The posterior bone block procedure in posterior shoulder instability
A LONG-TERM FOLLOW-UP STUDY

D. E. Meuffels,
H. Schuit,
F. C. van Biezen,
M. Reijman,
J. A. N. Verhaar

From Erasmus MC,
University Medical Centre, Rotterdam,
The Netherlands

We present the long-term outcome, at a median of 18 years (12.8 to 23.5) of open posterior bone block stabilisation for recurrent posterior instability of the shoulder in a heterogenous group of 11 patients previously reported on in 2001 at a median follow-up of six years.

We found that five (45%) would not have chosen the operation again, and that four (36%) had further posterior dislocation. Clinical outcome was significantly worse after 18 years than after six years of follow-up (median Rowe score of 60 versus 90 (p = 0.027)). The median Western Ontario Shoulder Index was 60% (37% to 100%) at 18 years’ follow-up, which is a moderate score. At the time of surgery four (36%) had glenohumeral radiological osteoarthritis, which was present in all after 18 years.

This study showed poor long-term results of the posterior bone block procedure for posterior instability and a high rate of glenohumeral osteoarthritis although three patients with post-traumatic instability were pleased with the result of their operations.

Recurrent posterior shoulder instability is rare, with posterior dislocations representing only 5% of all shoulder dislocations.1 There is, however, considerable associated morbidity and treatment is difficult. The initial recommended treatment is conservative, but when dislocations recur, surgery is indicated.2 Various surgical techniques have been described for the treatment of recurrent posterior shoulder instability. Some address the soft tissues, such as open or arthroscopic capsulorrhaphy,3-6 others, such as glenoid osteotomy and the posterior bone block procedure, address the bony anatomy.7,8

Placement of a bone block on the posterior glenoid rim the posterior bone block procedure increases the posterior glenoid surface and improves stability. This procedure was first described in 1947 by Hindeanach.9

There are only a few reports of the posterior bone block procedure with small numbers of patients and short follow-up.10-14

Osteoarthritis of the glenohumeral joint is a common late finding after recurrent anterior dislocation of the shoulder or stabilising procedures for this condition.15-17 Several medium- and long-term radiological studies have shown high rates of osteoarthritis after surgery for recurrent anterior dislocation, regardless of the technique used.18-22 To our knowledge there are no long-term studies assessing the incidence of osteoarthritis following stabilising surgery for posterior instability.

We performed this follow-up study on the posterior bone block procedure, to assess its long-term outcome. We prospectively followed patients from an earlier study with a six-year follow-up23 to find out whether there was a difference in clinical outcome between medium- and long-term follow-up, focusing particularly on the long-term incidence of osteoarthritis.

Patients and Methods
Between 1985 and 1995, 11 patients with symptomatic involuntary recurrent posterior dislocation of the shoulder underwent a posterior bone block procedure. There were five women and six men. All had followed and failed an extensive conservative treatment programme for more than a year, consisting of strengthening the posterior shoulder muscle. At the time of operation their median age was 22 years (14 to 56). Three patients had a prior posterior Putti-Platt procedure in other hospitals and one had undergone a glenoid osteotomy. In three patients only a traumatic event initiated the instability.

At mid-term follow-up one patient was lost to follow-up,23 but in long-term follow-up this missing patient returned, resulting in no patients being lost to follow-up.

At long-term follow-up the patients were evaluated for functional ability, shoulder stability,
recurrent subluxation, range of movement, satisfaction with the operation and pain. Pain was scored with a Visual Analogue Scale (VAS) on a 100 mm horizontal line with 0 being no pain and 100 being maximum pain. Re-operations and complications were recorded. All patients were asked at long-term follow-up if they would still have chosen the operation, considering the outcome.

Pre-operatively and at long-term follow-up, anteroposterior and trans-scapular radiographs were taken to score the degree of osteoarthritis according to Samilson and Prieto and at long-term follow-up the extent of resorption of the bone block was evaluated. All the radiographs were examined by two physicians (DEM, HS): in case of disagreement, they would confer to reach a consensus opinion.

