ORIGINAL PAPER

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Primary endoprosthesis in comminuted humeral head fractures in patients over 60 years of age

Accepted: 29 May 1999

Abstract The purpose of this study was to determine the early subjective and functional results after primary endoprosthesis replacement for comminuted humeral head fractures in patients over 60 years old. Twenty comminuted humeral head fractures in 20 patients were treated primarily (within 3.5 days (range 0–17 days) with a Neer II modular shoulder prosthesis, and were then followed up for an average of 32.5 months (range 17–44 months). The average age of the patients was 77 years (range 63–91 years). The average post-operative Constant score was 52 points (range 30–76). This was significantly less than that of the contralateral side where the score was 80 points (range 53–100), $P=0.0001$. The average active abduction was 90° (contralateral 157°) and active flexion 99° (contralateral 161°). Eighteen of the 20 patients experienced relief of pain and would accept the same procedure again.

Résumé Nous rapportons l'évolution clinique de 20 patients avec 20 fractures humérales proximales multifragmentaires suivis consécutivement pendant 32.5 mois (17–44) après la mise en place d'une prothèse humérale modulaire (Neer II). L'âge moyen était 77 ans (63–91). L'intervention a été réalisée en moyenne 3.5 jours (0–17) après l'accident. Le score de Constant était en moyenne 52 points (30–76) - l'épaule controlatérale 80 points (53–100) - avec une différence significative ($P=0,0001$) de 28 points (11–66). L'abduction active moyenne était de 90° (controlatérale 157°) et la flexion active de 99° (controlatérale 161°). 90% des patients ne présentaient pas de douleurs et seraient prêts à accepter, à nouveau, une telle opération.

Introduction

The purpose of this study was to determine the early functional results and the associated complications after primary endoprosthetic replacement for comminuted and

severely displaced humeral head fractures in patients over 60 years of age.

Material and methods

From 1993 to 1995, 26 comminuted and displaced humeral head fractures in patients over the age of 60 years were treated by primary endoprosthetic replacement at our Institution. Patients with pathological fractures and preceding osteosynthesis were excluded. Four patients died because of other reasons. Two patients refused to participate in the investigation as they had no shoulder problems. Therefore 20 patients, 19 women and 1 man, with a mean age of 77 years (range 63–91) were available for assessment. Sixteen patients had suffered right-sided fractures and 4 patients had suffered left-sided fractures. The dominant side was involved in 75% of patients. The fracture was most often the result of a fall, though 2 patients suffered direct trauma in a road traffic accident. The operation was performed on average 3.5 days after the accident (range 0–17).

Technique

Each patient was placed in a supine position and received antibiotic prophylaxis. A delto-pectoral approach was used to identify and then to retract the tubercles. The humeral head was then resected. The humeral shaft was prepared to accept a modular humeral prosthesis (Neer II, Orthopaedic Products Division/3 M, St Paul, MN 55144) in retro-version of about 35° . All but one prosthesis, in a lady aged 70 years with excellent bone quality, were cemented. The length of the stem to be used was determined by clinical measurement of the length of the contralateral humerus (greater tubercle – lateral epicondyle). The optimal size of the head was selected to match that of the extracted head. Where possible, different sized trial prostheses were used to assess motion, stability and offset. The tubercles, together with the rotator cuff, were fixed to the prosthesis and to the humeral shaft using a tunnel through the bone and non-absorbable sutures. During operation the average blood loss was 370 ml, and the average operation time was 80 minutes (Figs. 1a, 1b).

A continuous passive motion device mobilised the shoulder post-operatively and active mobilisation started at 4 weeks. Therapy "under load" was started 6 weeks after operation.

The average stay in hospital was 16 days (range 7–38 days), and 16 patients went to a rehabilitation clinic. Clinical and radiological examinations were performed at 6 weeks, 4 months and 12 months after operation. The last clinical assessment was after 32.5 months (range 17–44 months). Subjective status and daily activi-

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Fig. 1a Pre-operative radiograph in an 81-year-old patient, **b** Post-operative radiograph in an 81-year-old patient

ties were recorded, and shoulder function was assessed according to the Constant score [2]. Statistical significance was determined using the t-Test (paired and unpaired) and the Pearson correlation coefficients.

