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Long-term results and arthropathy following the modified Bristow–Latarjet procedure

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Abstract The incidence of early osteoarthritis after the modified Bristow procedure has been the subject of several articles during the last decade. Recurrent dislocation, recurrent subluxation after surgery or the procedure itself have been suggested as the main causes of degenerative changes. We assessed 19 patients who underwent the Bristow procedure for recurrent anterior dislocations of the shoulder retrospectively. Only one redislocation occurred in 20 shoulders (six women and 13 men) with an average follow-up of 7.7 years. All patients were satisfied and experienced improved stability. Three patients showed arthritic changes (two mild and one moderate), which, surprisingly, were also seen in the opposite shoulder. We therefore conclude that the occurrence of arthropathic changes after surgical stabilisation is based on multiple factors, with the initial dislocation playing a major role.

Résumé La fréquence d'une arthrose précoce après l'intervention de Bristow modifiée a été l'objet de plusieurs articles pendant la dernière décennie. Les récurrences de luxation, la procédure chirurgicale elle-même ou des translations itératives après la chirurgie ont été suggérées comme les principales causes du processus dégénératif. Nous avons étudié rétrospectivement 19 malades qui ont subi l'intervention de Bristow pour luxation antérieure récidivante de l'épaule. Seulement une luxation s'est produite sur vingt épaules (six femmes et 13 hommes) avec un suivi moyen de 7.7 années. Tous les malades ont été satisfaits avec une amélioration de la stabilité. Trois malades ont présenté une évolution arthrosique (2 moyennes et 1 modérée) laquelle, étonnamment, a aussi été vue dans l'épaule opposée. Nous

concluons par conséquent que la survenue de l'arthropathie après la stabilisation chirurgicale est multifactorielle, avec un rôle majeur de la luxation initiale.

Introduction

The incidence of early osteoarthritis in patients with a history of recurrent anterior dislocation of the shoulder has been noted in several reports during the last decade [5, 9, 11]. Degenerative changes of the shoulder were also linked to specific surgical techniques for the treatment of recurrent dislocation. In the past, over 100 different operations have been described. Practically, these can be divided into four groups: osteotomies (e.g. Weber), coracoid transpositions (Bristow and Eden–Hybinette), capsulorrhaphy (Putti–Platt) and labrum repairs (Bankart procedure). In 1954, Latarjet described a procedure for recurrent dislocation of the shoulder in which the coracoid was fixed to the glenoid by a screw [6]. A few years later (1958), Helfet modified the Latarjet operation. He sutured the coracoid process through the fibres of the subscapularis muscle [4], a procedure that was actually introduced in 1938 by R.W. Bristow. More than 10 years later, the original Bristow procedure was modified by May [8], who introduced a bone screw to secure the coracoid process to the scapular neck in a similar way to the Latarjet procedure. The recurrence rate of this procedure ranged from 2% to 20% [13]. Recent reports show a high rate of arthritis after this procedure, which can be ascribed to several factors, including the operation itself [5, 9, 10]. The primary objectives of this retrospective study were to evaluate the long-term clinical results and the incidence of arthropathy after the modified Bristow–Latarjet procedure.

Materials and methods

Thirty-four patients with recurrent anterior dislocation of the shoulder were treated by the same surgeon (de Waal Malefijt) between May 1989 and April 1999. Nineteen of

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these patients (20 shoulders) were allocated for long-term follow-up. The average age of six women and 13 men at surgery was 28.3 (range 16–44) years. Seventeen patients had a history of more than three dislocations. Two patients underwent a Bankart procedure prior to the Bristow procedure. The mean interval between the first dislocation and surgery was 6.8 (range 1–24) years and the mean follow-up was 7.7 (range 1–12) years.

The modified Bristow–Latarjet procedure was used in all patients. Through a delto-pectoral incision, the coracoid process was exposed and soft tissue cleared away carefully to avoid injury to the musculocutaneous nerve. The coracoid process was then pre-drilled and osteotomised approximately 1–1.5 cm from the tip. The subscapularis muscle was split bluntly in the direction of its fibres, and the coracoid process, with the conjoint tendon attached to it, was passed through this opening. After a capsule split, the graft was positioned just below the glenoid equator and within 1 cm of the articular margin [7]. After roughening of the glenoid rim with an osteotome to optimise conditions for bony union, the coracoid tip was fixed in place with a malleolar screw.

