

Treatment of the exposed knee prosthesis

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Ten knees with early tissue breakdown after knee arthroplasty resulting in exposed prostheses were treated with different plastic surgical techniques. Six knees were successfully covered: four using a gastrocnemius musculocutaneous flap, one using a fasciocutaneous flap, and one using split-skin grafts. Four knees failed: two using local skin flaps and two using split-skin grafts.

A gastrocnemius musculocutaneous flap seems to provide a reliable coverage of the exposed knee joint.

Early tissue breakdown with exposure of the prosthesis is a serious complication following arthroplasty of the knee. Established infection ensues if the defect is not closed. Reports on the treatment of the exposed knee prosthesis are scarce (Sanders and O'Neill 1981, Hershman et al. 1983, Peled et al. 1983, Salibian and Anzel 1983, Johnson and Bannister 1986).

We report the results of treatment of 10 cases with exposed knee prostheses.

Patients and methods

Ten patients with an exposed prosthesis after knee arthroplasty were treated with different plastic surgical techniques, and all but 3 (Cases 1, 5, and 10, Table 1) were treated in collaboration with plastic surgeons. Lastly, all except Case 10 were treated at our hospitals.

The index arthroplasty had been performed between 1975 and 1985 at our departments (5 patients) and in other hospitals (5 patients). Every patient had received prophylactic antibiotics. Included were 7 women and 3 men with an average age of 68 (57-79) years. The underlying diagnosis

was rheumatoid arthritis in 6 patients and arthrosis in 4 (Table 1). The type of prosthesis used was a hinged or stabilized one in three knees, bicompartamental in two, and tricompartmental in five. Eight patients had had other operations on the knee prior to the index arthroplasty; these included four knee arthroplasties, two tibial osteotomies, three synovectomies, one double osteotomy, one patellectomy, and one posterior capsulotomy.

In Cases 2 and 3, high tibial osteotomy had previously been performed using a horizontal skin incision. At the index arthroplasty, a vertical parapatellar incision was used, and in both cases skin necrosis started where the two incisions met. In Cases 8 and 10 a second incision was made parallel to a previous scar and skin necrosis began between the distal ends of these incisions (Figure 1).

In all the cases, exposure of the knee prosthesis occurred within 2 weeks after the index arthroplasty and was due to wound dehiscence in 5 cases, skin necrosis in 4, and a hematoma in 1 case. All the instances of wound dehiscence occurred on the first day of mobilization.

Staphylococcus epidermidis was the most frequently cultured pathogen (Table 1). In all the patients, prophylactic antibiotics were followed by antibiotics suited to the sensitivity pattern of the pathogens, and this therapy was continued for an average of 7 (2-24) months.

In 4 cases a medial gastrocnemius musculocutaneous flap was used (Figure 1): in 1, a fascio-

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Table 1. Case reports of 9 patients with an exposed knee prosthesis

A	B	C	D	E	F	G	H	I	K	L	M	N
1	62 F	R	Gu	w	Se	Cf	2.0	18	4	I	44	I, Fr
2	67 M	R	M	s	Se	Cl	4.0	4	2	II	21	H
3	79 F	A	Gu	s	Pp	Cl	4.0	3	1	I	75	I, Fa
						Gm	0.24	1				
4	75 F	R	Tc	w	Se+Sf	Cf	4.0	1	(0) 5	I III	27	H
						Mz	0.6	2				
5	57 M	A	S	h	KI+Sf	Tc	1.0	2	(0) 4	I II	35	I, Fa
						Cf	3.0	4				
						Dc	3.0	24				
6	68 F	A	Ge	w	Se	Cy	0.9	4	(0) 8	I IV	63	H
7	78 F	R	PCA	w	?	Fc	1.5	3	(1) 6	I III	22	H
8	70 F	A	Tc	s	?	Cl	4.0	6	3	I III	30	H
						Pv	2.25	6				
9	64 F	R	FS	w	?	Cf	3.0	2	(1) 4	I III	10	H
						Fc	1.5	2				
10	61 M	R	Tw	s	Se	Cl	4.0	2	2	II	74	I, nFa

A Case.