Clinical outcome was evaluated using the Rowe score for instability of the shoulder which we had used in our previous study and the Western Ontario Shoulder Index, which is a validated tool with a high responsiveness.

Surgical technique. After stability was assessed under general anaesthesia, the patient was placed in a prone position with the shoulder in abduction on a supporting device. An incision was made over the spine of the scapula, and the deltoid muscle detached from it. The interval between the infraspinatus and teres minor muscles was enlarged, and the infraspinatus was retracted near the humeral head to avoid damaging the suprascapular nerve. The joint capsule was opened to inspect the joint cavity and the postero-caudal part of the scapular neck was roughened to create a bed for the bone block. A 3 cm tricortical bone block was harvested from the posterior part of the iliac crest and fixed with two AO-screws for the posterocaudal glenoid rim (Fig. 1). The bone block was aligned not to protrude lateral to the posterior labrum.

The deltoid muscle was then re-inserted. After operation a Velpeau plaster was applied for eight weeks, after which shoulder exercises were started. Return to sport was allowed after six to nine months.

Statistical analysis. Statistical analysis was performed using SPSS 15.0 software (SPSS Inc., Chicago, Illinois). As the variables did not have a normal distribution the results are presented as median and minimum, and maximum. Wilcoxon’s signed ranks test was used to detect statistically significant differences in the VAS and Rowe score between mid-term and long-term follow-up. In all analyses, a two-sided p-value < 0.05 was considered significant.

Results

At long-term follow-up with a median of 18.3 years (12.8 to 23.5), all 11 patients with a median age of 38 years (33 to 75) were evaluated. The characteristics of the patients and the results are shown in Table I.

Subjectively, three patients had a stable shoulder, the remaining eight did not. Of these eight patients, four suffered recurrent posterior dislocation.

Post-operative complications. Severe instability and recurrent dislocations in two of these four patients led to an arthrodesis being performed on the affected shoulder. One of these patients was diagnosed with Ehlers-Danlos Syndrome nine years post-operatively. The screws were removed in two patients because of local symptoms and in two this was performed before the glenohumeral arthrode-sis. In one it was a separate procedure, in the other, it was carried at in the same session. Post-operatively one patient had a superficial wound infection which resolved with antibiotic treatment. At long-term follow-up the median Rowe score was significantly lower than at mid-term follow-up: 60 (15 to 100) versus 90 (55 to 100) (p = 0.027). The Western Ontario Shoulder Index score was 60% (37% to 100%) of normal. Three patients had a perfect or good score, three had a moderate outcome, and five had a poor outcome. The median VAS was 70 pre-operatively (0 to 100), 25 (0 to 100) at mid-term and 40 (0 to 87) at long-term follow-up. There was a significant difference between the pre-operative VAS versus the six-year follow-up.
THE POSTERIOR BONE BLOCK PROCEDURE IN POSTERIOR SHOULDER INSTABILITY 653

VOL. 92-B, No. 5, MAY 2010

(p = 0.028) and pre-operative versus 18-year follow-up (p = 0.011) (Table II).

Radiographic findings. At long-term follow-up the posterior bone block was resorbed in two patients, neither of whom had recurrent dislocation.

Pre-operative scoring with the Samilson and Prieto24 method showed that three patients had mild osteoarthritis and one had moderate osteoarthritis. At long-term follow-up two patients had arthrodesis; all remaining patients had glenohumeral osteoarthritis. Six patients had mild, two moderate and one severe osteoarthritis. There was a significant increase from four patients with radiological osteoarthritis pre-operatively to nine at long-term follow-up (18 years).

Discussion
This study shows poor long-term results for the posterior bone block procedure for recurrent posterior instability. After a median of 18 years’ follow-up more than half of the patients had further instability, four of whom had recurrent dislocation. Only three patients maintained a stable shoulder. We also found a low level of satisfaction with the operation. Only six patients were satisfied and would undergo the operation again. In those patients who had not required an arthrodesis, all developed radiological osteoarthritis, ranging from mild to severe.