After-treatment consisted of a sling for five days, and restricted rotational exercises were started from the first post-operative day. External rotation was undertaken with the aid of the physiotherapist. Lifting heavy weights was forbidden during the first six weeks.

Follow-up assessment was conducted in three parts. First, the patients filled in a questionnaire in which they subjectively scored mobility, strength, stability and satisfaction. Second, the Rowe score was established in each patient. This is a functional score consisting of objective as well as subjective parameters (pain, stability, range of motion and strength) with a maximum of 100 points. The last part of the assessment at follow-up consisted of a radiographic evaluation for which X-rays were taken in two directions (AP and axial). Both authors independently assessed screw position and osteolysis as well as signs of arthropathy according to the Samilson and Prietos criteria [9]. The diagnosis of arthritis was based on the size of the inferior humeral and/or glenoid osteophytes and the appearance of the glenohumeral joint. When the exostoses measured less than 3 mm, the arthritis was classified as mild. Moderate arthritis was diagnosed when the exostoses were between 3 and 7 mm with mild gleno-humeral irregularity. Exostoses larger than 7 mm with narrowing and sclerosis of the glenohumeral joint indicated severe arthritis.

Results

Clinical assessment

In all patients, a substantial improvement in stability was recorded after surgery. Pre-operative stability was 2.4 (scale 1–10) and 7.7 post-operatively. Re-dislocation occurred in only one patient. The average hospital stay was 3 days, and the mean duration of post-operative physiother-

Fig. 1 Axial radiograph of a patient with moderate arthropathic changes. Note the deformity of the humeral head.

apy was 7.5 weeks. Thirteen patients resumed their normal working activities within six weeks. Three patients complained of moderate pain, and five patients complained of feelings of instability. The overall satisfaction rate was 6.15 (range 4–7).

Rowe score

The mean Rowe score at follow-up was 92 (range 54–100). Pain and stability scored relatively highly, with 13.2 (maximum 15) and 22.5 (maximum 25), respectively. There was no limitation in abduction while external rotation was slightly limited in seven patients. Four patients showed a substantial loss of strength.

X-rays

A bent screw was found in one shoulder, and radiolucency appeared around one screw in another case, however without clinical symptoms. One coracoid bone block was avulsed, but none of the blocks showed bone resorption. Two patients showed a mild arthropathy according to the criteria of Samilson and Prieto whereas moderate arthropathy was recorded in one shoulder (Fig. 1). Surprisingly, each of these three patients showed mild arthritis in the opposite shoulder.

Discussion

In terms of post-operative shoulder stability, the results reported in the literature invariably show low re-dislocation rates, the majority of which are attributed to trauma or contact and throwing sports [1–3, 5, 9, 10, 12–14]. These reports concern less-invasive methods for shoulder stabilisation, which in turn show fewer complications [5]. The present study accords with these reports since only one re-dislocation occurred (5%).

Fig. 2 Optimal positioning of the screw is obtained in the shaded area under the equator and within 1 cm of the glenoid rim.

In the literature, results of the Bristow operation are compared with clinical outcomes of other open surgical procedures, such as the Bankart and Putti–Platt techniques [5, 11]. No significant differences were found in re-dislocation rate, post-operative complications, or loss of motion.

There are two important pre-requisites for optimal positioning of the coracoid screw in the modified Bristow procedure [7]. First, the screw needs a bicortical fixation on the glenoid rim in order to achieve optimal stability. Second, it should preferably be located just below the equator of the glenoid and within 10 mm of the glenoid rim (Fig. 2).

The modified Bristow procedure provides a dynamic stabilisation. During external rotation and abduction of the arm, when the humeral head comes into the position at risk for anterior dislocation, the conjoined tendon acts as a constraining sling. In addition, the bone block closes the frontal tear of the glenoid labrum, thus providing extra protection against anterior shoulder dislocation.

