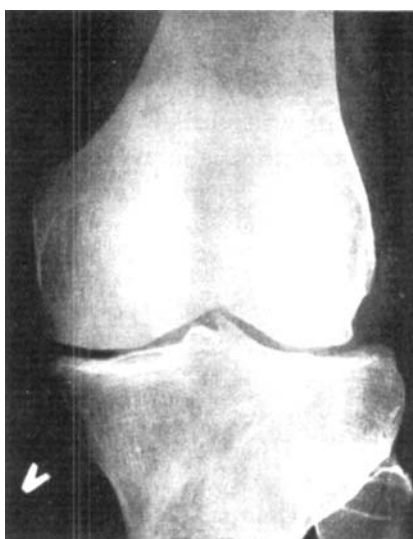


Fig. 1.

E. P. ♂ group poor (see text).

Roentgenogram 14 years after accident showed increase in breadth and slight depression of lateral tibial condyle. Joint space was decreased and surface of lateral condyle was irregular. Pronounced arthritic changes on eminentia intercond.

TABLE 3

Results of conservative treatment in 25 cases with depressed lateral tibia condyle fractures.

Excellent	Good	Fair	Poor
8	9	6	2

the knee was almost continuously painful. His working capacity was severely impaired (he was receiving a disability pension). Clinical examination revealed only slight atrophy of the calf muscles and moderate crepitation. The roentgenographic appearance of the knee at the time of the review is shown in Fig. 1. On comparison of this roentgenogram with that of a patient of the same age belonging to the group *excellent* (Fig. 2), it appears that there is no correlation between the disability described and the roentgenographic appearance in these 2 cases. As to the other patient with a poor result she had been submitted to arthrodesis 3 years after the accident because of severe, obstinate knee pain. Examination at the time of the operation (1941) had revealed: moderate capsular swelling, defective (10°) extension, valgus



Fig. 2.

V. P. ♂ group *excellent* (see text).

Roentgenogram 17 years after accident showed that entire lateral tibial condyle was depressed. The joint surface was irregular especially the medial portion. Extensive changes on eminentia intercond.



Fig. 3.

E. A. ♀ group *poor* (see text).

Aged 26 at time of accident. Roentgenogram then showed fracture of lateral tibial condyle with slight depression and lateral displacement. Arthrodesis performed some years later because of disabling symptoms.

deformity (10°) and wasting (3 cm.) of the thigh (measured 20 cm. above patella) and of the calf (1.5 cm.) on the roentgenogram. There was 80° flexion and no lateral instability. The depression of the lateral condyle was measured as exactly 3 mm. and the articular surface was almost normal (Fig. 3). Thus, there was no clear correlation between the symptoms and the clinical findings on one hand and the roentgenographic findings on the other.

It was of interest to note that one patient (group *fair*) had an extension defect of 30° for 9 years, after which he presented himself at the Department of Orthopaedics (1949). After redression under anaesthesia the extension defect disappeared almost entirely.

Of the 25 patients 14 had no impairment of mobility, and 6 could flex the knee about 90° , none less than 90° except the patient with arthrodesis.

Four of the 6 patients with about 90° flexion had a slight extension defect of at most 10° . None of the 25 patients had a larger extension defect. Instability (valgus) of 5 – 10° was observed in 5 (groups *good* 2, *fair* 3).

Roentgenographical findings.—Roentgenograms taken at the review were compared with those that had been taken at the time of the accident. At the time of the review examination showed, of course, depression increased breadth and varying degree of deformity of the joint surface of the lateral condyle of approximately the same degree as in the primary roentgenograms. Practically the entire joint surface of the lateral condyle showed osteo-arthritic changes (frontal view). Beak-shaped arthritic changes in the edge of the lateral joint surface were almost the rule. They were seldom accompanied by any such changes on the joint surface of the medial condyle. Despite incongruence of the joint surfaces of the lateral tibial and lateral femoral condyle, the joint surface of the femoral condyle was practically always roentgenologically intact, as were the joint surfaces of the medial condyle of the femur and of the tibia. In other words, late arthritic changes were limited to the traumatised region and had not encroached upon joint surfaces that had not been damaged at the time of the accident.

On comparison of the groups Excellent, Good and Fair no definite difference was found between them in respect to the severity of secondary osteo-arthritic changes (Table 4).

Examination of the roentgenograms of either knee at the review showed that osteo-arthritic changes were much more common in the injured knees (Table 5).

TABLE 4

Arthritic changes found on review of 25 cases of depressed fracture of lateral tibial condyle.

	Slight	Moderate	Severe	Total
Excellent	1	5	2	8
Good	1	5	3	9
Fair		3	3	6
Poor			1	1*
Total	2	13	9	24

* 1 case (arthrodesis) not included.

TABLE 5

Arthritic changes found in injured and other knee at time of review.*

Injured knee			Other knee			
Slight	Moderate	Severe	None	Slight	Moderate	Severe
2	13	9	10	11	3	1

* One case (arthrodesis) not included in table had no arthritic changes in other knee.

Patients with an injured joint of the lower limb and later pain in some other joint in any limb are apt to believe that the primary symptoms had resulted in an abnormal gait, which had in turn thrown an extra strain on the very joint in which pain had later developed. It was for this reason that roentgenograms were taken of the hip, knee and foot joints on both sides. The purpose was to determine whether an injured painful knee favours the development of osteo-arthritic changes in other joints of the lower limb. In view of the fairly high ages of the patients deforming processes were, as expected, seen in the edges of the joint surfaces of a high percentage of the knee and hip joints. Pain in joints other than that which had been injured was by no means so common and was reported in only 5 cases.

