

Case report

Two cases of bilateral reverse shoulder arthroplasty performed in patients with rheumatoid arthritis

Takuya Tada¹, Yuki Kobayashi³, Misaki Watanabe³, Akito Nishimura^{1,2}, and Kenji Takagishi⁴¹Department of Orthopaedic Surgery, Shimizu Welfare Hospital, Japan²Department of Rheumatology, Shimizu Welfare Hospital, Japan³Division of Rehabilitation, Shimizu Welfare Hospital, Japan⁴Department of Orthopaedic Surgery, Sada Hospital, Japan

Abstract

Bilateral shoulder joint disorders caused by rheumatoid arthritis significantly impair daily functioning owing to a lack of contralateral compensation. In Japan, reverse shoulder joint prostheses were approved in 2014. This was expected to improve the surgical outcomes of rheumatoid shoulder arthroplasty. We report two patients with rheumatoid arthritis who underwent bilateral reverse shoulder arthroplasty. This study aims to evaluate their postoperative clinical outcomes and activities of daily living. The patients were women in their 70s with stage III class 2 rheumatoid arthritis. Their treatment and postoperative activities of daily living were retrospectively reviewed. The first patient underwent the inlay type and experienced a residual limitation of external rotation postoperatively; therefore, she was restricted to dress with front-open clothes. However, she was able to undress after the lining of the garment was changed to a slippery material. The second patient underwent the onlay type and showed almost no limitations in postoperative activities of daily living. She was able to undress with an external rotation of 40–50°. Bilateral reverse shoulder arthroplasty improved range of motion, the Japanese Orthopaedic Association shoulder score, and functional outcomes. Only a few difficulties were encountered in the activities of daily living.

Key words: bilateral reverse shoulder arthroplasty, rheumatoid arthritis, activities of daily living

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Introduction

Ono *et al.* reported that functional disability due to shoulder joint involvement in rheumatoid arthritis (RA) is greater bilaterally than unilaterally. Bilateral shoulder joint dysfunction also results in a significant impairment of daily functioning owing to a lack of contralateral compensatory function. In rheumatoid shoulder disorders, the rotator cuff is thinned and dysfunctional¹. Since reverse total shoulder arthroplasty (RSA) was introduced in Japan in April 2014,

it has been used to reduce pain and improve function in irreparable cases of rotator cuff dysfunction, such as rotator cuff tear arthropathy. Indications are expanding such that it has been performed in individuals over 65 years old with rheumatoid shoulder and proximal humeral fractures². In this study, we reported two patients with RA who underwent bilateral RSA and discussed the clinical outcomes and activities of daily living (ADL) postoperatively on the basis of a literature review.

Case report

Case 1

The patient was a 75-year-old woman with Stage III class 2 RA, which developed at X. She developed right shoulder pain and was administered an interleukin 6 inhibitor at X+9. She experienced a four-part fracture of the left proximal humerus at X+10 and underwent left RSA at Y. The patient was admitted to our hospital to undergo right RSA 3 months after Y+10. She had a history of chronic myelogenous leukemia that was in remission.

The preoperative active range of motion of the right

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Correspondence: Takuya Tada, Department of Orthopaedic Surgery, Shimizu Welfare Hospital, 578-1 Iharacho, Shimizu-ku, Shizuoka-city, Shizuoka 424-0114, Japan

E-mail: ka06223@gmail.com

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shoulder was approximately 90° for elevation with a slight limitation in external rotation (Table 1). Preoperative radiographs of the right shoulder showed that the right shoulder's joint and wrist were classified as Larsen grade IV (Figure 1). Computed tomography (CT) showed a narrowing of the joint fissure, and magnetic resonance imaging revealed significant deformities of the humeral head and scapular glenoid fossa, suggesting a bone marrow edema. A rotator cuff tear was suspected, as no tendon continuity was identified at the greater tuberosity attachment of the supraspinatus tendon. The continuity of the subscapularis and infraspinatus muscles was preserved (Figure 2).

