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BRISTOW-LATARJET PROCEDURE FOR RECURRENT ANTERIOR DISLOCATION OF THE SHOULDER

A 2–5 Year Follow-up Study on the Results of 112 Cases

L. HOVELIUS, C. ÅKERMARK, B. ALBREKTSSON, E. BERG, L. KÖRNER, B. LUNDBERG & T. WREDMARK

Departments of Orthopaedic Surgery, Gävle Hospital, University Hospital, Linköping, and Huddinge Hospital, Stockholm, Östra Hospital, Gothenburg, Ludvika Hospital, Sweden

A follow-up study of 111 out of 112 patients operated on for shoulder joint dislocation according to the Bristow-Latarjet procedure during the years 1975 through 1979 in four Swedish hospitals is presented. The average follow-up time was 30 months (range 24–60 months).

There were seven cases of significant recurrences (6 per cent). During follow-up, further surgery had been performed on four of these. Another eight patients (7 per cent) had experienced occasional insignificant subluxations. In one case neurolysis of the musculocutaneous nerve was undertaken because of postoperative paresis of elbow flexors.

The average limitation of outward rotation as compared with the nonoperated side was 19° in adduction and 21° in abduction. There was a measurable difference in strength between the operated and nonoperated shoulders.

The results were considered excellent or good by 101 of the patients (90 per cent), fair by eight and bad by three. Of 12 cases with failed surgery before the Bristow-Latarjet procedure 10 regarded the result as good or excellent.

Key words: Bristow-Latarjet procedure; recurrent dislocation of the shoulder; shoulder joint dislocation; shoulder surgery

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In 1954 Latarjet described four cases with recurrent anterior dislocation of the shoulder which he operated by transferring the coracoid process with the con-joined tendons through an incision in the subscapularis muscle to the anterior part of the scapular neck where it was secured with a screw.

During the last 10 years the Bristow procedure, in which the transferred coracoid is only sutured to the subscapular tissue (Helfet 1958) has become popular in the United States. The modified Bristow's procedure (May 1970, Sweeney et al. 1975, Collins & Wilde 1973, Lombardo et al. 1976), which is most often used, is in fact the same method as that described by Latarjet.

Since 1975 the Bristow-Latarjet procedure has also become increasingly used in Sweden. The present paper presents the results of a follow-up study after 24–60 months on 113 consecutive Bristow-Latarjet procedures performed at four Swedish hospitals during the years 1975 through 1979.

PATIENTS AND METHODS

A total of 112 patients were treated for recurrent anterior dislocation of the shoulder during the period January 1975 through November 1979 at four Swedish hospitals (Gävle 36, Huddinge 36, Ludvika 10 and Gothenburg 30). The present follow-up study includes

Table 1. The number of primary dislocations in four age groups, the interval between primary dislocation and the first recurrence and the interval between primary dislocation and surgery

	≤22 years	23–30 years	31–40 years	>40–50 years
Age of occurrence of the primary dislocation	67	36	7	2
	≤2 years	>2–5 years	>5–10 years	>10 years
Interval between primary dislocation and first recurrence	104	6	1	1
Interval between primary dislocation and surgery	43	33	18	18

111 patients. Only one patient was lost to follow-up. One patient had undergone bilateral surgery. The survey thus covers 112 operated shoulders.

There were 28 female patients and 83 male. In 61 cases the right shoulder was affected and in 51 the left. Fifty-seven of the patients had surgery performed on the dominant and 50 on the nondominant shoulder. Five were ambidextrous.

As shown in Table 1 the majority of the primary dislocations occurred before the age of 22 and the second dislocation came within 2 years in 93 per cent of the patients. The interval between the first luxation and surgery varied from 10 months to more than 10 years. Only one patient was younger than 12 at the first dislocation. She was 1 year old when her mother pulled her arm and the shoulder dislocated. One year later two further dislocations occurred. After that she was symptom-free for 25 years when she again dislocated the shoulder by falling on it. She was operated on at the age of 28.

Table 2 shows the type of trauma that caused the primary dislocation. Twenty of the dislocations (18 per cent) were classified as spontaneous. In 41 of 112 dislocations (37 per cent) the patient had coped with the primary dislocation without consulting a physician or visiting a hospital.