All of the patients had arthritic changes of varying severity in both hip joints, in 3 of them the changes were more pronounced on the healthy side and in none were the changes more severe on the injured side.

Roentgenologically definite arthritic changes were seen in the healthy knee in 15 (60 per cent) (Table 5).

Bilateral changes in the various joints of the foot were readily re-

cognized in a total of 12 (48 per cent) in 1 of whom the changes were definitely more severe on the injured side and in 2 patients on the healthy side.

The analysis thus permitted no valid conclusion as to whether a painful knee joint favours the development of osteo-arthritic changes in any other particular joint of the lower limbs.

COMMENTS

The end-results in the present material are not strictly comparable with other conservatively treated series on record. My series includes only fractures of a certain type (group II according to Palmer's classification), while other authors report the total results of different types of intra-articular tibial fractures. As to the results obtained in fractures of the type under discussion, Palmer seems to be the only one who has given a report on such a series. The figures he gave for a total of 42 cases were: excellent 28, good 9, fair 5, poor 0. (The figures of my 25 cases were: 8, 9, 6, and 2). His results were thus appreciably better than those achieved by the treatment given in the present series. Though Palmer's results are better, those presented here cannot be regarded as unsatisfactory. The series are comparable in that the age distribution was approximately the same in both materials. The injuries were thus most common in middle-aged persons (40–60 years).

In view of the fact that the roentgenographic examination at the review showed no definite differences between the various groups (excellent, good etc.) the question arises: why were the functional end results so different? It is not easy to find an answer to this question. Even though no objections can in principle be raised against the desirability of correct restitution of the anatomy of the joint,—which can only be achieved by open reduction—there are many other factors to be considered, which may reasonably influence the end-results. Such factors might be the immediate effect of the primary trauma on the soft tissue surrounding the knee joint, the general constitution of the patient, occupation, duration of immobilization, efficacy of physiotherapy, and disposition for arthrosis deformans. These factors as well as possible complications of operation (infection, thrombosis) should be borne in mind in the choice between conservative and surgical treatment. In addition it might not be out of place to quote the words of Palmer: "Recognition of the operative indication requires experience, and the operation itself may be technically delicate".

SUMMARY

1. 25 patients with compressed fracture of the lateral condyle of the tibia were reviewed at least 7 years after the accident.

2. Treatment had consisted of aspiration of the haemarthrosis, no attempt at reduction, immobilization (1–2 weeks), and then physiotherapy (6 weeks). Weight-bearing was allowed after 6 weeks.

3. The results were excellent in 8 cases, good in 9, fair in 6 and poor in 2.

4. Excellent or good results had been achieved in the majority (68 per cent) despite roentgenologic evidence of depression, increase in breadth and osteo-arthritic changes of the lateral tibial condyle.

5. As a rule, secondary osteo-arthritic changes were seen only in the injured part of the knee (lateral condyle).

6. Judging from the present material there is no reason to assume that the injured knee leads to an "abnormal gait" favouring the development of osteo-arthritic changes in any other particular joint of the injured or healthy limb.

7. It is probable that a number of irrational factors influence the end-results of both surgical and conservative treatment. Such factors may be the effect of the primary trauma on the soft tissue surrounding the joint, the general constitution of the patient, occupation, duration of immobilization, efficacy of physiotherapy and disposition for arthrosis deformans.

RESUME

1. 25 malades avec fracture de compression du condyle latéral du tibia ont été réexaminés au moins 7 ans après l'accident.

2. Le traitement a consisté en une aspiration de l'hémarthrose, sans tentative de réduction, par immobilisation (1–2 semaines) et ensuite physiothérapie (6 semaines). La charge de l'articulation a été autorisée au bout de 6 semaines.

3. Les résultats ont été excellents dans 8 cas, bons dans 9, relativement bons dans 6 et piètres dans 2.

4. Des résultats excellents ou bons ont été obtenus dans la majorité des cas (68%) en dépit de la constatation radiologique de dépression, d'un accroissement en largeur et de modifications ostéo-arthritiques du condyle tibial latéral.

5. En règle générale, des modifications secondaires ostéo-arthritiques ont été constatées uniquement dans la partie de genou endommagée (condyle latéral).

6. Il est probable qu'un certain nombre de facteurs ont une influence sur les résultats finaux, aussi bien lorsqu'il s'agit du traitement chirurgical que conservateur.

ZUSAMMENFASSUNG

1. 25 Patienten mit Kompressionsbrüchen des lateralen Tibiakondyls wurden zumindest 7 Jahre nach dem Unfall überprüft.

2. Die Behandlung bestand in der Aspiration des Hämarthros, keinerlei Repositionsversuch, Ruhigstellung (1–2 Wochen) mit folgender physikalischer Behandlung (6 Wochen). Belastung wurde nach 6 Wochen gestattet.

3. Das Ergebnis was ausgezeichnet in 8 Fällen, gut in 9 Fällen, weniger gut in 6 Fällen und schlecht in zweien.

4. Ausgezeichnete oder gute Ergebnisse wurden in der Mehrzahl der Fälle (68%) erzielt, obwohl röntgenologisch Depression, Verbreiterung und osteo-arthritische Veränderungen des lateralen Tibiakondyls nachweisbar waren.

5. Im allgemeinen wurden sekundäre osteo-arthritische Veränderungen nur im geschädigten Anteil des Knies (lateralen Kondyl) gesehen.

6. Es ist wahrscheinlich, dass eine Anzahl von Faktoren das Endergebnis sowohl der operativ, als auch der konservativ behandelten Fälle, beeinflussen.

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