Early results of the Souter-Strathclyde unlinked total elbow arthroplasty in patients with osteoarthritis

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We have carried out a retrospective review of 11 Souter-Strathclyde primary total elbow arthroplasties in ten patients with osteoarthritis, over a period of nine years. The diagnosis was primary osteoarthritis in nine elbows and post-traumatic arthritis in two. The mean follow-up was 68 months (15 to 117).

Although no patient was symptomatic, radiological review revealed evidence of loosening affecting three humeral and two ulnar components, one of which subsequently failed and was revised at 97 months. There were no dislocations, deep infections or mechanical failures. Complications included two superficial wound infections and two neurapraxias of the ulnar nerve which resolved.

This study shows that the unlinked Souter-Strathclyde total elbow arthroplasty can be considered for patients with osteoarthritis and gives good symptomatic relief and improvement in function.

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There is very little in the literature regarding the use of an unlinked total elbow arthroplasty in patients with osteoarthritis. Kozak, Adams and Morrey¹ reviewed five patients with two unlinked and three semi-constrained arthroplasties and a mean follow-up of three years. There were four early major complications and two minor complications in four

elbows. Two required revision. In other studies only small numbers of patients with osteoarthritis have been reviewed as part of larger series, making it hard to draw conclusions on the value of this procedure in the treatment of osteoarthritis.²⁻⁶ Our aim therefore was to review our short- to medium-term experience of the Souter-Strathclyde total elbow arthroplasty in patients with osteoarthritis.

Patients and Methods

Between 1991 and 2000 the senior author (PGL) carried out Souter-Strathclyde total elbow replacements in 179 patients of whom 15 had osteoarthritis. Thirteen had primary osteoarthritis and two post-traumatic osteoarthritis. Ten (six men and four women) (11 elbows) were available for review. Their mean age at the time of operation was 66 years (56 to 79). Three (four elbows) had died from unrelated causes and their radiographs were unavailable for review. At the latest clinical review, none of these patients had problems relating to the prosthesis.

A standardised operating technique was used. All patients were positioned prone, with the elbow in an arm support, and a pneumatic tourniquet was applied. Antibiotic prophylaxis (cefuroxime, 1.5 g) was given at induction and two doses of 0.75 g at intervals of eight hours thereafter. The elbow was exposed via a modified posterior Campbell approach. The ulnar nerve was identified and protected, but not routinely transposed. The radial head was resected and an oscillating saw and bone burr were used to prepare both the humerus and ulna. After a trial reduction, the components were secured using a single mix of Palacos cement. The stability and range of movement of the prosthesis were tested. A vacuum drain was inserted and the skin closed with clips.

Postoperatively, the elbow was immobilised in extension for 48 hours after which physiotherapy was started. The patients were discharged from hospital when 90° of flexion of the elbow had been achieved. A night splint holding the elbow in extension was used until control and range of movement had improved. The patients were reviewed at two, six and 12 weeks, and at six months and annually thereafter.

We used the Wrightington method of numbering and measuring migration and demarcation of the components in

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Table I. The range of movement (degrees) obtained at a mean follow-up of 68 months for the ten patients who underwent the Souter-Strathclyde unlinked total elbow arthroplasty for osteoarthritis

Case	Preop			Postop		
	Extension lag	Flexion range	Flexion/extension arc	Extension lag	Flexion range	Flexion/extension arc
1	45	140	95	45	140	95
2	60	100	40	38	140	102
3	40	120	80	10	140	130
4	30	140	110	10	140	130
5	25	110	85	20	140	120
6	45	90	45	70	120	50
7	30	100	70	30	140	110
8 (Left)	40	110	70	21	130	109
(Right)	35	100	65	16	135	119
9	70	130	60	30	140	110
10	65	110	45	30	135	105
Mean	43	114	69	29	136	107

Table II. The postoperative symptoms, radiological findings and questionnaire results, at a mean follow-up of 68 months, for the ten patients who underwent the Souter-Strathclyde unlinked total elbow arthroplasty for osteoarthritis