Table 2. Cause of primary dislocation in 112 operated cases

	n	Per cent
Sports or recreational activity	44	39
Unspecified falls	23	21
Traffic accidents	8	7
Epileptic fit	6	5
Unspecified	11	10
Spontaneous (incautious arm movement)	20	18
Total	112	100

Twenty-one patients (19 per cent) had bilateral shoulder joint dislocation (SJD). In 11 cases SJD's were reported in the family (brother, sister or parents), 10 on the male and one on the female side. Four of the patients had a recognised alcohol problem and eight had epileptic disease.

The surgical technique applied in this series essentially followed the principles described by Latarjet (1954) and later reproduced by May 1970, Lombardo et al. 1976 and Collins & Wilde 1973. The aim was to secure the tip of the coracoid process to the anterior part of the scapular neck medial to the glenoid rim (Figure 1). In 71 cases the subscapular muscle was divided along its fibers and in 41 cases in addition more or less transversally. In 16 cases the joint was not opened. A malleolar screw of about 4 cm was preferred but in less than one third of the cases a cortical screw with a washer was used. A total number of 11 surgeons were involved, all but one, senior surgeons. The shoulders were immobilized with the arm against the body for 2–6 weeks or merely held in a sling after surgery. In 12 of the shoulders, previous surgery had failed before the Bristow-Latarjet procedure was performed.

The follow-up was undertaken 2–3 years after surgery in 82 cases, 3–4 years in 23 cases and 4–5 years in 7 (mean 2.5 years, range 2–5 years). At the follow-up all patients were personally examined by a surgeon.

The most important question at the follow-up has been the evaluation of shoulder function from the point of view of stability. The patients have then been classified into three different groups: stable, subluxated and redislocated. Subluxation has been defined as a specific episode at which the patient experienced that the shoulder had almost been dislocated but reduced immediately by itself. The patients were not especially bothered by this incident. Redislocation has been defined as cases with total dislocation.

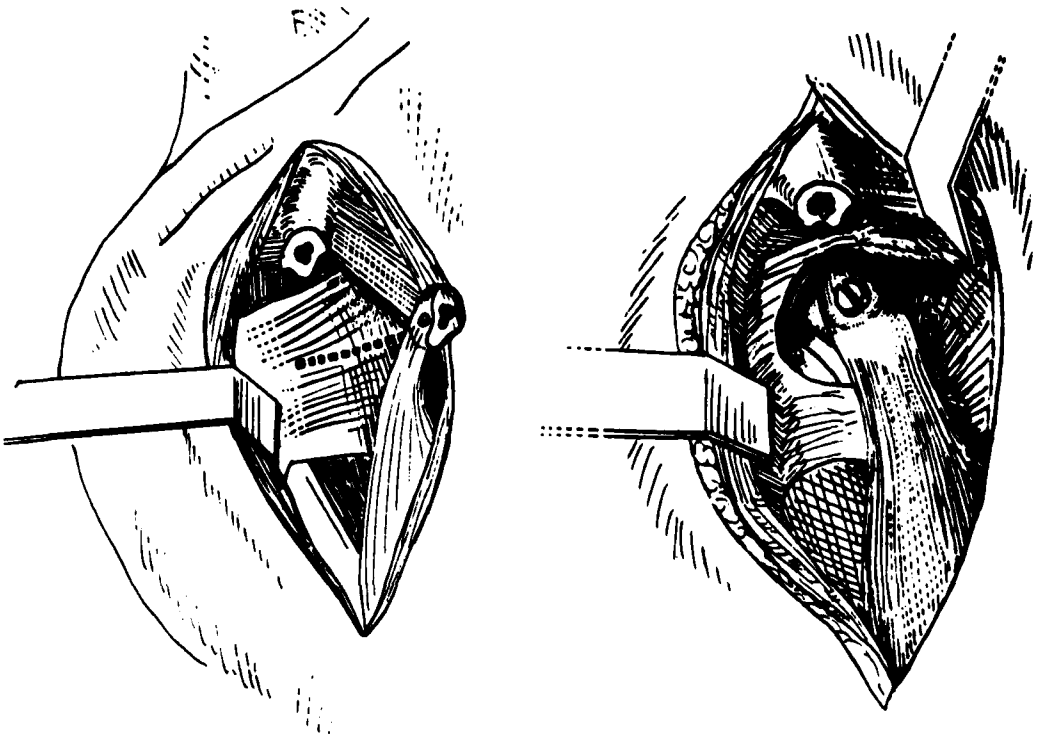

Figure 1. The transfer of the tip of the coracoid process through the subscapularis tendon (Latarjet 1954).

