Two-Year Results After Exchange Shoulder Arthroplasty Using Inverse Implants

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Exchange shoulder arthroplasty using inverse implants is a standardized procedure used to treat impingement, restricted range of motion, joint instability, and infection.

The biomechanical principle of inverse shoulder implants is largely based on distalization and medialization of the center of rotation. As long as the function of the deltoid muscle is still intact, this principle enables the implant to compensate for irreparable damaged rotator cuffs.[1,2]

Three main primary and three revision indications exist for implantation of these prostheses. Primary indications include defect arthropathy, infection, and fracture, and revision indications include decentering of the prosthesis head (impingement), dislocation of the prosthesis head, and periprosthetic infection.

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MATERIALS AND METHODS

This prospective study analyzed the results of exchange shoulder arthroplasty (revision indications) using a Delta Prosthesis (DePuy Orthopaedics Inc, Warsaw, Ind). In this pilot study, we report on the first 21 of 84 patients with a minimum 2-year follow-up. Mean patient age at the time of operation was 64.8 years (range: 49-77 years). Fourteen patients were female and seven male. The right, in most cases the dominant, side was affected in 20 patients. We exchanged 17 hemi and 3 total prostheses. One patient had a total humerus replacement. At follow-up, any claims for financial compensation that the patients might have had, had already been settled.

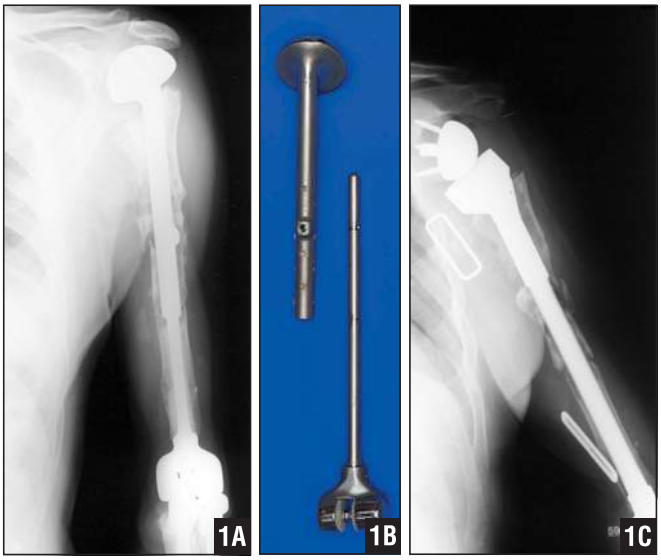


Figure 1: Loose, cranially decentered total humerus replacement in a patient with rheumatoid arthritis (A). Retrieved prosthesis (B). Postoperative radiograph: Custom-made total humerus replacement (W. Link) with inverse shoulder component (DePuy) (C).

The original indications for primary shoulder replacement, which needed to be exchanged included: idiopathic osteoarthritis in 11 patients, four-part fracture in 7, rheumatoid arthritis in 2 (Figure 1), and giant-cell tumor in 1 (Figure 2).

Indications for exchange surgery included impingement with pain and restricted movement in 12 patients (Figure 3); cranioventral dislocation or subluxation in 5 (Figure 4); periprosthetic infections in 3 (Figure 5), 2 were caused by Proprioni species and 1 by *Staphylococcus aureus*; and ankylosis due to periarticular ossifications in 1.

