Souter-Strathclyde arthroplasty of the rheumatoid elbow

23 cases followed for 3 years

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Twenty-three elbows in 17 rheumatoid arthritis patients have undergone unconstrained Souter-Strathclyde elbow replacements since March 1984. One patient developed a deep-wound infection, and 4 others had a temporary ulnar nerve paresis. At follow-up 3 (0.5–6) years postoperatively, there was a moderate improvement in the arc of movements: 25° in extension-flexion and 45° in forearm rotation. Pain relief was achieved in 20 cases. Three elbows required revision, two following recurrent dislocation and the other after a humeral fracture and component loosening.

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Arthroplasty for rheumatoid arthritis of the elbow using the fully constrained hinged implants has shown a high failure rate due to mechanical loosening (Inglis and Pellici 1980, Dee 1982). This has led to the development of unconstrained elbow replacements with reliance on local fixation in the humerus and ulna with retention of soft-tissue support. We report our results after implantation of an unconstrained elbow prosthesis (Souter-Strathclyde) in rheumatoid arthritis.

Materials and methods

At our hospital, 23 Souter-Strathclyde elbow replacements have been performed on 17 patients. (15 females) with an average age of 62 (27–80) years at the operation. All the patients had seropositive rheumatoid arthritis with a duration of disease in the elbow averaging 6 (2–15) years. Ten patients had received intraarticular steroids, 2 had undergone chemical synovectomies, and 3 had had radial head excisions. Pain before and after the operation was assessed on a five-point scale. Function was assessed before and after the operation by the patients' ability to perform household tasks. Preoperative radiographs were classified according to Larsen et al. (1977), with 14 elbows grade Class V (severe destruction) and 9 elbows grade Class IV. Radiographs were taken at 6-month intervals, with particular attention being given to the presence, width, and completeness of any radiolucency around the prosthesis. The follow-up was for an average of 3 (0.5–6) years, with a full clinical and radiographic examination.

The average duration of the operation was 150 (110–200) minutes, and all of them were performed by the senior author. The Campbell approach, reflecting a flap of triceps, was used to carry the dissection distally to the olecranon. The medial and lateral epicondyles at the distal posterior humerus were exposed, preserving the collateral ligaments as much as possible. After capsulotomy, the radial head was resected and the elbow joint dislocated. The humerus and ulna were then prepared using high-speed burrs. The components were fixed using Simplex® cement with antibiotics (Figure 1). The wound was closed in layers over a suction drain, and prophylactic antibiotics were routinely used. For 5 days postoperatively, a compression bandage and splint at 90° were applied; the drains were removed after 48 hours, and the stitches were removed after 14 days. Passive movements were initiated after 5 days and assisted active motion after 7 days.

Table 1. Relief of pain following elbow arthroplasty for rheumatoid arthritis

Pain	Preoperatively	Postoperatively
No pain	0	11
Occasional	0	5
Moderate	0	3
Substantial	13	4
Severe	10	0

Figure 1. Souter-Strathclyde prosthesis in situ.

Figure 2 (Case 15). Posttraumatic dislocation.

Table 2. Observations in 17 patients with 23 elbow arthroplasties

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	68	F	4	72	90	120	30	30	40	120	80	80		c
2	56	F	5	72	50	115	40	90	50	140	80	80		b
3	57	F	4	66	65	115	30	45	50	130	80	80		b
4	27	M	4	60	30	110	40	40	30	120	80	80		c
5	70	F	5	Died	50	100	40	40	40	120	70	70	1	
6	71	F	4	48	30	130	60	40	35	125	70	80		a
7	58	F	5	48	60	110	45	60	60	140	90	80		b
8	72	F	4	48	55	130	45	50	50	140	90	90		b
9	57	F	5	48	80	120	50	65	35	140	90	60		b
10	63	F	5	30	20	110	60	90	20	140	90	90		b
11	64	F	5	–	35	120	70	70	80	120	50	50	2	
12	68	M	5	36	25	90	60	30	55	140	90	90		b
13	65	F	5	24	25	130	90	90	30	150	90	90		a
14	61	F	5	18	70	85	15	70	35	130	80	80		a
15	57	F	4	24	50	140	90	90	30	140	90	90	3	b
16	80	F	5	24	0	160	70	75	10	135	90	90		b
17	52	F	5	24	60	120	60	20	55	130	75	90		a
18	41	F	5	24	70	90	85	70	50	120	90	90		a
19	58	F	5	12	50	120	60	60	50	140	80	80	4	a
20	56	F	5	12	50	110	90	45	30	150	90	90		a
21	61	F	4	12	40	110	50	45	25	145	90	80		a
22	72	F	4	12	30	120	90	90	30	140	95	90		a
23	63	F	4	6	50	115	55	60	40	150	70	60		a
Mean	62			35	48	116	58	60	42.5	135	82.5	80		