The three patients with a traumatic onset to their posterior shoulder instability had the best outcome, whereas in those with hyperlaxity it was poor. This suggests that the posterior bone block procedure should be restricted to those with a traumatic onset to their dislocation.

We do not know whether surgery or recurrent dislocation is the cause of the osteoarthritis. The incidence of glenohumeral osteoarthritis, in a much older population of 85 years or more, was 4%.29 In a large series of patients with anterior instability of the shoulder treated non-operatively the incidence of osteoarthritis at a follow-up of ten years was 20%.15 Other long-term studies on different kinds of surgical technique for anterior instability all showed increased rates of glenohumeral osteoarthritis. Van der Zwaag et al22 reported an incidence of 61% at 22 years’ follow-up with the Putti-Platt procedure. Pelet et al20 reported a 40% rate after a mean follow-up of 29 years with the Bankart repair. In addition, Pelet et al20 and

---

Table I. Patient characteristics

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Surgical indication</th>
<th>Satisfaction with intervention</th>
<th>Would choose intervention again</th>
<th>Direction of instability on examination</th>
<th>Recurrence of dislocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>36</td>
<td>Hyperlaxity</td>
<td>Dissatisfied</td>
<td>No</td>
<td>Arthrodesis</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>46</td>
<td>Trauma</td>
<td>Very satisfied</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>75</td>
<td>Trauma</td>
<td>Very satisfied</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>43</td>
<td>Laxity</td>
<td>Satisfied</td>
<td>Yes</td>
<td>Posterior</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>35</td>
<td>Hyperlaxity</td>
<td>Satisfied</td>
<td>Yes</td>
<td>Arthrodesis</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>35</td>
<td>Habitual</td>
<td>No opinion</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>48</td>
<td>Trauma</td>
<td>Very satisfied</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>37</td>
<td>Hyperlaxity</td>
<td>Satisfied</td>
<td>Yes</td>
<td>Inferior/posterior</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>47</td>
<td>Hyperlaxity</td>
<td>Dissatisfied</td>
<td>No</td>
<td>Inferior/posterior/anterior</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>33</td>
<td>Hyperlaxity</td>
<td>Dissatisfied</td>
<td>No</td>
<td>Inferior/posterior/anterior</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>38</td>
<td>Habitual</td>
<td>Dissatisfied</td>
<td>No</td>
<td>Anterior/posterior</td>
<td>No</td>
</tr>
</tbody>
</table>

Table II. Pain score pre-operatively, and at mid- and long-term, mid-term and long-term Rowe score, and long-term Western Ontario Shoulder Index (WOSI)

<table>
<thead>
<tr>
<th>Case</th>
<th>Surgical indication</th>
<th>Pre-operative VAS*</th>
<th>Rowe score</th>
<th>VAS</th>
<th>Rowe score</th>
<th>VAS</th>
<th>% WOSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hyperlaxity</td>
<td>90</td>
<td>NA† (arthrodesis)</td>
<td>100</td>
<td>NA (arthrodesis)</td>
<td>50</td>
<td>74</td>
</tr>
<tr>
<td>2</td>
<td>Trauma</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>90</td>
<td>0</td>
<td>91</td>
</tr>
<tr>
<td>3</td>
<td>Trauma</td>
<td>50</td>
<td>80</td>
<td>10</td>
<td>85</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>4</td>
<td>Laxity</td>
<td>80</td>
<td>85</td>
<td>30</td>
<td>15</td>
<td>2</td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td>Hyperlaxity</td>
<td>100</td>
<td>NA (arthrodesis)</td>
<td>55</td>
<td>NA (arthrodesis)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>6</td>
<td>Habitual</td>
<td>60</td>
<td>100</td>
<td>20</td>
<td>90</td>
<td>8</td>
<td>66</td>
</tr>
<tr>
<td>7</td>
<td>Trauma</td>
<td>70</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>14</td>
<td>100</td>
</tr>
<tr>
<td>8</td>
<td>Hyperlaxity</td>
<td>70</td>
<td>95</td>
<td>20</td>
<td>45</td>
<td>50</td>
<td>47</td>
</tr>
<tr>
<td>9</td>
<td>Hyperlaxity</td>
<td>95</td>
<td>65</td>
<td>80</td>
<td>45</td>
<td>53</td>
<td>48</td>
</tr>
<tr>
<td>10</td>
<td>Hyperlaxity</td>
<td>60</td>
<td>55</td>
<td>80</td>
<td>45</td>
<td>78</td>
<td>37</td>
</tr>
<tr>
<td>11</td>
<td>Habitual</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA (arthrodesis)</td>
<td>60</td>
<td>87</td>
</tr>
<tr>
<td>12</td>
<td>Habitual</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

