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ORIGINAL ARTICLE

Posterior open wedge osteotomy of the scapula neck for the treatment of advanced shoulder osteoarthritis with posterior head migration in young patients

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Background: Treatment of young, active patients with symptomatic glenohumeral osteoarthritis, excessive glenoid retroversion, and static posterior humeral subluxation is challenging. Correction of glenoid retroversion may lead to centric loading and perhaps recenter the humeral head. We describe the functional and radiologic outcomes after corrective osteotomy of the glenoid in this population of patients.

Materials and methods: In this retrospective study, we included 10 shoulders (8 patients) that were observed for a mean of 33.4 months (range, 24-52 months) after corrective osteotomy of the glenoid. The mean age at surgery was 41.5 years (range, 24-51 years). On standardized axial images, glenoid retroversion and posterior static humeral subluxation were measured preoperatively and postoperatively and at the final follow-up. At final follow-up, anterior and posterior axial radiographs were performed to determine humeral head position in different arm positions. Clinical follow-up included Constant-Murley score, subjective shoulder value, and patient satisfaction.

Results: The mean Constant-Murley score improved significantly from 45.1 points (range, 24-71) to 64.1 points (range, 44-92; $P < .001$). The average degree of anterior flexion improved significantly from 117° (range, 50°-160°) to 143° (range, 110°-180°; $P = .006$). The mean glenoid retroversion changed from 16° (range, 11°-31°) preoperatively to 5° (range, 13° anteversion–16° retroversion; $P = .003$) at the final follow-up. The mean posterior static subluxation of the humeral head changed from 5 mm (range, 0-10 mm) preoperatively to 6 mm (range, 0-14 mm; $P = .259$) at the final follow-up.

Conclusions: This study shows that posterior open wedge osteotomy of the glenoid neck provides excellent correction of glenoid retroversion.

Level of evidence: Level IV; Case Series; Treatment Study

Keywords: Glenoid cavity; retroversion; glenohumeral subluxation; arthritis; open wedge osteotomy; scapula neck

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Table I Patient demographics, glenoid morphology, and arthritis

Patient	Age at surgery (years)	Follow-up (months)	Sex	Side	Walch morphology[31]	Samilson and Prieto stage[25]
1	32	32	M	R	B1	1
2	24	25	M	R	B2	1
3	51	24	M	L	B1	2
3	50	31	M	R	B1	2
4	49	52	M	R	B2	3
5	40	37	M	L	B1	2
6	41	44	M	L	B1	2
6	41	38	M	R	B1	3
7	51	26	M	R	B2	2
8	36	25	M	R	B2	3

Excessive retroversion of the glenoid causes eccentric loading of the glenohumeral joint and can lead to instability, progressive arthritis, functional impairment, and posterior static subluxation of the humeral head (PSSH).[3,23] However, there is some evidence that extension of PSSH does not correlate with extension of glenoid retroversion.[9,14,30] Therefore, causes for PSSH seem to be multifactorial and are probably related to a combination of bone and soft tissue factors.

Therapeutic options for young patients with severe glenoid retroversion, PSSH, arthritis, pain, and functional impairment are scarce. In general, total shoulder arthroplasty (TSA) is considered in patients with advanced age, but in younger patients, joint-preserving methods are on the rise.[19,20,32]

In TSA, the longevity of the implant is a major concern in these often young patients.[5,26] In addition, TSA in cases with severely retroverted glenoids is associated with higher revision rates, high rates of glenoid-sided loosening, and inferior functional outcomes.[16,23,32]

Few joint-preserving surgical methods to correct glenoid retroversion have been described. Scott first described a method to correct glenoid retroversion using glenoid neck osteotomy in 3 cases of patients with chronic posterior dislocation.[27] The rationale behind corrective osteotomy is to correct the retroversion to achieve centric loading of the glenohumeral joint, which should lead to recentering of the humeral head. The purpose of this study was to evaluate the functional and radiologic outcomes after glenoid corrective osteotomy in young patients with severe glenoid retroversion, PSSH, and signs of osteoarthritis.

Materials and methods

In this retrospective observational study from 2010 to 2014, we analyzed 10 shoulders from 8 patients who underwent corrective osteotomy of the glenoid for severe glenoid retroversion. The indications for surgery were age younger than 55 years, glenoid retroversion (≥10°), PSSH (≥5 mm), signs of osteoarthritis (Samilson and Prieto stage ≥1), and impaired function.

Glenoid retroversion and humeral head position were measured using computed tomography (CT) scans of the affected shoulder.

Glenoid morphology was classified according to the method described by Walch et al.[31] Six shoulders showed a B1 glenoid and 4 shoulders showed a B2 glenoid.

Arthritis was classified according to Samilson and Prieto.[25] Two shoulders had stage 1, 5 shoulders had stage 2, and 3 shoulders had stage 3 arthritis before surgery.

None of the patients had a positive jerk test result or other signs of posterior instability. In all patients, conservative, physiotherapeutic treatment was performed before surgery for at least 6 months. Physiotherapeutic treatment mainly comprised strengthening exercises of the infraspinatus and teres minor muscle. Failure was defined as unsatisfied patients with no improvement in range of motion and no decline in shoulder pain. All patients received CT scans preoperatively, in the first postoperative week, and at the final follow-up. At the final follow-up, functional axial radiographs were performed to evaluate humeral head subluxation during different arm positions on the horizontal plane.

All of the patients were men with a mean age at surgery of 41.5 years (range, 24-51 years). The right shoulder was operated on in 7 cases and the left shoulder in 3 cases. In 2 patients, both shoulders were treated. The mean follow-up was 33.4 months (range, 24-52 months). Table I shows patient demographics, glenoid morphology, and osteoarthritis in detail.

Clinical evaluation included preoperative and postoperative Constant-Murley score (CMS) and postoperative subjective shoulder value.[4] Range of motion was measured using a goniometer. Two independent examiners who were not part of the surgery examined the patients. The patients were asked to rate their final result as excellent, good, fair, or dissatisfied and to indicate if they would undergo the same procedure again.

Operative technique

The patient was positioned in the lateral decubitus position with the affected shoulder uppermost. The skin incision was made vertically approximately 2 cm medial to the acromial angle and straight downward to the posterior axillary fold along the line of the acromion and directly in line with the posterior glenohumeral joint. After the fascia of the deltoid was opened, the muscle was split as much as possible by blunt dissection along the muscle fibers. When splitting the muscle, one has to keep in mind the axillary nerve. Measured from the acromion, a split of approximately 7 cm is sufficient. The underlying infraspinatus and teres minor muscles were separated,