Prior to our exchange oper-

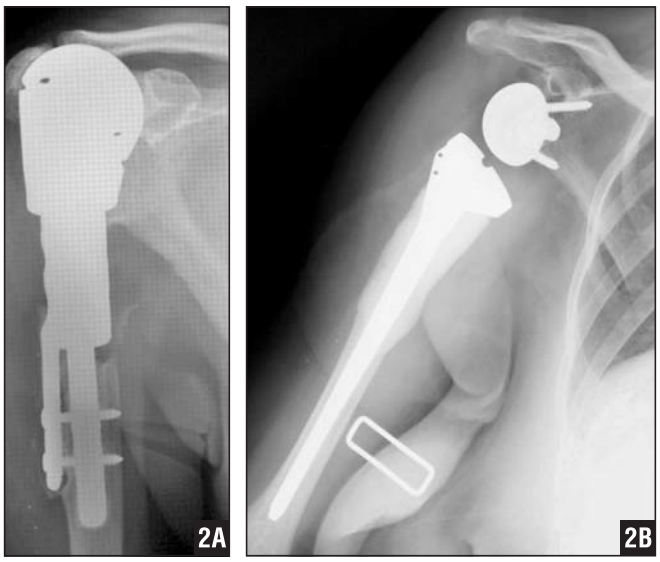


Figure 2: Dislocated special implant after giant-cell tumor resection of the humeral head with pain at rest (A). Postoperative radiograph (B).

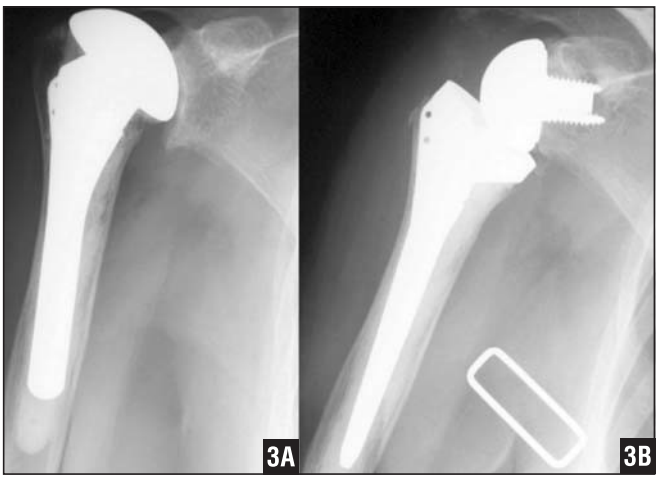


Figure 3: Cranially decentered prosthesis head and deficient rotator cuff (A). Postoperative radiograph (B).

ation, 2 patients had one prosthesis exchange, 1 had two exchanges, and 11 had non-arthroplasty revisions (rotator cuff reconstruction, subacromial decompression, and Neer procedures).

Preadmission preparation for all patients included determination of the inflammatory markers and joint aspiration with microbiological examination of the fluid to verify or exclude the presence of periprosthetic infection.[3]

The exchange operation was performed with the patient in the beach-chair position. A scalenus block was used in addition to routine anesthesia. Although the metaglene straightway is intended for uncemented anchorage, infected cases were treated with a one-stage procedure, which included implanting the metaglene straightaway and cementing it in position. In the remaining 18 patients, emphasis was directed at placing a layer of autologous cancellous bone, obtained from reaming of the glenoid, under the metaglene (Figure 6). To compensate for pre-existing severe bone loss, the glenoid was reconstructed in 1 patient using iliac crest bone graft and in 3 patients using homologous bone grafts.

Follow-up occurred 3, 6, 12, and 24 months after surgery. The patients' subjective opinion of the surgical result was determined by our specifically compiled questionnaire, while the shoulder function was assessed according to the usual subjective criteria "pain and everyday activities" and the objective markers "strength" and "range of movement." These four markers were evaluated according to the Constant Score. None of the patients were examined by the surgeon who performed the operation. Additional radiographs were taken 6, 12, and 24 months postoperatively.

TABLE

Shoulder Function and Analgesic Intake (n=21)

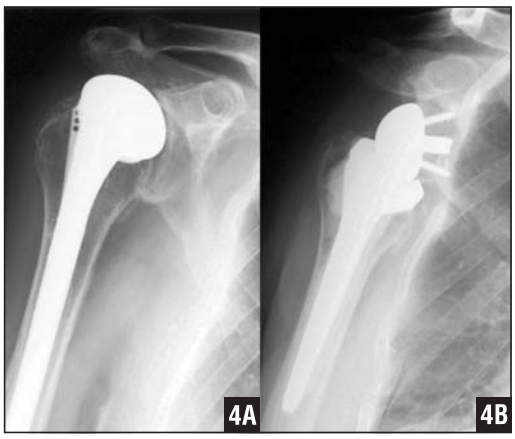
	Preoperatively	Postoperatively
Abduction/adduction (NPM)	40-0-15	85-0-40
Extension / Flexion (NPM)	35-0-20	90-0-35
Internal/external rotation from 0° abduction (NPM)	30-0-10	80-0-20
Hand to neck (%)	4.8	76.2
Hand to back (%)	14.3	85.7
Analgesics (%)		
Regularly	80.9	0.0
Sporadically	19.1	14.3

Abbreviation: NPM=neutral position method.

