

SUBSPECIALTY PROCEDURES

LARGE GLENOID DEFECTS TREATED BY MULTIPLE BIORESORBABLE PINNING-ASSISTED BONE-GRAFTING IN REVERSE SHOULDER ARTHROPLASTY

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Published outcomes of this procedure can be found at: *JBJS Open Access*. 2021 Oct 21;6(4):e21.00049.

Investigation performed at Shiga University of Medical Science, Shiga, Japan

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Abstract

Background: Large glenoid defects pose problems in reverse shoulder arthroplasty (RSA)¹⁻⁴. Bone-grafting enables restoration of the glenoid, but outcomes of this procedure may be hampered by early instability, which can lead to implant malpositioning, and by graft resorption, which can lead to implant loosening²⁻⁷. To combat these potential complications, we utilize multiple bioresorbable pinning (MBP) during the bone-grafting process, in which as many bioresorbable pins as required are inserted from whatever aspect of the graft is appropriate until initial stability of the graft is achieved¹. We retrospectively compared the various grafting techniques applied for various degrees of retroversion, concluding that MBP is better when retroversion is $>30^{\circ}$ ¹. Treatment decisions are made according to the degree of preoperative retroversion. The MBS technique is indicated for type-2 and type-3 glenoid deformities. This technique is not only relatively safe—as it involves only the use of bioresorbable materials—but also yields improved graft incorporation and less glenoid loosening¹.

Description: This procedure is performed with the patient under general anesthesia and in the beach-chair position, via a deltopectoral approach. After placing the structural graft, 5 to 10 provisional 1.5-mm Kirschner wires are inserted through the graft up the medial cortical bone of the scapula. The Kirschner wires are subsequently replaced with bioresorbable (BR) pins (1.5-mm Fixsorb Pin; TEIJIN). If more wires are needed, another set of 4 to 5 RB pins is inserted to gain initial stability. After placing the graft, the glenoid component is implanted as usual.

Alternatives: Traditionally, 1 or 2 screws are inserted in the periphery of the graft to obtain stability. The screws either must be inserted at an angle that does not impede placement of the implant² or are removed before the placement of

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the glenoid implant. One or a maximum of 2 long screws are inserted through the graft and glenoid³, meaning that the screw(s) must be aimed at a very narrow space between the central post and screws. Otherwise, these screws will represent an obstacle to the placement of the glenoid implant.

Rationale: In addition to facilitating initial graft stability, this procedure promotes graft incorporation. Typically, when performing this procedure, a total of 15 to 20 temporary Kirschner wires are placed in sets, with 5 to 7 wires per set. Of these, the most stable wires, usually 8 to 10 in total, are replaced by BR pins. The resultant bone holes, whether filled or unfilled with the BR pins, may promote neovascularization and osteoinduction, enabling long-lasting remodeling of and improved incorporation of the bone graft.

Expected Outcomes: A prior study compared the use of MBP versus angulated bony-increased offset (BIO) graft, assessing graft incorporation according to the size of the remaining graft on axial radiographs, with full incorporation defined as >75% of the original graft size^{1,2}. In that study, all 13 patients in the MBP group showed full graft incorporation compared with only 9 (47%) of 19 patients in the angulated BIO group ($p < 0.001$)¹.

Important Tips:

- Expose all 4 quadrants of the glenoid in cases of type-2 deformity. Accurate orientation of the MBP is important.
- Expose the upper and lower 2 quadrants of the glenoid in cases of type-3 deformity. The bases of the scapular spine and axillary border serve as a graft scaffold.
- Preserve circumferential soft tissues in cases of type-3 deformity because these tissues will serve to contain cancellous bone graft.
- Keep the Kirschner wire that extends the most medially (reaching the most medial cortical bone of the scapula) as a future guidewire for drilling of the central peg hole.

Acronyms and Abbreviations:

- RSA = reverse shoulder arthroplasty
- MBP = multiple bioresorbable pinning
- BIO = bony-increased offset
- BR = bioresorbable
- TSA = total shoulder arthroplasty
- CT = computed tomography
- K-wire = Kirschner wire
- ROM = range of motion
- P.O. = postoperative

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References

1. Imai S. A Sequential Approach to the Management of Posterior Glenoid Defects in RSA: Angulated BIO Versus Multiple Bioresorbable Pinning-Assisted Structural Bone-Grafting. *JB JS Open Access*. 2021 Oct 21;6(4):e21.00049.
2. Ernstbrunner L, Werthel JD, Wagner E, Hatta T, Sperling JW, Cofield RH. Glenoid bone grafting in primary reverse total shoulder arthroplasty. *J Shoulder Elbow Surg*. 2017 Aug;26(8):1441-7.
3. Jones RB, Wright TW, Zuckerman JD. Reverse total shoulder arthroplasty with structural bone grafting of large glenoid defects. *J Shoulder Elbow Surg*. 2016 Sep;25(9):1425-32.

4. Tashjian RZ, Granger E, Chalmers PN. Structural glenoid grafting during primary reverse total shoulder arthroplasty using humeral head autograft. *J Shoulder Elbow Surg.* 2018 Jan;27(1):e1-8.
5. Boileau P, Moineau G, Roussanne Y, O'Shea K. Bony Increased Offset-Reversed Shoulder Arthroplasty (BIO-RSA). *JBJS Essent Surg Tech.* 2017 Dec 27;7(4):e37.
6. Boileau P, Morin-Salvo N, Gauci MO, Seeto BL, Chalmers PN, Holzer N, Walch G. Angled BIO-RSA (bony-increased offset-reverse shoulder arthroplasty): a solution for the management of glenoid bone loss and erosion. *J Shoulder Elbow Surg.* 2017 Dec;26(12):2133-42.
7. Sperling JW, Cofield RH, Rowland CM. Neer hemiarthroplasty and Neer total shoulder arthroplasty in patients 50 years old or less. Long-term results. *J Bone Joint Surg Am.* 1998 Apr;80(4):464-73.
8. Wagner E, Houdek MT, Griffith T, Elhassan BT, Sanchez-Sotelo J, Sperling JW, Cofield RH. Glenoid Bone-Grafting in Revision to a Reverse Total Shoulder Arthroplasty. *J Bone Joint Surg Am.* 2015 Oct 21;97(20):1653-60.