Surgery was performed with the patient in the beach chair position using a deltopectoral approach. A modular

Table 1 Range of motion and JOA scores for both shoulders at Y+10 months postoperatively

	Rt a-ROM		Lt a-ROM
	Pre-operative	Post-operative	Post-operative
Flex	90	120	120
Abd	100	120	120
ER	35	-10	-10
IR	70	L2	Th9
JOA	52.5	74	86.5

Rt: right; Lt: left; A-ROM: active range of motion; Flex: Flexion; Abd: Abduction; ER: External rotation; IR: Internal rotation; JOA: Japanese orthopaedic association shoulder score.

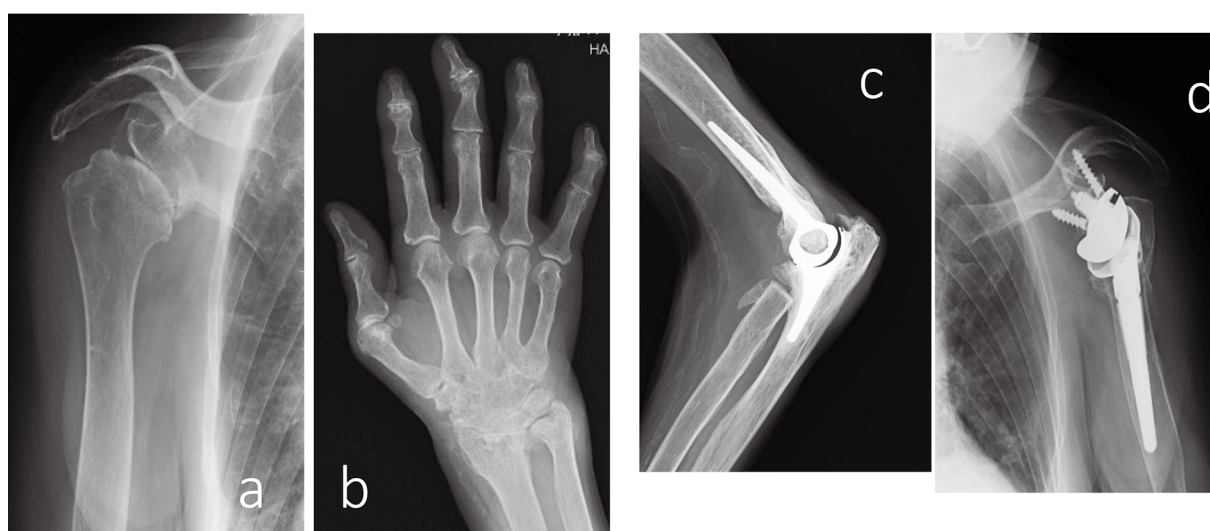


Figure 1 A preoperative plain X-ray of case 1. (a) Right shoulder joint Larsen classification Grade IV, (b) Right wrist Larsen classification Grade IV, (c) Left elbow joint after total elbow arthroplasty (TEA), (d) Left shoulder joint after reverse total shoulder arthroplasty (RSA).

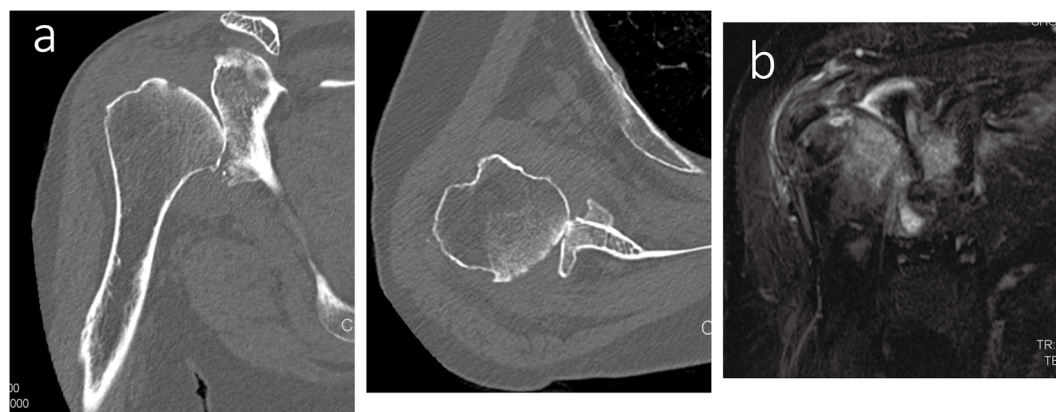


Figure 2 A preoperative image of case 1. (a) Plain computed tomography (CT) image of right shoulder joint, (b) Magnetic resonance imaging (MRI) Short Tau Inversion Recovery (STIR).

shoulder system (SMR, Systema Multiplana Randelli; Lima-LTO, San Daniele del Friuli, Italy) was used as an inlay implant. Postoperatively, the patient wore an arm sling for 4 weeks and was immobilized in the abduction and internal rotation positions. The patient underwent assisted movement to 90° of flexion 3 weeks postoperatively, and she started to move automatically 4 weeks postoperatively (Figure 3).