RESULTS

The outcome of this procedure showed that with inverse prostheses, it is possible to achieve functional results that correspond to those of primary implantation (Figure 7). Seventeen of the 21 patients (80.9%) rated the result of their operation as very good, 3 (14.3%) as good, and 1 (4.8%) as satisfactory. Only 3 patients required analgesics sporadically after the operation, whereas preoperatively all patients were regularly or sporadically dependent on pain-killing medication. Marked improvement was noted in shoulder range of movement in all patients (Table).

Using the Constant Score, the total preoperative points improved from 30 preoperatively to 58 after 24 months and in the age and gender-adapted Constant Score from 42 to 81. Three months postoperatively, the patients had achieved an improvement of



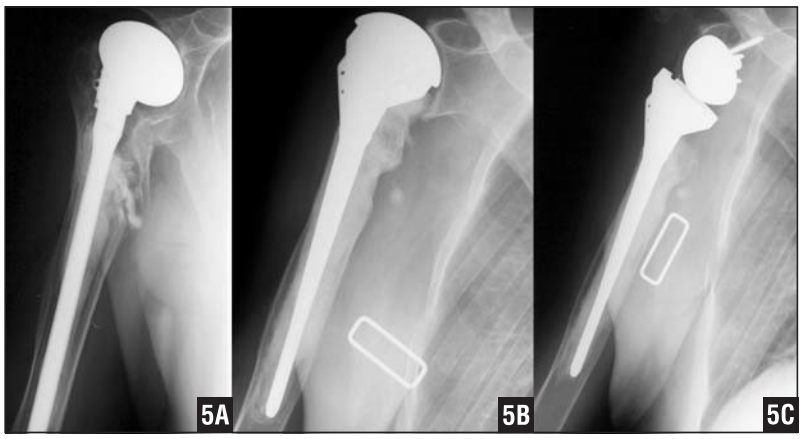


Figure 4: Cranioanterior dislocation (A). Postoperative radiograph (B). **Figure 5:** Periprosthetic infection with pseudarthrosis (A). Delta intermediary head (intermediate stage, not used in this series) (B). Conversion to an inverse prosthesis with implantation of a metaglene and exchange of the intermediary head for an epiphysis after elimination of infection (C).

55 or 76 points respectively and thus a degree of function that almost corresponded to the final maximum result. Further gradual improvement was mainly due to an increase in strength achieved after continued physiotherapy.

The radiographs of all 21 patients showed no signs of loosening (osteolysis or radiolucency). Acromion pseudarthrosis occurred in 1 patient, although the patient remained pain free, and in 2 patients inferior glenoid notching was observed as a subordinate finding within the normal range and therefore of no pathological importance. Two (9.5%) complications required revision; dislocation in 1 patient was treated by interposition of a humeral lengthener and persistence of propioni infection in 1 patient required a second one-stage exchange.

Figure 6: Layer of autologous bone under the metaglene.

Figure 7: Functional result after exchange of a shoulder replacement in the left shoulder and primary replacement of the right shoulder.

Conclusion

Exchange of shoulder replacements using inverse implants is a standardized procedure used to treat impingement, restricted range of motion, joint instability, and infection. The complication rate is low and patient satisfaction is high. Little correlation exists between the score value and patient satisfaction due to the fact that the main benefit to the patient is immediate pain relief. Consequently, the functional result, which has a considerable effect on the score value, was only of secondary importance to the patients. The need for nursing care of elderly patients can be avoided and the almost maximum functional result is achieved at a very early stage, ie, as early as three months after surgery.[1,4,5] A disadvantage of this procedure, however, is the high cost of the implant.

References

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