The results have been objectively divided into excellent, good, fair and poor by using the same score Rowe (1978) used when he reported the results after his operations according to the Bankart procedure. In the scoring, taken into consideration were postoperative stability (0–50 points), mobility (0–20 points) and function (0–30 points). To be classified as excellent, 90–100 points are demanded, good 75–89, fair 51–74 and poor 50 points or less. This means that all shoulders with redislocation postoperatively are automatically regarded as poor. The patients have also been asked for their purely subjective evaluation of the operative results with a choice of four classes (excellent, good, fair and poor).

Shoulder movement was recorded for abduction, outward and inward rotation.

Outward and inward rotation have been measured with the elbow joint at a right angle and the shoulder in 90° abduction. The outward rotation has also been measured with the upper arm against the body. The results have been given as the difference in degrees between operated and non-operated side. As a further evaluation of the movement of the shoulder we have registered which spinal process the patient has been able to reach with his arm stretched backwards. This movement has been regarded as a combination of inward rotation and extension and has been registered as the number of spinal processes reached between the non-operated and operated side. It has been termed extension-inward rotation.

Muscle strength in the shoulder joint has also been registered. The patient has been placed in a dorsal position with the arm in 90° abduction and the elbow in 90° flexion. With the neutral position of the rotation as a basis, strength has been registered in kiloponds for inward rotation, outward rotation and abduction with the aid of a dynamometer. The results have been given for the three types of movement as the quotient of strength between operated and non-operated side. This means that if the strength is the same in both shoulders then the quotient is 1 and the weaker the shoulder is compared to the non-operated side the smaller the quotient.

Cases with previously failed surgery or bilateral repairs were excluded when studying shoulder movement and strength.

Radiographs were obtained from 106 of the 112 shoulders, and included four different projections (frontal, subcoracoid, axillary and side views) according to Lamm et al. (1982). At two of the hospitals (Gävle and Gothenburg) all cases were examined using fluoroscopy in order to establish whether bony union occurred or not.

RESULTS

Of the 111 patients who took part in the follow-up examination redislocation occurred in 6 per cent (7 cases). In another 7 per cent (8 patients) subluxations occurred on one or two occasions. This was, however, not experienced as troublesome by the patients.

Five of the seven patients with redislocations and seven of those eight with subluxations (80 per cent) received their luxations within the first postoperative year. The remaining three patients (20 per cent) experienced their recurrences or subluxations during the second postoperative year. No redislocations occurred during the period 2–4 years (23 cases) or 4–5 years (7 cases). The result of the patients' subjective evaluation of the outcome of the operations and our objective scoring according to Rowe can be seen from Table 3. Excellent or good results were reported by 90 percent of the patients, including all the patients with subluxations and also two of the patients with reluxations. At the objective classification only 80 per cent were considered excellent or good.

The age at the time of the operation in connection with later recurrences can be seen from Table 4. The patients between 23 and 30 show the greatest number of subluxations or redislocations postoperatively (19 per cent).

The corresponding figure for the patients 22 years and younger is 9 per cent. Four of the seven patients with reluxations had been reoperated while the remaining three still regarded reoperation as unnecessary since they had only moderate symptoms.

Table 4. Age at the time on the Bristow-Latarjet procedure in relation to number of cases with redislocations and subluxations at the follow-up

	Age in years at time of surgery			
	≤22	23–30	31–40	>40–
Stable	29	39	22	7
Redislocations	1	4	2	0
Subluxations	2	5	1	0
Total	32	48	25	7

Besides reoperations because of reluxations (4 per cent), further surgery was required in seven cases (6 per cent) on five occasions because the screws were too long, loose or in a wrong position. In one case the coracoid transplant loosened half a year after the operation in connection with a heavy lift. Because of residual pain after 3 months, a Putti Platt operation as well as a reinsertion of the coracoid transplant was carried out. Finally in one case neurolysis was performed 10 months postoperatively because of paresis of the musculocutaneous nerve with only slight restitution of the function in the elbow flexors.

