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Modified Loeffler's medial capsulotomy for osteoarthritis of the knee: 20 years' follow-up

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Abstract We reviewed 11 knees in ten patients at a mean follow-up of 23 years after a modified Loeffler's medial capsulotomy for osteoarthritis of the knee. The mean age was 59 ± 8 years at surgery. The mean knee score (Hospital for Special Surgery) was 59 points before surgery and 79 points at follow-up. The long-term results of this operation were thus maintained over a prolonged period. This is a relatively simple procedure, which may be performed in the elderly, with satisfactory long-term results.

Résumé Dix malades (11 genoux) ont été suivis 20 à 25 années après capsulotomie de Loeffler modifiée. L'âge moyen était de 59 ± 8 années à l'opération. La cotation moyenne du genou (score H.S.S.) était de 59 points avant chirurgie, et de 79 ensuite. Les résultats éloignés de cette opération ont bien été maintenus même sur une période prolongée. C'est une méthode peu invasive pouvant être utilisée chez des patients très âgés.

Introduction

Loeffler's capsulotomy was described in 1960 [16] and involves a medial release and debridement; and there are several satisfactory reports of the outcome following this procedure [23, 24, 27, 28]. In this study 11 knees in ten patients with more than 20 years follow-up were available for review.

Patients and methods

Between 1974 and 1979, 33 patients (27 women, 6 men) with 35 knees affected by primary medial compartment osteoarthritis underwent a modified Loeffler's operation. Indications for surgery

included severe pain in the knee, limiting activities of daily living, with disturbance of gait and difficulty climbing stairs, which did not respond to conservative management. Between 1983 and 1998 6 patients (6 knees) died, 13 patients (13 knees) were lost to follow-up and 4 patients (5 knees) underwent unicompartmental knee arthroplasty (UKA).

The remaining ten patients (11 knees), with more than 20 years follow-up, were studied (Table 1). The mean age at surgery was 59 years (44–74 years). The mean follow-up was 23.2 years (20.5–24.3 years) and the mean age at follow-up was 81 years (68–88 years). The outcome was assessed with regard to knee pain, mobility, range of movement, flexion contracture and effusion according to the criteria of the Hospital for Special Surgery knee score (HSS) [11].

Radiological evaluation was made using standing antero-posterior (AP) radiographs. The femorotibial angle (FTA) [5] was used as a parameter of varus deformity. The severity of medial compartmental knee osteoarthritis was evaluated according to modified Ahlbäck's criteria [1, 14], and nine knees were classified as grade 2, and two as grade 1.

Operative procedure. A horizontal skin incision about 7 cm long is made 1 cm below the medial joint line (Fig. 1). The medial retinaculum, capsule and medial collateral ligament are resected as a long strip measuring 7 cm $\times$ 1.5 cm, with the degenerative medial meniscus and surrounding hypertrophied synovium. The medial joint space is opened widely and a debridement performed, with resection of osteophytes and application of bone wax to the bleeding subchondral bone. Eburnated ulcerative chondral lesions are drilled and, in very degenerative cases, the articular cartilage of the weight-bearing area of the medial femoral and tibial condyles is shaved. The capsule and retinaculum are left open, and only the subcutaneous tissue and skin are closed. Postoperatively a splint is worn for 7 days, after which an active exercise programme is started. Partial weight bearing is allowed at 2 weeks and full weight bearing at 4 weeks after surgery.

Results

At 1 year after surgery there was reduction in pain in all patients. At the last follow-up nine patients had maintained satisfactory pain relief. An effusion was present in 7 of the 11 knees preoperatively, which resolved after operation; and there was no effusion in all these at 20 years follow-up. The mean range of flexion was 140° ($\pm 10.9^\circ$) preoperatively, 136° ($\pm 10.9^\circ$) 1 year after operation and 131.4° ($\pm 10.7^\circ$) at 20 years follow-up. There

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Fig. 1a,b Surgical procedure of modified Loeffler's capsulotomy. **a** Photograph of the medial joint space of the right knee. The medial collateral ligament, medial meniscus and surrounding synovium are resected. The medial joint space is widely opened. **b** Outline of the operative procedure of the right knee

was a mean flexion contracture of $8.3^\circ (\pm 1.3^\circ)$ preoperatively, which improved to $6.4^\circ (\pm 5.9^\circ)$ at 1 year after operation and was maintained at $5.5^\circ (\pm 4.2^\circ)$ at 20 years follow-up. Among the components of the HSS score, the preoperative pain score was 13 points (± 1), which was increased to 27 points (± 3) at 20 years follow-up. The score for lateral instability was 6 points (± 5) preoperatively, unchanged at 1 year after operation and 3 points (± 2) at the latest follow-up. Eight patients remained satisfied with the operation and there were no significant complications.