Compared with that preoperatively, the active range of motion for right shoulder flexion and abduction at Y+10 months postoperatively was improved; however, external rotation remained limited to less than 0° (Figure 4). The Japanese Orthopaedic Association shoulder (JOA) score for



Figure 3 A postoperative plain X-ray of case 1. Photographed after Y+3 months

the right shoulder increased from 52.5 to 74 (Table 1).

In terms of ADL status, the patient was able to perform many activities independently, such as manage toileting and wearing and removing her trousers. However, she was unable to remove front-opening shirts smoothly because of the restricted external rotation; thus, she needed assistance.

Occupational therapy intervention is considered necessary to decrease most movement-limiting changes in clothing. The patient's undressing movements involved grasping the front of the button on the collar on the chest, externally rotating the shoulder joint, and dorsiflexing the wrist joint (Figure 5a). The collar was removed by reaching and removing the garment from the opposite shoulder (Figure 5b). However, she took time to remove the collar from the shoulder in both methods, as this was not performed smoothly. Furthermore, an occupational therapist advised her to use a reacher to easily remove the garment from the shoulder. However, this method was not performed because it was difficult for the patient to carry the reacher, and she needed a caregiver to help her at home (Figure 5c). Therefore, motion instructions were provided again, and a method was developed to easily remove the collar from the shoulder girdle area. The occupational therapy intervention included grasping the front of the front-opening shirt by the chest and raising it upward to loosen the tension between the collar and shoulder. The patient was then able to undress by placing both hands behind her back and pulling the cuff. It was easier to wear and remove the front-opening shirt if its lining was made of an elastic and slippery material. Undressing became easier after motion guidance. (Figure 5d).

Case 2

The patient was a 75-year-old woman with Stage III class 2 RA. She developed hypothyroidism and atrial fibrillation after catheterization. She was diagnosed with a torn rotator cuff in her left shoulder at X+3 and was referred to our hos-



Figure 4 Range of motion after Y+10 months.



Figure 5 Occupational therapy interventions.

Table 2 Range of motion for both shoulders and JOA score for right shoulder at Y+6 months postoperatively

	Rt a-ROM		Lt a-ROM	
	Pre-operative	Post-operative	Pre-operative	Post-operative
Flex	40	145	40	170
Abd	45	145	50	170
ER	40	45	40	45
IR	L5	L2	L3	L2
JOA	54	82	52	92

	Rt JOA score	
	Pre-operative	Post-operative
Pain	10	25
Function	3	3
Stamina	0	5
Activities of daily living	7	7
Elevation	4	12
ER	6	6
IR	4	4
XP	5	5
Joint stability	15	15
Total	54	82

Rt: right; Lt: left; A-ROM: active range of motion; Flex: Flexion; Abd: Abduction; ER: External rotation; IR: Internal rotation; JOA: Japanese orthopaedic association shoulder score.

pital at X+4. She was admitted to our hospital to undergo a right RSA 4 months later.

Shoulder joint elevation was approximately 45°, which was markedly limited. External/internal rotation was relatively well maintained (Table 2). Simple radiographs showed Larsen classification Grade IV in the right shoulder and Grade II in the left shoulder (Figure 6). CT showed that the humeral head moved upward, and a joint destruction was evident in the right shoulder. The left shoulder showed a large tear in the supraspinatus tendon and a synovial pro-

liferation (Figure 7).