Results

There were neither intra-operative nor peri-operative complications. Four months after operation one stiff shoulder was manipulated under anaesthesia successfully. At final review all patients were satisfied except 2 who expressed ambivalence. None of the patients complained of night pain but 12 reported some pain with specific movements or loads. Paracetamol and non-steroidal anti-inflammatory preparations were used to control pain regularly by 3 patients, and 1 used a morphine derivative but not because of shoulder pain. Three patients had pain in the contralateral shoulder. Patients were asked what they found most disturbing about their shoulder; 6 patients replied that they found nothing disturbing, 6 replied that it was pain, 6 that it was restriction of movement, and 2 that it was weakness.

The results of the Constant score are shown in Table 1. Active flexion was 99° (range 25–180), contralateral flexion being 161° (range 105–180). Active abduction was 90° (range 45–180), contralateral flexion being 157° (range 75–180). External rotation was limited in 15 pa-

Table 1 Results of Constant score (max 100 points) of the operated and contralateral shoulder of patients younger than 80 years of age, and older than 80 years, after an average of 32.5 months after surgery

	Operated shoulder	Contralateral shoulder
Under 80 years of age	55 (range 31–76)	83 (range 66–100)
80 years of age and over	48 (range 31–66)	75 (range 53–85)

tients when compared to the contralateral side. On testing internal rotation, 2 patients were able to reach their buttocks, 3 the lumbosacral joint, 9 the 3rd lumbar vertebra, 5 the 12th thoracic vertebra and 1 the interscapular region. Eleven patients could place their hand over their head, 5 to skull and 4 to neck. All could elevate the non-operated arm over their head. Power of abduction, which could not be measured in 3 patients due either to insufficient abduction or pain, was 3.4 kg (range 0.8–6.7), and on the contralateral side it was 6.8 kg (range 1.2–14.2). The score of the operated shoulder and the score of the non-operated shoulder did not correlate at all ($r=-0.7113$, $P=0.0004$). The score of the non-operated shoulder did not correlate with age ($r=-0.5675$, $P=0.0091$), but it did correlate with the score of the operated shoulder ($r=0.5302$, $P=0.016$).

All patients were able to dress themselves, 11 could comb their hair using the arm on the operated side, 14 patients could manage housework and were able to prepare their own meals, 5 still enjoyed sports, and 3 ladies did gentle occupational work. All patients had returned to their previous accommodation.

Discussion

In the literature there are publications which favour endoprosthetic replacement of the humeral head for 4-part fractures [1, 6, 8, 10], but there is no prospective randomised study comparing different techniques in a similar group of patients. Compito noted 80% of acceptable results when reporting on 171 4-part humeral head fractures treated with primary endoprosthetic replacement [1]. Classification of proximal humeral fracture is difficult [9]. Various studies have reported good functional results, however, following primary prosthetic replacement in proximal humeral fractures, but they often lack important detail. Moeckel found flexion of 119° in 22 patients (average age 70 years) [5]. Tanner and Cofield reported abduction of 101° in 16 patients (average age 69 years) [10]. Compito found an active elevation of 124° in 64 patients (average age 62 years) and of these, nearly a half managed 140° [1]. Hawkins and Switlyk noted flexion of 72° in 20 patients (average age 64 years) [4]. In our study, the functional results were not so favourable, but the average age of the patients was considerably older at 77 years. Moeckel reported that the younger the patient, and the shorter the interval between

accident and operation, the better the functional result [5]. In our study the Constant score in patients aged more than 80 years was lower than in younger patients. However this was not statistically significant. Shoulder function decreases with age, and between the follow-up date at 16 months and the latest data, some patients lost power in the shoulder which had not undergone operation. Injured shoulder function improved while power did not. We operated early after the fracture in order to allow early rehabilitation. The overall results support the use of primary endoprosthetic replacement in severe comminuted and displaced humeral head fractures in very old patients, although there was poor shoulder function when compared with the uninjured side. The functional result is related to the operative technique, the quality of the rotator cuff, and to the mobility of the joint before the accident [3, 4, 7, 10]. In cases of severe soft tissue lesions, especially of the rotator cuff, a functional deficit has to be expected, and good relief of pain is an acceptable result [7]. The high level of satisfaction expressed by these patients may be explained by their age, for at this stage in their life patients are often in poor physical condition. Therefore, pain relief and maintenance of personal independence become more important when assessing results. Although this surgical procedure is demanding, it is safe and it gives very satisfactory results. The complication rate is low, most patients obtain good pain relief and they are able to continue to enjoy their independence.

Acknowledgements We thank Molly T. Vogt, Associate Professor, Director of Clinical Outcomes Research, Department of Orthopaedic Surgery, 3471 Fifth Avenue, Pittsburgh, PA 15213-3221, USA, for her help with the statistical analysis.

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