Superficial postoperative infection which

Table 3. Subjective and objective assessment of the results of follow-up

		Subjective scoring				
		Excellent	Good	Fair	Poor	Per cent
Number of redislocated cases	(7)	1	1	2	3	6
Number of cases with subluxuations	(8)	3	5			7
Stable	(97)	66	25	6	0	87
Total	(112)	70	31	8	3	100
		Objective scoring				
		72	17 (64 per cent)	15 (15 per cent)	8 (13 per cent)	(7 per cent)

healed within 2–5 weeks was noted in three cases. In no case was a deep postoperative infection seen.

In 16 cases the coracoid fragment was accidently fractured at surgery. The broken fragments were secured sometimes with thinner screws to bone (12 cases) or by sutures to the subscapular tissue (4 cases) as described by Helfet (1958). These 16 patients had a higher rate of recurrences or subluxations (31 per cent) than the patients in whom the coracoid fragment was unfractured during surgery (9 per cent).

Postoperative muscular strength recorded for dominant and nondominant side expressed as the quotient between the operated and nonoperated shoulder and decrease in shoulder joint movement is shown in Tables 5 and 6. There was an average 10 per cent loss of muscular strength in the operated shoulder. Abduction movement was not significantly influenced postoperatively. The decrease in outward rotation mobility was nearly the same (19° and 21° respectively) in adduction and abduction. On measuring the inward rotation in the extension there was a difference of on average two spinal processes between the two shoulders and maximally the difference was nine spinal processes.

Six of the 12 patients with previously failed surgery reported the result as excellent, four as good and two as poor. Two of these 12 cases (17 per cent) had postoperative redislocations. In the subgroup of epileptics five were very satisfied with the surgical result (excellent) and three stated the result as good. There were no recurrences in this group.

The radiological examinations showed osseous healing in 55 cases (52 per cent) and fibrous union in 30 cases (28 per cent). In 17 cases (16 per cent) the bone-blocks had dislocated more than 5 mm at the follow-up. In another four patients, it was not possible to demonstrate any remnants of the transferred coracoid. A posterior capital notch (Hermodsson 1934, Hill-Sachs 1940) could be demonstrated in 66 cases. In nine cases (8 per cent) it was severe, in 31 (29 per cent) evident and in 26 (25 per cent) probable. It was not demonstrable in 40 cases (38 per cent). In six patients no radiological examination was performed.

Table 5. Mean postoperative decrease in shoulder movement (in comparison with the healthy shoulder) (see text)

Outward rotation		
Arm adducted	=19°	(range 0°–75°)
Arm abducted	=21°	(range 0°–80°)
Inward rotation		
Arm abducted	=13°	(range 0°–60°)
Arm in extension	= 2.1	(range 0–9 spinal processes)

Table 6. Quotient of strength in the operated shoulder compared to the healthy

	Abduction	Outward rotation	Inward rotation
Dominant shoulder	0.94	0.90	0.92
Nondominant shoulder	0.85	0.82	0.85
Mean	0.9 (range 1.21–0.25)	0.87 (range 1.24–0.22)	0.90 (range 1.18–0.28)

DISCUSSION

In Sweden the most common method of operation for recurrent dislocation of the shoulder has long been that described by Eden-Hybbinette. The frequency of recurrence with this method is variably reported as 0 per cent (Jakobsson 1949), 6.3 per cent (Palmer & Widén 1948) and 13 per cent (Skogland & Sundt 1973).

Another often used procedure these days in Sweden is that known as Putti-Platt (Osmond & Clarke 1948). Lipscomb shows 0 per cent recurrence (1975) when the original method (Osmond-Clarke 1948) is used. Morrey & Janes (1976) show a frequency of recurrence which increases from 1.4 per cent to 11 per cent when the period of follow-up is increased from 1 to 10.2 years.

Long-term follow-up of the method described by Bankart (Rowe et al. 1978) in a material of 124 patients showed that the method had low

