Failure of metal-backed patellar arthroplasty

47 AGC total knees followed for at least 1 year

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A prospective series of 47 total knee arthroplasties in 44 patients with gonarthrosis were followed for at least 1 year to detect patellar complications. In five knees the metal-backed patellar component failed, in one knee the cement fractured, and in one knee there was a spontaneous fracture of the patella. We regard this failure rate as unacceptable.

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Several designs of metal-backed patellar components have been introduced to give the option of fixation without cement. Failures related to the design of these components have been reported (Sutherland 1988, Stulberg et al. 1988, Bayley et al. 1988, Lombardi et al. 1988, Felmet et al. 1989), but most of the reports contain series of cases from several orthopedic clinics, and the failure rate is not well known. Felmet et al. (1989) found 3/51 failures after 11–17 months and Lombardi et al. (1988) 7/131 failures after 9–24 months. No difference seems to exist between failure rate of cemented and noncemented cases.

We started a prospective series of total knee replacement to investigate the failure rate of the metal-backed patellar component and other patellar complications.

Patients and methods

Between January 1988 and March 1989, 47 AGC 2000 total knee replacements (Biomet Corp., U.K.) were inserted into 44 patients suffering from gonarthrosis. Lateral release was never used because there were no cases with valgus deformity in the patient material (10 men and 34 women). The median age was 73 (58–84) years. All the components were fixed with bone cement. Continuous passive motion was used for all the knees. Postoperative radiography was performed within 2 days and again in combination with a clinical examination after 3 months, 1 year, and in case of complications within the period of the study. Radiographs were taken in AP and lateral projections. Bone-cement radiolucency, positional changes of the prosthetic components, and the HKA angle were measured. Skyline views were only used upon suspicion of irregular patellar tracking. The clinical investigation included tracking of the patella, range of motion in degrees, and stability in 0° and 20° of flexion.

Results

The sex and the patellar complications of the series are shown in Table 1. The clinicoradiographic results at the latest follow-up of the series are shown in Table 2. Seven patients were admitted between the normal clinicoradiographic control visits during the entire period of the study because of sudden pain in the operated on knee. One patient had a nontraumatic patellar fracture that was treated conservatively. Another patient had traumatic cement cracking and loosening of the entire patellar component, and underwent revision. Five other patients experienced sudden pain in the knee and loud squeaking during knee motion. Radiographically, metal-against-metal contact was demonstrated between the patella and femoral components (Figure 1). These knees were all revised within the shortest possible period of time by removal of the patellar button, synovectomy, and insertion of a polyethylene component. The symptoms disappeared following this treatment. The findings during revision were black synovial lining and dissociation of the polyethylene from the metal (Figure. 2), with the latter remaining firmly seated in the cement and bone.

The polyethylene had either fractured or showed excessive wear. Upon histologic examination, metallic synovitis, with giant-cell granulomas, was

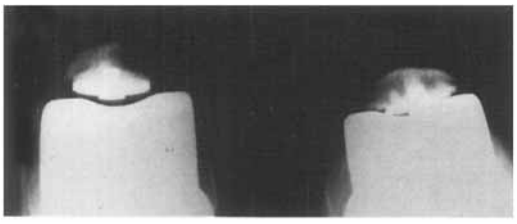

Figure 1. Disintegration of the patellar button. Skyline radiograph showing femoropatellar metal-against-metal contact.

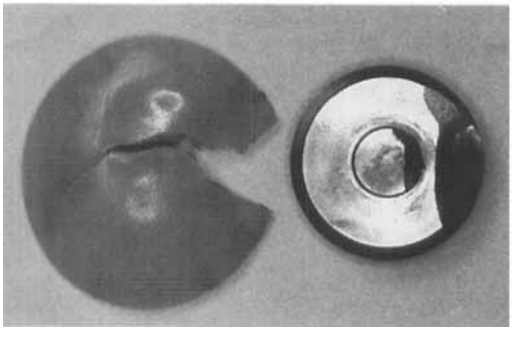

Figure 2 An example of the harvested metal-backed patellar button demonstrating total dissociation of the polyethylene and the metal. The polyethylene component is fractured and grooved, and the metal component shows severe wear.

Table 1. Patellar complications in 47 total arthroplasties for gonarthrosis

	n	F	S	C
Male	10	1	0	1
Female	37	0	1	4
Duration before failure (months)		8	11	7, 7, 9, 17, 22

F fracture; S subsidence; C component failure.

Table 2. Clinical and radiographic results at the latest follow-up (47 knees)

Patellar tracking normal[a]	47
Extension defect > 5 degrees	0
Knee flexion < 90 degrees	0
Straight-knee stability	47
Flexed-knee stability	47
Radiolucency < 1 mm	46
Subsidence of patellar component (cement fracture)	1
Femoropatellar metal contact[a]	5
Patellar fracture	1
HKA angle	175 ± 3.9[b]

[a]Five patellar components revised within the study period.
[b]Mann-Whitney test, $P > 0.05$ when compared with patellar component failure.

found. There was no difference between the five failed knees and the rest of the knees regarding position of the components, HKA angle, or techniques of cementation.

Discussion

In the present consecutive study of patients with gonarthrosis who underwent a total knee arthroplasty with bone-cement fixation of all three components, seven patellar problems were found during the period of the study. The single case with a traumatic cement fracture could not be attributed to either surgery or prosthetic design. The patient with a nontraumatic patellar fracture unequivocally contracted the fracture as a result of excessive bone removal from the patella. The remaining 5 cases were characterized by sudden, serious symptoms that objectively were related to a squeaking sound and subjectively to a grinding sensation. Radiographically, a disruption of the patellar component was demonstrated. Other orthopedists, on the other hand, in some cases have not been able to demonstrate the disruption radiographically (Bayley and Scott 1988), but they have found the phenomenon upon exploration of the knee joint following their patients' typical complaints (Stulberg et al. 1988, Bayley et al. 1988, Lombardi et al. 1988).

The main reason for failure is probably that the metal is square with sharp edges over which the polyethylene becomes very thin (Stulberg et al. 1988). In our 5 cases of patellar component disruption, we have not found any other explanations for the failure, for our patients were not overweight, and none of them had valgus knees, which carry a risk of patellar impingement (Merkow et al. 1985). In these 5 cases, the resurfacings were until failure judged to be optimal from the surgical, radiographic, and patients' points of view. Radiographic analysis yielded neither a difference between the HKA angles in noncomplicated cases versus cases with complications, nor was there any difference between the placement of the patellar components. We therefore concluded that the reason for failure must be an inherent error in the design of the patellar component. The problem is not specifically related to the product that we have used, but may be a universal problem of metal-backed patellar components (Bayley and Scott 1988). The frequency of failure of patellar components in the short-term follow-up

after surgery (maximally 2 years) in our present consecutive series may only be the top of an iceberg. Thus, withdrawal from the market of the current standard for metal-backed patellar prostheses seems warranted.

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