Case	Index score		Postoperative pain	Questionnaire results		
	H-index	U-index		Success of treatment (out of 7)	Room for improvement (out of 4)	Satisfaction with surgery (out of 10)
1	0.8	0.1	Mild	7	1	10
2	0.0	2.0	No	5	2	8
3	0.6	0.7	Mild	7	1	10
4	0.8	0.2	No	7	1	9
5	0.9	0.3	No	7	2	10
6	0.1	0.4	No	3	4	5
7	0.6	0.3	No	7	1	10
8 (Left)	0.0	0.4	Moderate	7	1	10
(Right)	0.6	0.6	Yes	7	1	10
9	0.6	0.0	No	7	1	10
10	0.2	1.6	No	5	4	7
Mean (%)				6.3 (90)	1.7 (4.3)	9 (90)

order to identify which were at risk of failure.⁷ Antero-posterior and lateral radiographs were taken at review and the humeral and ulnar components were assessed separately. Areas of loosening surrounding a component at the cement-bone interface were measured perpendicular to fixed reference points, and 12 measurements were made from each radiograph. The varus or valgus angle of the humeral component and the flexion or extension angle of the ulnar component was used to measure the relationship of each component to the humerus and ulna, respectively. These measurements were used to calculate an index score (H-index = humeral, U-index = ulnar). An index value greater than 1 indicated a component at 'high risk of failure', 0.7 to 1 as 'almost at risk of failure' and less than 0.7 as 'not at risk of failure'. At review the patients were asked to complete a questionnaire, reviewing their perception of the treatment and satisfaction with the outcome, graded on a visual analogue scale.

Results

Clinical review. The mean follow-up of the ten patients was 68 months (15 to 117). The mean flexion/extension arc increased from 69° to 107°, an improvement which was maintained throughout the study period (Table I).

Postoperatively, seven patients were free from pain and three had persistent occasional pain, especially on repetitive movement (Table II). None had pain at rest. At its worst the pain was described as mild by two patients (cases 1 and 3) and moderate by the third (case 8). One patient (case 6) was unhappy with the range of movement which was obtained.

Radiological review. When grouped into the risk categories (Table II), two ulnar components were 'at risk'. The component with a U-index of 2.0 at eight years (case 2) was subsequently revised for aseptic loosening. The other 'at-risk' prosthesis (case 10) had shown progressive loosening since insertion. The U-index was 0.4 at three months, 1.3 at 12

months and 1.6 at 15 months. The patient had occasional mild pain, but was otherwise asymptomatic. All other ulnar components had indices of less than 1.0. None of the humeral components was considered to be at 'high risk of failure' but three were in the 'almost at risk' group (cases 1, 4, and 5). Examination of sequential radiographs showed progressive loosening after 12 months and H-index values reached the 'almost at risk' group at 48 (case 4), 49 (case 5) and 63 (case 1) months.

Complications. One patient (case 2) required revision arthroplasty for aseptic loosening of the ulnar component after 97 months. There were no dislocations, deep infections or mechanical failures. Two patients had transient neuropathia of the ulnar nerve which resolved after six weeks and eight months, respectively. Two patients were successfully treated for superficial wound infections with oral antibiotics. One patient suffered a myocardial infarction and a pulmonary embolus, but made a satisfactory recovery.

Discussion

Total elbow arthroplasty has been successfully used in patients with rheumatoid arthritis for many years.^{2-4,8-10} Constrained, semi-constrained and unconstrained prostheses have been used.^{1,4-8,11-15} To our knowledge there are no published results of the use of an unlinked total elbow arthroplasty for patients with osteoarthritis. In our series the unlinked Souter-Strathclyde total elbow arthroplasty gave good symptomatic relief and improvement in function when used in this group of patients. Of the 11 elbows reviewed, one ulnar component required revision for aseptic loosening. Four patients suffered minor complications which resolved with treatment. All patients considered the procedure to be successful.

Kozak et al¹ reported the results of two unlinked and three semi-constrained prostheses in osteoarthritic patients. They ascribed the high rate of complications to the vigorous physical demands which these patients placed on the prosthesis and agreed with previous recommendations that prosthetic replacement in primary osteoarthritis should be avoided if possible.

We have compared our results with those for the Souter-Strathclyde total elbow arthroplasty in patients with rheumatoid arthritis.^{4,7,9,13,15,16} As in these series, our patients reported good symptomatic relief and a significant increase in range of movement. Our revision rate was 9%, which compares favourably with rates of between 5% and 21% in rheumatoid patients.⁴ The main indications for revision were dislocation and perioperative fracture; we encountered neither. It may be that the rate of perioperative fracture and dislocation is lower in osteoarthritic compared with rheumatoid patients since the bone stock is more robust and there is less soft-tissue inflammation. It may also be for this reason

that our radiological review did not show the ventral migration associated with loosening of the humeral component reported in some rheumatoid patients.^{7,15} We recommend removing only enough bone from the distal humerus to allow insertion of the humeral component with an adequate cement mantle.

We acknowledge that continued review is required to monitor the progression of periprosthetic loosening, particularly of the ulnar component. In our series, one component was revised for aseptic loosening and a second component had clear early evidence of loosening. We are encouraged by these preliminary results. Although the numbers are small they show that the Souter-Strathclyde total elbow arthroplasty can be considered in selected osteoarthritic patients.

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