

Reconstruction of the patellar articulation with periosteal grafts

4-year follow-up of 13 cases

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Reconstruction of the damaged articular surface of the patellar articulation with free periosteal grafts was performed in 13 patients who had not responded to previous treatment. After an average of 4 years, a good result was obtained in 8 patients and a fair result in 4 others. Only 1 patient, a 55-year-old man with severe patellar arthrosis, continued to have disabling pain.

The periosteum has osteogenic capacity, but it can also be used to promote cartilage formation in a chondrotrophic environment (Basset 1962, Ritsilä et al. 1972, Poussa et al. 1981, Jaroma and Ritsilä 1987). In animal experiments, it has been shown that free periosteal grafts transplanted to an articular defect can yield hyaline-like cartilage (Rubak et al. 1982, Jaroma and Ritsilä 1987).

We evaluated the clinical results after reconstruction of the patellar articulation with free periosteal grafts in patients with chronic knee pain caused by lesions of the articular surface.

Patients and methods

Thirteen patients, 6 men and 7 women, with disabling patellar pain were operated on between 1979 and 1987. The mean age of the patients at operation was 36 (16-55) years. The mean follow-up time was 3.8 years (8 months-9 years).

The etiology of the articular lesions was trauma in 8 patients, recurrent dislocation of the patella in 2 patients, and patellar chondromalacia in 3 patients. Previous conservative or operative treatment (shaving, Hauser's operation, Kroggius' operation, tibial

tubercle elevation, lateral release of the patellar retinaculum) had failed to alleviate anterior knee pain. All the patients had severe damage of the patellar articulation as assessed by arthroscopy or at a previous operation. At the resurfacing procedure, damage of the articular cartilage was found down to the subchondral bone in every case.

Arthrotomy was made through a medial parapatellar incision. Debridement of the damaged articular surfaces of the patellar articulation was made and osteophytes were excised. Multiple holes were drilled on the bare articular bone surface to be covered with periosteum. The periosteal graft was taken from the anterior surface of the tibia. The graft was sutured with the cambium layer towards the subchondral bone using resorbable sutures (Figure 1). In six operations after 1984, fibrin glue (Beriplast®) was used for fixing the graft to the articular surface. In 2 cases, both the patellar and femoral surfaces were covered with periosteum. At the resurfacing operation, anterior tibial tubercle elevation was performed in 3 cases and lateral release of the patellar retinaculum in 1 case.

The knee was mobilized immediately after surgery in 3 cases or was immobilized with a plaster cast for 1-6 weeks in 10 cases (Table 1). In the cases in which fibrin glue was used, mobilization of the knee was started after 1 week or immediately after surgery, because graft fixation was considered firm enough. Mobilization consisted of passive extension-flexion exercises and isometric training of the quadriceps and hamstring muscles. Within 2-3 weeks, full flexion of the knee joint was allowed, and active muscle training was started.

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A

Figure 1. Case 12. A 36-year-old man with damage in the patellar articulation after traumatic patellar dislocation.

A. The damage extends to the subchondral bone on both the patellar and the femoral articular surfaces. The site of the periosteal graft to be detached from the anterior tibial surface is indicated by arrows. The periosteal graft is scraped loose from the underlying bone with a knife. The area of the bone surface from which the graft is taken must be about 30 percent wider than the area of articular surface to be covered, for the graft shrinks after detachment

B. The damaged cartilage has been excised and the underlying subchondral bone has been drilled before periosteal grafting.

C. The periosteal grafts have been glued and sutured onto the articular surface of the patella and femoral groove.



B



C

Clinical scoring of the knee function was performed according to Freeman et al. (1977). Further, the final result was evaluated according to the patient's ability to perform daily activities. Accordingly, the final result was considered good if the knee did not cause restriction of the patient's daily activities and there was no or only slight pain. The final result was fair if the patient reported considerable alleviation of pain and was able to work. A poor result was defined by persistent intense pain. Congruency of the patellar articulation was examined radiographically according to Laurin et al. (1979) at the final follow-up.

No perioperative or postoperative complications were encountered.

Results

All but one of the 13 patients obtained alleviation of knee-joint pain after the operation, and 11 gained acceptable function of the knee joint (Table 1). The final result was considered good in 8, fair in 4, and poor in 1 (Case 8). The latter patient, a 55-year-old

man, was unable to resume his work owing to severe arthrosis in the tibiofemoral articulation, as well as painful snapping of the hamstring tendons. One patient (Case 7) had retired because of back problems and coronary artery disease. All the other 11 patients resumed work. At the radiographic examination, the patellar position was congruent in 8 cases. In five knees with a slight subluxation of the patella, the final result was good in 3 and fair in 2 patients.