However, because no additional capsular shift is performed, subluxation of the shoulder joint remains possible, and some authors have suggested that the repeated sliding of the humeral head causes arthropathy [9, 10]. Singer et al. [10] described arthropathies in 71% of a small group of 14 patients with a follow-up of at least 20 years and a mean age of 45 years. They stated that there were three possible reasons for the occurrence of arthropathy after coracoid transposition. First, they suggested an association between shoulder arthropathy and restriction of external rotation due to an excessively tight capsule. Furthermore, they postulated that the transposed coracoid tip might act as a levering bone block, as occurs in the Eden–Hybinette procedure. The third causative factor might be the primary damage to the humeral head due to frequent dislocation prior to the operation (dislocation arthropathy). With this in mind, it is conceivable that a certain number of patients will

develop arthropathy due to the recurrent dislocation, irrespective of any surgical treatment.

In the present series, we registered two mild arthropathies and one moderate arthropathy. However, we noted that these patients had identical arthritic changes in the contralateral shoulders without specific clinical symptoms. Our conclusion is that the occurrence of arthropathic changes in a shoulder after surgical stabilisation is based on multiple factors. We agree with Singer's report that there are more causative factors in the occurrence of arthropathy, and that recurrent dislocation before any surgical procedure has taken place plays a predominant role.

Although we realise that the present patient series is too small for statistically significant conclusions, our study does not implicate the modified Bristow–Latarjet procedure with an increased incidence of shoulder arthropathy.

References

1. Banas MP, Dalldorf PG, Sebastianelli WG, Dehaven KE (1993) Long-term follow up of the modified Bristow procedure. *Am J Sports Med* 21:666–671
2. Ferlic DC, DiGiovine NM (1988) A long-term retrospective study of the modified Bristow procedure. *Am J Sports Med* 16:469–474
3. Halley DK, Olix ML (1975) A review of the Bristow operation for recurrent anterior shoulder dislocation in athletes. *Clin Orthop* 106:175–179
4. Helfet AJ (1958) Coracoid transplantation for recurring dislocation of the shoulder. *J Bone Joint Surg Br* 40:198–202
5. Hovelius LK, Sandstrom BC, Rosmark DL, Saebo M, Sundgren KH, Malmqvist BG (2001) Long-term results with the Bankart and Bristow–Latarjet procedures: recurrent shoulder instability and arthropathy. *J Shoulder Elb Surg* 10:445–452
6. Latarjet M (1954) A propos du traitement des luxations recidivantes de l'épaule. *Lyon Chir* 49:994–997
7. Lemmens JAM, de Waal Malefijt J (1984) Radiographic evaluation of the modified Bristow procedure for recurrent anterior dislocation of the shoulder. *Diagn Imag Clin Med* 53:221–225
8. May VR (1970) A modified Bristow operation for anterior recurrent dislocation of the shoulder. *J Bone Joint Surg Am* 52:1010–1016
9. Samilson RL, Prieto V (1983) Dislocation arthropathy of the shoulder. *J Bone Joint Surg Am* 65:456–460
10. Singer GC, Kirkland PM, Emery RJH (1995) Coracoid transposition for recurrent anterior instability of the shoulder. *J Bone Joint Surg Br* 77:73–76
11. de Waal Malefijt J, Ooms AJAM, van Rens TJG (1985) A comparison of the results of the Bristow–Latarjet procedure and the Bankart/Putti–Platt operation for recurrent anterior dislocation of the shoulder. *Acta Orthop Belg* 51:831–842
12. Weaver JK, Derkash RS (1994) Don't forget the Bristow–Latarjet procedure. *Clin Orthop* 308:102–110
13. Wredmark T, Tornkvist H, Johansson C, Broberg B (1992) Long-term functional results of the modified Bristow procedure for recurrent dislocations of the shoulder. *Am J Sports Med* 20:157–161
14. Zabinski SJ, Callaway GH, Cohen S, Warren RF (1999) Revision shoulder stabilisation: 2 to 10-year results. *J Shoulder Elb Surg* 8:58–65