As in case 1, surgery was performed with the patient in the beach chair position using a deltopectoral approach. Both shoulders were operated using the comprehensive reverse shoulder system (COMP; Zimmer Biomet Company, Warsaw, IN, USA), which is an onlay-type system that externalizes both the scapular and humeral sides. Postoperatively, the patient was immobilized in abduction and internal rotation by using an abduction brace for 1 week. Two weeks later, the patient started active external rotation to 0°. Four

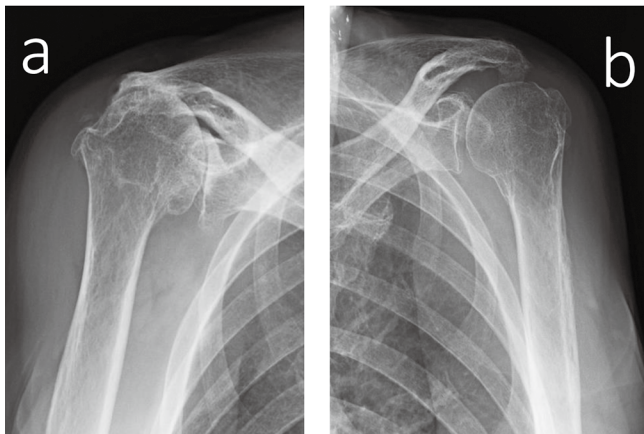


Figure 6 A preoperative plain X-ray of case 2.
 (a) Right shoulder joint Larsen classification Grade IV,
 (b) Left shoulder joint Larsen classification Grade II.

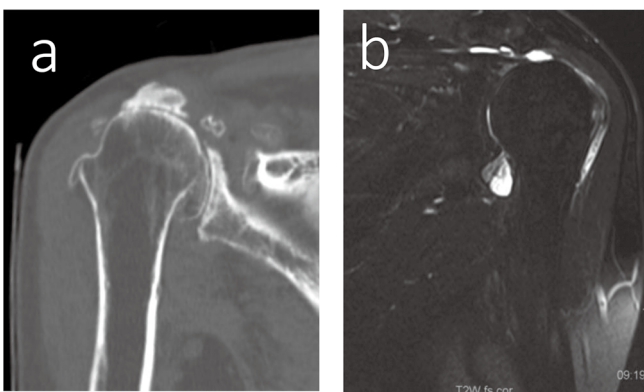


Figure 7 A preoperative image of case 2.
 (a) Plain computed tomography (CT) image of right shoulder joint,
 (b) Magnetic resonance imaging (MRI) Short Tau Inversion Recovery (STIR) of left shoulder joint.

weeks later, the external rotation was unrestricted (Figure 8). Six months after Y+, the elevation improved significantly compared with that preoperatively. The JOA scores also increased from 54 to 82 on the right side and from 52 to 92 on the left side (Figure 9). Internal/external rotation was similar to that preoperatively (Table 2).

The patient could independently manage toileting and wear and remove her trousers, dress independently except for reaching the overhead shelf, eat independently with chopsticks, and change clothes independently. She was able to undress with an external rotation of 40–50°.

Discussion

Regarding the postoperative range of motion, Levy *et al.* conducted a prospective study of 38 shoulders of 19 patients who underwent bilateral RSA and found that the range of

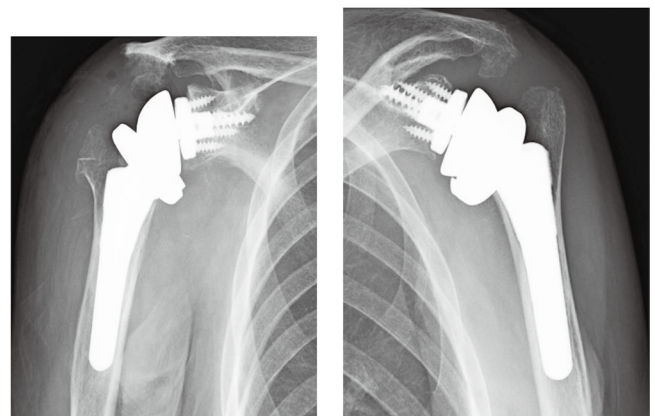


Figure 8 A postoperative plain X-ray of case 2.