A Case number
B Age
C Sex
D Larsen's Grade (1–5)
E Follow-up in months
F Flexion contracture before surgery
G Active flexion before surgery
H Pronation before surgery
I Supination before surgery
J Flexion contracture after surgery
K Active flexion after surgery
L Pronation after surgery
M Supination after surgery
N Complications
  1 recurrent dislocation
  2 humeral fracture
  3 dislocation after fall
  4 wound infection
O Radiographs
  a normal
  b partial linear translucency
  c loosening

Table 3. Improvement in function following elbow arthroplasty

Function	Preoperatively	Postoperatively
Hand to mouth	15	22
Hand to hair	6	20
Hand to perineum	10	21
Lift a cup of tea	7	15

Results

Pain was completely relieved in 11 joints. There were occasional twinges in five, moderate pain in three, and severe pain in four (Table 1). Postoperatively, a reduction was achieved in the fixed flexion deformity of 6° and an increase in flexion of 19°. The ability to pronate was improved by 25° and the ability to supinate by 20° (Table 2). Function was improved (Table 3). Two elbows showed evidence of loosening, with a complete linear translucency of 2 mm or more at the cement-bone interface at the 5-year follow-up. An additional nine elbows showed partial linear translucencies of 1 mm or less, and one elbow had perforation of the supracondylar ridge with cement extrusion.

Two patients had dislocations (Figure 2). In Case 5 this occurred shortly after the operation and required repair of the medial capsule with 1 month of immobilization. Recurrent dislocation followed, and a special semiconstrained Souter ulnar component corrected this problem. This was later complicated by a deep-wound infection, and the patient has since died of unrelated causes. Case 15 occurred after the patient had pulled herself up the stairs, and this dislocation was successfully treated with a medial ligament reconstruction.

In Case 11 the supracondylar ridge of the humerus was fractured during the operation, and the humeral component had migrated after 3 months. This required revision to a long-stemmed Souter prosthesis; but, unfortunately, the olecranon fractured, and further revision to a metal-backed ulnar prosthesis was required. Case 19 had a deep-wound infection and wound dehiscence. After debridement and systemic antibiotics, the defect was successfully treated with a muscle flap. Four patients developed paresthesia in the ulnar nerve territory, and 3 of these had associated motor weakness. All of them recovered, and exploration was never required.

Discussion

Half of the patients with long-standing rheumatoid arthritis have evidence of elbow joint involvement (Souter 1989). Several types of fully constrained hinged implants have been introduced, but long-term follow-up studies show failure from mechanical loosening (Inglis and Pellici 1980, Morrey et al. 1981, Dee 1982). This can be explained by transfer of joint forces solely by the implant, resulting in high loading at the bone-cement interface. Also revision of a hinged implant is difficult because of inadequate bone stock for fixation of a new prosthesis. This leads to the development of the unconstrained elbow prosthesis with or without a stem. It appears that condylar resurfacing procedures must be supplemented by some intramedullary fixation in rheumatoid disease (Lowe et al. 1984, Rydholm et al. 1984).

The Souter-Strathclyde elbow prosthesis has been designed with localized fixation in the humerus and ulna using stems, but retaining soft-tissue support. Using this prosthesis, we have obtained results that are similar to Souter's (1985), with pain relief in the majority, good recovery of flexion, pronation, and supination, but only a small improvement in extension. The rate of serious complications, however, has been 4 out of 23 elbows.

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