rates of recurrence (3.5 per cent) and good functional results. This was confirmed in other studies (Moseley 1961-0.4 per cent, Hovelius et al. 1979-2 per cent). Surgery, however, according to Bankart could be time-consuming (average time for surgery 150 min, Rowe et al. 1978) and the operation is by many regarded as technically difficult (Collins & Wilde 1973, Skogland & Sundt 1973, Morrey & James 1976). This probably explains why transfer of the coracoid process according to Bristow-Latarjet both in the USA and in Sweden is at present gaining at the expense of Bankart's method for the operative treatment of recurrent anterior dislocation of the shoulder. The frequency of recurrence after the operation according to Bristow-Latarjet has in earlier descriptions been given as 0 per cent (Collins & Wilde 1973, Allman 1975), 2 per cent (Lombardo et al. 1976, Hill et al. 1981) and 3 per cent (Sweeney et al. 1975). The frequency of recurrence of 6 per cent which is shown in this study is the highest score reached so far. We have also found that 7 per cent of our patients show subluxations. Even if these patients have not been especially bothered by the episodes we do not yet know what the longer term result will be for these patients or for the material as a whole. After 13 years of experience of the method Sweeney et al. (1975) give a frequency of 16 per cent of subluxations. This, however, did not in the long run cause the patients any trouble.

Our results concerning the radiological follow-up, with bone healing in only 52 per cent are about the same as those in the latest edition of Campbell (1980) (50–75 per cent) but far worse than those presented by Sweeney et al. (1975) and Hill et al. (1981), who reported a bone-healing frequency of 85 per cent and 96 per cent respectively. The difference can to some extent be explained by the fact that we have been using a better method of X-ray examination including through-viewing (Lamm et al. 1982). A proper tangential view of the base of the transplant is required to establish whether bony union has occurred or not. A beam deviation of only a few degrees from the tangential direction can fail to reveal a small fibrous gap between the transplant and scapula. Access to fluoroscopy is therefore helpful in the radiological examination of these shoulders.

The limitation of outward rotation in our series (around 20°) is a little more than in previously reported Bristow series (11° Lombardo et al. 1975, 12° Hill et al. 1981). At operations according to Bankart the same limitation of outward rotation is present in most materials (Hovelius et al. 1979, Moseley 1961) even if Rowe et al. (1978) state that 69 per cent of the patients in their study had full normal movement when care was given to certain technical details in connection with the operation. When inward rotation measured in abduction is considered, it was found that our patients showed a larger limitation than those presented in earlier publications (13° compared to 2.6°, Hill et al. 1981).

Methods of assessment of the effects of operation on the strength of the shoulder joint have previously been based on both subjective and coarse objective evaluations. Hill et al. (1981) were the first to present truly objective measurements. They reported normal postoperative muscle strength after Cybex isokinetic muscle assessment in 15 out of 107 Bristow procedures. Our results are worse. Our own measurements of postoperative strength, which are presented as the quotient between the operated and non-operated shoulder, show a decreased quotient of on average 10 per cent, somewhat more pronounced in operations on the non-dominant shoulder (Table 6). The reduction in the strength quotient is approximately the same for outward rotation, inward rotation and abduction.

Of our 112 Bristow-Latarjet procedures a total of 11 (10 per cent) have demanded further surgery for different reasons. This must be considered as a considerable disadvantage and what is more we do not know if all the loose screws will cause any trouble in the future. In the latest edition of Campbell (1980) a removal of these is recommended.

Table 1 shows that 104 of the 112 initial (primary) luxations were followed by reluxations within 2 years (93 per cent). This corresponds to the figures presented by Moseley (94.5 per cent) (1961).

In other studies of the frequency of recurrent anterior dislocation of the shoulder primarily based on non-operated patients it has been men-

tioned that 70 per cent of the recurrences after the primary dislocation will occur within 2 years (Rowe 1956, Kazar & Belovszky 1969).

Thirty-seven per cent of the patients in this material did not go to see a doctor or a hospital the first time their shoulder dislocated. This corresponds rather well with the results in a study of shoulder dislocations in the normal population in which the corresponding figure was 43 per cent (Hovelius 1982). Moseley (1961) states that 47 per cent of the primary luxations in his material were not assessed by a doctor while the corresponding figure in Skogland and Sundt's series of patients operated on according to Eden-Hybbinette (1973) amounts to 23 per cent. In the present study there were also differences between the different hospitals from 52 per cent in Gothenburg to 23 per cent in Stockholm.

CONCLUSION

For the orthopedic surgeon who for various reasons is not satisfied with his operative treatment of chronic anterior shoulder instability we recommend the Bristow-Latarjet procedure as a good alternative.

REFERENCES

Allman, F. (1975) Symposium on sports injuries to the shoulder. *Contemp. Surg.* **7**, 88.

Collins, H. R. & Wilde, A. H. (1973) Shoulder instability in athletics. *Orthop. Clinic. N. Am.* **4**, 759–774.