B Age at the index arthroplasty. Sex.

C A arthrosis, R rheumatoid arthritis.

D Index arthroplasty. FS Freeman-Samuelsson, Ge Geomedic, Gu Guepar, M Marmor, S Sphero-centric, Tc Total Condylar, Tw Townley.

E Complication. h hematoma, s skin necrosis, w wound rupture.

F Pathogen. KI *Klebsiella*, Pp *Pseudomonas pyocyanea*, Se *Staphylococcus epidermidis*, Sf *Streptococcus faecalis*, ?-no pathogen cultured.

G Antibiotic treatment (G,H,I). Cf Cefalexin, Cl Cloxacillin, Cy Clindamycin, Dc Dicloxacillin, Fc Flucloxacillin, Gm Gentamicin, Mz Metronidazol, Pv Pivampicillin, Tc Tetracycline.

H Dose in gram/day.

I Duration (months).

K Time before closure (weeks). Number within parentheses refers to time of initial secondary suturing.

L Treatment. I - local skin flap, II - split-skin graft, III - medial gastrocnemius musculocutaneous flap, IV - fasciocutaneous flap, I - initial secondary suturing.

M Follow-up (months).

N End results. H healed, I infected, Fr failed revision arthroplasty, Fa fused arthrodesis, nFa nonfused arthrodesis.

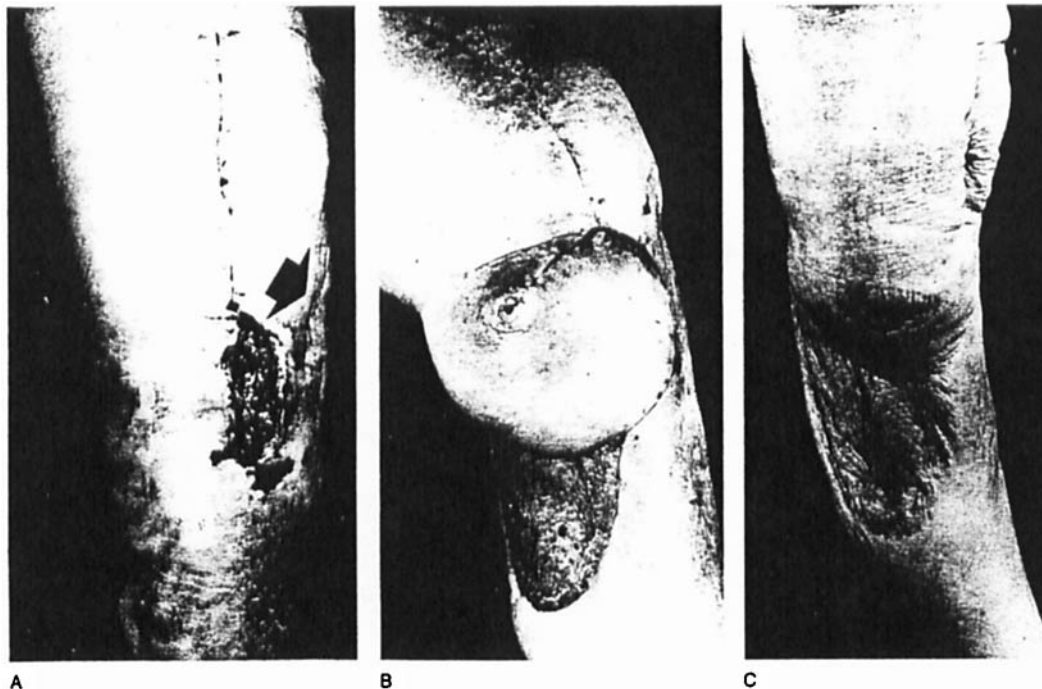


Figure 1. Case 8. A 70-year-old woman with a mechanically loose knee prosthesis.