At more than 20 years follow-up, nine knees were classified as grade 2 and two as grade 3, according to the grading system of Ahlbäck [1]. The mean FTA was $178.9^\circ (\pm 3.2^\circ)$ preoperatively, $179.3^\circ (\pm 3.9^\circ)$ at 1 year after operation, and $180.2^\circ (\pm 1.2^\circ)$ at 20 years follow-up (Fig. 2). The mean FTA of a medial stress radiograph was $179.7^\circ (\pm 8^\circ)$ 1 year after operation, and the mean FTA on a lateral stress radiograph was $171.7^\circ (\pm 4^\circ)$. The mean difference between the two stress radiographs was $8^\circ (\pm 5^\circ)$. After resection of medial osteophytes from the femoral and tibial condyles at operation, the gradual new formation of large osteophytes was seen extending horizontally in the medial aspect of condyles, as a reaction to weight bearing (Fig. 2c). This new growth of horizontal marginal osteophytes was seen to enlarge the weight bearing area of the knee. At 20 years follow-up, this enlargement of the medial joint surface was seen in 7 out of 11 knees.

Discussion

Medial release as a part of the surgical treatment for medial compartmental osteoarthritis of the knee, with pain localised to the medial aspect, was popular between 1940 and 1960 [7, 8, 9, 10, 19, 20, 21]. In addition, Pridie described the concept of drilling sclerotic areas of the eburnated articular surface so as to encourage local fibrocartilage formation; and Insall added medial compartment debridement with meniscectomy and resection of osteophytes [9, 10]. Bassett and Harrelson also advocated open debridement with medial meniscectomy as being particularly suitable for osteoarthritic knees without a varus deformity or a flexion contracture [4].

In 1960 Loeffler described a procedure which included resection of the medial collateral ligament for medial compartment osteoarthritis suitable for patients with both early and late degenerative changes [16]. He reported satisfactory results in 80 patients. Schonbauer reported a short-term success rate of 90% in 1972 and a medium-term success rate of 72.5% in 1975 [28]. Reiter reported 82% satisfactory results in a short-term follow-up [24]. Reichel and Muller-Stephann reported satisfactory results with a low complication rate (4%) in a review of 78 patients with a follow-up of 9 years [23]. Thus it seemed that this procedure might yield promising long-term results in selected cases.

In our study initial satisfactory short-term results were obtained 1 year after surgery and we have found

Table 1 Long-term follow-up results of 11 knees with medial compartmental osteoarthritis after modified Loeffler's medial release operation (*HSS* Hospital for Special Surgery knee score, *FTA* femorotibial angle, *F* female)

Case	Knee no.	Site	Sex	Follow-up duration	Preoperative			At 1 year follow-up		At more than 20 years follow-up		
					Age (years)	HSS (points)	FTA (degrees)	HSS (points)	FTA (degrees)	Age (years)	HSS (points)	FTA (degrees)
1	1	R	F	24y3m	56	35	178	85	174	80	81	177
2	2	L	F	24y2m	56	75	184	88	187	80	77	187
3	3	L	F	24y	62	65	179	73	176	86	63	178
4	4	R	F	24y	62	65	177.5	85	177.5	86	77	180
4	5	L	F	23y11m	49	45	180	84	182	72	79	182
5	6	L	F	23y11m	44	85	176.5	91	181	68	83	182
6	7	R	F	23y4m	60	70	182	100	182	83	88	185
7	8	L	F	22y8m	67	55	172	73	174	88	71	174
8	9	R	F	22y5m	74	45	180	83	181	87	73	181
9	10	L	F	22y4m	59	50	177.5	82	177	79	92	178
10	11	L	F	20y6m	58	60	181	93	181	78	86	182
Means $\pm$ SD					59 $\pm$ 8	59 $\pm$ 3	178.9 $\pm$ 3.2	85 $\pm$ 8	179.3 $\pm$ 3.9	81 $\pm$ 6	79 $\pm$ 8	180.2 $\pm$ 1.2

Fig. 2a–c Medial compartmental osteoarthritis of the right knee in an 83-year-old woman (case 6). **a** Preoperative AP radiograph. **b** AP radiograph taken 1 year after surgery. **c** AP radiograph taken 23 years and 4 months after surgery. Note horizontally extending large osteophytes (arrow)

continuing good results in 11 knees after follow-up of more than 20 years.

The main purpose of Loeffler's operation is to release the tight medial soft tissue structures and excise hypertrophied synovial tissue which may cause pain in degenerative knees [6, 22]. It has been reported that neuropeptides, such as substance P, responsible for the neural transmission of pain accumulate in the synovium and capsule of osteoarthritic knees [15, 18, 26]. The main difference between this and other open debridement techniques is that the medial collateral ligament is resected horizontally, which should lead to valgus instability. No patients, however, in our study had symptoms relating to instability. The medial meniscus is also resected. The functional importance of the menisci in weight-bearing has subsequently been extensively discussed. Several studies have shown that total open meniscectomy leads to increased degenerative changes and unsatisfactory long-term outcome [3, 12, 13]. Lotke indicated that radiographic degenerative changes advanced particularly in association with the presence of pre-existing degenerative changes, continuing sporting activities, ligamentous laxity and abnormal joint alignment [17]. Other authors have reported that increased degenerative changes do not always follow meniscectomy [2, 25, 29].

The influence and relative risk factors following meniscectomy on further articular degeneration remain controversial. In our initial patients, who subsequently required UKA, there were more degenerative changes and more severe flexion contracture at the time of the initial operation. Preoperative pain was also more severe and there was a higher total HSS score in those patients who required UKA compared with those who did not. Actually, as a revision procedure, UKA was more beneficial, since a larger tibial component could be inserted in the enlarged medial compartment of the knee.

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