* VAS, visual analogue scale
† NA, not available, either because of loss to follow-up or not scored because of glenohumeral arthrodesis
Buscayret stated that procedures using a bone block have even higher rates of osteoarthritis at a shorter follow-up period, referring to the Eden-Hybinette procedure, which is the anterior variant of the posterior bone block. It is unclear why there should be a higher rate of osteoarthritis after the use of bone graft for stabilisation. A possible cause could be impingement of the humeral head on the graft. This could also be a reason for the high rates of osteoarthritis in this study.

Several surgical techniques have been described to treat patients with posterior instability of the shoulder. Some authors do not recommend the use of soft-tissue procedures alone, owing to a high rate of recurrence, although others have reported good results after the postero-inferior capsular shift procedure. Arthroscopic capsulorrhaphy for posterior instability has shown good results in the short term. Kim et al had good results in 27 cases with traumatic recurrent posterior subluxation after three years with arthroscopic labral repair and posterior capsular shift. Glenoid osteotomy is a technically difficult procedure, with many complications. Hawkins et al found a complication rate of 29% and a recurrence rate of 41%.

This small cohort study has inherent shortcomings. It is a heterogeneous group with a possible selection bias as the patients were treated at an academic tertiary referral centre. However, although the numbers are small there is a complete long-term follow-up.

The few studies on the posterior bone block procedure involve small groups of patients with a short follow-up. Recently Barbier et al described eight patients with a median follow-up of 34 months (10 to 60). Three patients required removal of the screws. Mowery et al described five patients with a follow-up of two and a half to eight years. With good results. Fried reported success in five of six shoulders. Fronek et al, who combined a bone block with posterior capsulorrhaphy, reported five cases with an average follow-up of five years with no recurrence of instability or glenohumeral arthrosis. Sirveaux et al showed how the outcome after a posterior bone block procedure evolved with time. Nine patients were operated on with an iliac crest posterior bone block, with a median follow-up of 13.5 years, and nine patients were operated on using an acromial bone block, with a median follow-up of 3.5 years. The total group of 25 patients consisted of one with recurrent dislocation, 12 with involuntary subluxation and five with symptoms and arthroscopically diagnosed posterior instability. Seven patients were lost to follow-up. Using the radiological scoring of Samilson and Prieto, they found glenohumeral arthritis in four of 18 patients. The lower rate could be due to a shorter follow-up, a lower posterior dislocation rate or differences in operative technique throughout the study, making comparison difficult.

Servien et al described the posterior bone block procedure in 16 shoulders with traumatic posterior dislocation and five shoulders with posterior traumatic subluxation; 33 cases with chronic posterior dislocation were excluded. In 21 shoulders with an average follow-up of six years, good results were found. We confirm these findings. The results for the posterior bone block procedure following traumatic posterior dislocation are good. On following up our previous study, however, we found that in the long term, the outcome deteriorated with glenohumeral osteoarthritis in all cases.

We counsel against performing a posterior bone block procedure in patients with posterior shoulder instability associated with hyperlaxity or multidirectional instability, because of the poor long-term clinical result and the inevitable development of glenohumeral osteoarthritis.

We wish to thank T. Gosens for his work on the mid-term follow-up as an intern in our department.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References