Helfet, A. J. (1958) Coracoid transplantation for recurring dislocation of the shoulder. *J. Bone Joint Surg.* **40**-B, 198–202.

Hermodsson, I. (1934) Röntgenologischen Studien über die traumatischen und habituellen Schultergelenkverrenkungen nach vorn und nach unten. *Acta Radiol.*, Suppl. 20.

Hill, J. A., Lombardo, S. J., Kerlan, R. K., Jobe, F. W., Carter, V. S., Shields, C., Collins, H. R. & Yocum, L. A. (1981) The modified Bristow-Helfet procedure for recurrent anterior shoulder subluxations and dislocations. *Am. J. Sports Med.* **9**, 283–287.

Hill, H. A. & Sachs, M. D. (1940) The grooved defect of the humeral head. A frequently unrecognized complication of dislocations of the shoulder joint. *Radiology* **35**, 690–700.

Hovelius, L. (1982) Incidence of shoulder dislocation in Sweden. *Clin. Orthop.* **166**, 127–131.

Hovelius, L., Thorling, J. & Fredin, H. (1979) Recurrent anterior dislocation of the shoulder. Results after the Bankart and Putti-Platt operations. *J. Bone Joint Surg.* **61**-A, 566–569.

Jakobsson, Å. (1949) On recurrent dislocation of the shoulder joint. A contribution to its pathomechanics and the results of Eden/Hybbinettes bone-block operation. *Acta Orthop. Scand.*, Suppl. 18, 284–318.

Kazar, B. & Belovszky, E. (1969) Prognosis of primary dislocation of the shoulder. *Acta Orthop. Scand.* **40**, 216–224.

Lamm, C. R., Zachrisson, B. E. & Körner, L. Radiography of the shoulder after the Bristow repair. *Acta Radiol.*, in press.

Latarjet, M. (1954) A propos du traitement des luxations récidivantes de l'èpaule. *Lyon Chir.* **49**, 994–997.

Lipscomb, A. B. (1975) Treatment of recurrent anterior dislocation and subluxation of the glenohumeral joint in athletes. *Clin. Orthop.* **109**, 122–125.

Lombardo, S. J., Kerlan, R. K., Jobe, F. W., Carter, V. S., Blazina, M. E. & Shields, C. L. (1976) The modified Bristow procedure for recurrent dislocation of the shoulder. *J. Bone Joint Surg.* **58**-A, 256–261.

May, J. V. (1970) A modified Bristow operation for anterior recurrent dislocation of the shoulder. *J. Bone Joint Surg.* **52**-A, 1010–1016.

Morrey, B. F. & Janes, J. M. (1976) Recurrent anterior dislocation of the shoulder. *J. Bone Joint Surg.* **58**-A, 252–261.

Moseley, H. F. (1961) *Recurrent dislocation of the shoulder.* pp. 85, 85, 120. E. & S. Livingstone, Edinburgh.

Osmond-Clarke, H. (1948) Habitual dislocation of the shoulder. The Putti-Platt operation. *J. Bone Joint Surg.* **30**-B, 19–25.

Palmer, I. & Widén, A. (1948) The bone block method for recurrent dislocation of the shoulder joint. *J. Bone Joint Surg.* **30**-B, 53–58.

Rowe, C. R. (1956) Prognosis in dislocations of the shoulder. *J. Bone Joint Surg.* **38**-A, 957–977.

Rowe, C. R., Patel, D. & Southmayd, W. W. (1978) The Bankart procedure. A long-term end-result study. *J. Bone Joint Surg.* **60**-A, 1–16.

Skogland, L. B. & Sundt, P. (1973) Recurrent anterior dislocation of the shoulder. The Eden-Hybbinette Operation. *Acta Orthop. Scand.* **44**, 739–747.

Sweeney, H. I., Mead, N. C., Dawson, W. J. & Fitzsimmons, P. (1975) Fourteen years' experience with the modified Bristow procedure for recurrent anterior dislocation of the shoulder. Read at the annual meeting of The American Academy of Orthopaedic Surgery, San Francisco.

Campbell's operative orthopaedies (1980) 6th edn. pp. 486–488. CV Mosby, St Louis.

Correspondence to: Lennart Hovelius, M.D., Department of Orthopaedic Surgery, Gävle Hospital, S-801 17 Gävle, Sweden.