A. Early tissue breakdown after revision arthroplasty, where a second incision was made parallel to a previous scar (arrow). The defect communicates with the joint.

B. 1 month after coverage with a medial gastrocnemius musculocutaneous flap.

C. After 1 year.

cutaneous flap; in 3, split-skin grafts; and in 2, local skin flaps. Prior to the plastic surgical operation, but during the same sitting, the orthopedic surgeon carried out a careful debridement.

The time between tissue breakdown and the first attempt to close the exposed knee joint averaged 1 (0-4) week and between tissue breakdown and successful closure 5 (2-8) weeks. The follow-up time averaged 3 (1-6) years.

Results

Revision of the wound with secondary suturing was used in 5 cases as a primary attempt to close the defect and in 1 case (Case 3) after failed local skin flap - all failed (Table 1). In 4 of these cases the wound opened up 5 cm or more and in 2 cases there was a full thickness necrosis covering most of the wound.

Three knees treated between 1975 and 1979, all with constrained prostheses, failed. A local skin flap (two knees) and a split-skin graft (one knee) had been used. Due to persistent deep infection, these knees were further revised; two ended up with fused arthrodeses and one with a failed, painful, revision arthroplasty.

Seven knees, treated between 1978 and 1985, all with compartmental prostheses, were successfully closed except for one. A medial gastrocnemius musculocutaneous flap was used in four knees, a fasciocutaneous flap in one, and repeated split-skin grafts in two. Four of these knees had primarily been treated with secondary suturing. The knee that failed ended up with a nonfused arthrodesis with fistulation. The remaining six knees were followed clinically and radiographically after closure without manifesting any signs of infection or loosening.

Discussion

Fortunately, it is rare that the prosthesis becomes exposed following arthroplasty of the knee. The 5 cases that occurred in our hospital derived from 1,159 arthroplasties with a risk of 0.5 per cent, and with no difference between arthrosis and rheumatoid arthritis.

Our experience confirms that previous knee surgery with conflicting skin incisions increases the risk of wound breakdown after knee arthroplasty (Sanders and O'Neil 1981). The use of secondary suturing in closing the exposed knee prosthesis has not, to our knowledge, been investigated by others; all six attempts at secondary suturing in our study failed.

Johnson and Bannister (1986) found five exposed knee prostheses in 25 knees with deep infections in a consecutive series of 471 knees. Split-skin grafting was used in 2 cases to cover the exposed prosthesis and both failed. In our study, split-skin grafting was used in 3 cases, and 2 of these failed.

To cover an exposed knee prosthesis, one must use a well-vascularized flap that obliterates the dead space around the prosthesis (Salibian and Anzel 1983). The gastrocnemius musculocutaneous flap (McCraw et al. 1977) fulfills this requirement and has been successfully employed in 11 out of 15 knees (Sanders and O'Neill 1981, Hershman et al. 1983, Peled et al. 1983, Salibian and Anzel 1983, Johnson and Bannister 1986). In our study a gastrocnemius musculocutaneous flap was used in 4 cases and none failed.

Pontén (1981) presented the fasciocutaneous flap to cover soft-tissue defects of the lower leg. There have been no reports on the use of this flap for the coverage of the exposed knee prosthesis. It was successfully employed in 1 of our cases.

In our study no correlation was found between time before closure and success rate. The same has been reported by Sanders and O'Neill (1981), although the time varied between 24 hours and 9 months. Despite this finding, we believe in earliest possible closure of the joint.

Because previous knee surgery with conflicting skin incisions predisposes to tissue breakdown after knee arthroplasty, standardized anterior incisions should be used that are compatible with later knee arthroplasty procedures. Wound healing should take priority over motion in knees with compromised soft tissue. If exposure of the knee joint occurs, a gastrocnemius musculocutaneous flap seems to provide a reliable coverage.

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