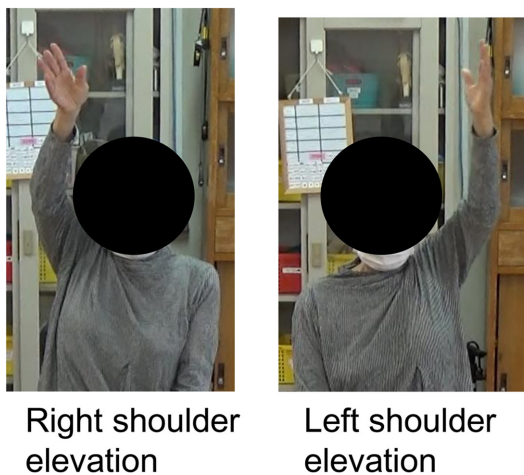
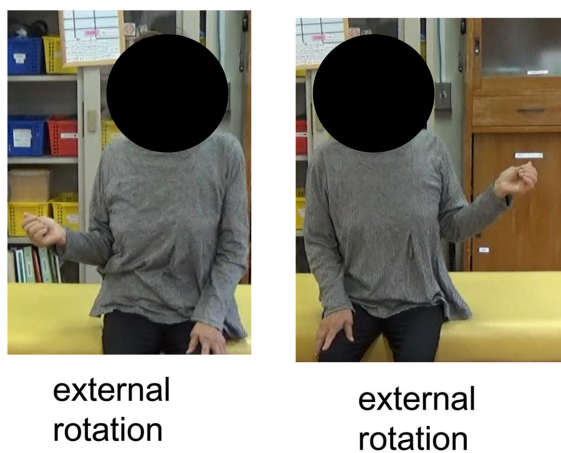


Figure 9 Range of motion after Y+6 months.



motion increased from 57.5° to 143° for flexion, from 9° to 81° for internal rotation, and from 20° to 32° for external rotation. Most patients reported that they were able to resume leisure and sport activities (gardening, golf, swimming, and bowling)³. In the present case, the elevation also increased to more than 120° and the JOA score increased by more than 20 points compared with that preoperatively. In case 1, the postoperative range of motion for external rotation did not improve compared with that preoperatively, and it was limited to less than 0°.

In terms of ADL, Jorge Rojas *et al.* monitored 105 patients who underwent unilateral RSA and 78 patients who underwent bilateral RSA for more than 12 months. Eighty percent of the patients were able to use the toilet independently. Almost all the patients who underwent bilateral RSA managed toileting with at least one arm. They reported no significant difference in the percentage of patients able to manage toileting between those who underwent unilateral and bilateral RSA⁴. The two patients in this study were able to independently manage toileting and wear and remove their trousers. In Case 1, limitations were observed during undressing activities. However, no ADL problems persisted when we changed the fabric to a slippery material and taught the patient to undress.

Washino *et al.* measured the range of motion of 21 patients with frozen shoulders in four activities: washing the body, washing the hair, changing clothes (front-opening shirts), and drying clothes, and they found a significant difference in the range of motion between patients who could perform the four ADL and those who could not. The minimum range of motion required for these ADL was 105° for flexion, 75° for abduction, 50° for external rotation, and 90° for horizontal internal rotation⁵. We were unable to find studies on ADL after bilateral reverse shoulder arthroplasty regarding dressing and dismounting movements. However, in our study, dressing and undressing were possible with 40–50° of external rotation, as reported by Washino *et al.*

In case 1, an inlay-type RSA was performed, and in case 2, an onlay-type RSA was performed. However, in general,

the onlay type presented a better postoperative range of motion for external rotation. Alessandro *et al.* conducted a prospective study on 42 patients who underwent bilateral RSA regarding the reacquisition of external rotation and found a significantly better range of motion for external rotation, adduction, and extension for the onlay type compared with that for the inlay type. However, they reported no significant differences in flexion and abduction⁶. In our study, the onlay type was also less limited in ADL according to external rotation.

Conclusion

In this study, we reported two cases with RA who underwent bilateral RSA, which improved range of motion, JOA score, and functional outcomes. We concluded that a patient with an external shoulder rotation of 40–50° could easily perform dressing and undressing activities. Even a patient with postoperative external rotation restriction could easily wear and remove clothes under the guidance of an occupational therapist.

Ethics approval and consent to participate: The research related to human use complied with all the relevant national regulations and institutional policies according to the tenets of the Helsinki Declaration and was approved by the authors' institutional review board or an equivalent committee. We explained the purpose and methods of the research to the participants, stated the fact that participation was voluntary with no disadvantages on refusal, protected their personal information, and obtained their consent.

Conflict of interest: The authors declare that they have no conflict of interest.

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