Discussion

The principle of using periosteum as a transplant onto the articular surface essentially differs from the procedures including only removal of injured cartilage and drilling holes into subchondral bone. Large chondral defects do not regenerate to hyaline cartilage, but are replaced by fibrous tissue. The chondrogenic capacity of the periosteum in a chondrotrophic environment is the basis of the present method. Ritsilä and Alhopuro (1979) and Ritsilä et al. (1980) presented preliminary results of reconstruction of articular surfaces of the patella, the femoral condyle,

Table 1. Reconstruction of the patellar articulation with periosteal grafts. In Cases 1-7, the graft was sutured onto the articular surface and in Cases 8-13 the fixation of the graft was strengthened with fibrin glue. In Cases 11 and 12 the articular surfaces of both the patella and the femoral groove were covered with periosteum

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	F 16	1	0	0	3	8.8	C	0	40	15	15	30	30	45	95	2
2	F 34	1	1, 2, 3	1	6	8.0	C	0	40	15	20	30	30	45	90	1
3	F 34	2	4	0	6	6.1	C	15	40	20	20	30	30	65	90	1
4	M 33	3	0	0	4	6.2	S	15	50	15	20	30	30	60	100	1
5	M 25	1	1, 3	1	2	5.1	S	0	40	15	20	30	30	45	90	2
6	F 31	1	5	2	2	3.3	S	15	20	20	20	30	30	65	70	2
7	F 42	4	1, 6	0	2	2.8	C	0	40	15	20	30	30	45	90	1
8	M 55	1	1, 7	0	0	2.3	C	15	15	15	15	30	30	60	60	3
9	F 31	4	3, 6	1	1	2.2	C	15	50	15	20	30	30	60	100	1
10	M 38	4	1, 7	0	0	1.5	C	0	40	15	20	30	30	45	90	1
11	F 46	2	2, 4	0	0	1.6	S	15	50	15	20	30	30	60	100	1
12	M 36	5	3, 6	0	1	1.3	S	0	50	15	20	30	30	45	100	1
13	M 50	3	0	0	1	0.7	C	0	40	15	20	30	30	45	90	2

A Case

B Age/Sex

C Etiology of patellar disability

- 1 knee distortion
- 2 habitual patellar dislocation
- 3 patellar fracture
- 4 patellar chondromalacia
- 5 traumatic patellar dislocation

D Previous surgery

- 0 no
- 1 shaving
- 2 Hauser's operation
- 3 medial reinforcement of patellar retinaculum
- 4 Kroggius' operation
- 5 removal of intraarticular loose bodies
- 6 lateral release of patellar retinaculum
- 7 tibial tubercle elevation

E Concomitant procedures at periosteal grafting

- 0 no
- 1 tibial tubercle elevation
- 2 lateral release of patellar retinaculum

F Postoperative immobilization (weeks)

G Follow-up (years)

H Postoperative congruency of the patellar articulation

- C congruent
- S subluxation

Clinical scoring of the knee functions (Freeman et al. 1977)

I Preoperative pain (points)

J Postoperative pain (points)

K Ability to walk preoperatively (points)

L Ability to walk postoperatively (points)

M Movement of the knee joint preoperatively (points)

N Movement of the knee joint postoperatively (points)

O Total points preoperatively

P Total points postoperatively

Q Final result: 1 good, 2 fair, 3 poor

and the metatarsal head with free periosteal grafts in patients with joint injuries.

Niedermann et al. (1985) used periosteal grafts to cover osteochondral defects on weight-bearing surfaces of femoral condyles, and macroscopic examination by arthroscopy after 12 months suggested complete healing of defects with cartilage similar to the surrounding healthy hyaline cartilage. We did not perform sequential histologic examinations of the resurfaced patellofemoral joint, because we did not want to disturb the healing process by taking biopsies.

In the present series, good results were obtained in cases with slight patellofemoral incongruence, as well as less favorable results in cases with congruent patellae. Thus, it is probable that slight patellar subluxation was not the reason for postoperative pain.

One knee remained painful and later arthrotomy and debridement of the patellofemoral joint did not alleviate pain. This 55-year-old patient was perhaps too old and his arthrosis too advanced for periosteal transplantation. Early mobilization of the knee was

started only in cases in which fixation of the graft was strengthened with fibrin adhesive. At present, we start passive mobilization within 2 days after the resurfacing procedure. Immobilization inhibits, whereas mobilization enhances chondrogenesis after periosteal grafting (Rubak et al. 1982, O'Driscoll and Salter 1984, O'Driscoll et al. 1988).

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