

GUSTAF ASPLUND, STOCKHOLM:

SOME VIEWPOINTS CONCERNING ARTHRODESIS OF  
THE SHOULDER JOINT IN PARALYSIS OF  
THE DELTOID

At the Orthopedic Congress in Stockholm 1923 I presented my findings on reexamination of 9 cases of arthrodesis of the shoulder joint, most of which had been performed more than ten years before, while I was assistant to Henning Waldenström in the St. Göran Hospital. Since then, during my work in Eugeniahemmet, I have performed this operation in 17 cases. My experiences in this respect, then, are based on 26 cases. When I take up this question again today, it is because, as pointed out by Vulpinus, arthrodesis of the shoulder joint is one of the most thankful of all orthopedic operations. It does not only, like other arthrodeses, give us a stabilization of a previously lax joint, but it also gives an active mobility of the paralysed arm through the action of the scapular musculature upon the newformed scapula-humerus block.

Arthrodesis in poliomyelitis was one of the main subjects before the Orthopedic Congress at Cologne 1935. The reporter, Kochs (Suchteln), emphasized that from questionnaires sent to German orthopedists that the shoulder-joint is that articulation where the serviceability of arthrodesis is least disputed, undoubtedly because there practically are no other methods to compete with it. Tendon transplantation has been tried but with particularly poor results, as the deltoid always is affected in these cases, and it cannot be replaced suitably. Moreover, the bandage therapy, which very well can compete functionally with

arthrodesis in the treatment of most other joints, is out of the question in this lesion.

When, in the late nineties, Vulpius strongly advocated this operation, which had been suggested as early as 1879 by Albert who performed it in two cases, it met much objection and doubt in Germany. Among others, such a prominent orthopedist as Hoffa stated: "Die Artrodese der Schulter bleibe auf alle Fälle nur das ultimum refugium und könne nur als solches von ihm empfohlen werden. Eine *Ankylose vera* könne sie wohl nicht erzeugen."

Also here in Sweden, where I think I was the first to perform this operation (in Waldenström's department, 1912) it had to begin with some difficulty in being acknowledged and adopted, partly because Haglund was then very strongly opposed to any form of arthrodesis, in particular to arthrodesis of the shoulder—a view he modified later on. Nowadays, I believe, this method is the standard method for treatment of deltoid paralysis in our orthopedic hospitals.

At first I performed the operation according to the directions given by Vulpius. Later I have modified this method in some respects.

As to the operative technique, I usually make a transversal incision 1 cm. below the acromion, and then this incision is extended perpendicularly downwards, anteriorly and posteriorly. This incision gives a more easy access to the joint than may be obtained with a longitudinal anterior incision. After this, the joint cartilage is removed carefully from the head of the humerus and the glenoid cavity (a sharp spoon is preferable here) and the inferior surface of the acromion; the head is fixed to the glenoid cavity and the acromion by means of strong catgut sutures, two to the cavity and one to the acromion. Previously I used metal sutures, but they may break, and often they are expelled gradually; besides, they may easily cut through the atrophic head of the humerus. I do not fix the head to the coracoid process—as Vulpius has recommended, at least previously. Occasionally there may be some difficulty in laying the sutures between the cavity and the head of the humerus. For

this purpose I here employ a bent perforated instrument, made especially to order, which is introduced through the glenoid cavity from within outwards. The head is to be pressed against the cavity, in order to obtain the best contact possible. The fixation is established at an abduction of  $80^{\circ}$  (further abduction makes it difficult to bring the arm down to the side of the body), in a position midway between abduction and forward elevation, and  $15-20^{\circ}$  outward rotation. In his original directions Vulpius recommended inward rotation of the forearm. This is wrong, however, as it will greatly impede supination, which is of particular importance to the function of the arm (*e.g.*, in bringing the hand up to the mouth in a suitable position).

In order to facilitate and quicken the plastering after the operation, on the day before I make an arm-chest splint of thin sheet-iron in the intended fixation position, and this is embedded in the plaster cast; besides, also the cast that is to be used for the bandage after the operation is made beforehand. The plaster bandage is allowed to stay on for 3 months whereafter it is replaced by an arm-chest bandage of leather that envelops the thorax completely. The total fixation time is from 9 to 12 months (in the last months the bandage is worn only in the night). Some months after the operation a slit is cut in the arm cast, and active movements of the arm are commenced cautiously; later they are continued in the leather bandage.

Of the 17 cases included in this account, the previously firm arthrodesis has loosened in 2 cases after respectively 2 and  $1\frac{1}{2}$  years, in the latter case presumably because the fixation period was shorter than usual (only 7 months). In the former case the cause is unknown; here the fixation period was 1 year. Probably, in the suturing, the head of the humerus did not get in sufficiently close contact with the glenoid cavity. In both of these cases, however, there is a fairly good firmness of the shoulder-joint with  $40^{\circ}$  abduction, and both patients think they have benefited by the operation even though the result is not as good as expected. In the other cases a firm union between the head of the humerus and the glenoid cavity was obtained.

The union is osseous in 11 cases, fibrous in 4. In 2 cases the functional result is poor because the indications prior to the operation were estimated erroneously. For in these cases the scapula musculature was too weak to justify an arthrodesis. In the other 13 cases the functional result has been good, in particular as to forward-upward and outward-upward elevation of the arm, to the extent of 80—90° (in one case 100—110°). Supination of the forearm is good in 11 cases (complete in 8 cases), rather limited in 4. In 1 case the arm is in maximal pronation, although the arthrodesis was set in slight outward rotation (but probably not enough). But, fortunately, a kind providence has corrected the present supination defect to some extent. The young man is musical, and his pronated forearm is quite suitable for playing the piano. Otherwise his arm is very useful, as is evident from the fact that he is a good swimmer (swimming teacher), a good oarsman (with his arthrodesis he is even able to feather the oar) and a good ski-runner. In practically all these cases there is no difficulty in getting the arm down to the side of the body, completely or nearly so, except in the case just mentioned where there is a defect in this respect amounting to about 25° (here the angle of the arthrodesis was somewhat too great).

In 11 of these cases the function of the elbow-joint is good or fairly good, while it is poor in the remaining cases. In two cases with a good functional result of the arthrodesis, arthrodesis of the wrist-joint has been performed too, and in three of these cases opponens operation was performed on the hand of the same arm, replacing the paralysed opponens pollicis with the flexor pollicis longus.

Of the 10 adult patients, 2 are disabled from a concurrent severe degree of paralysis, while 7 have learned a trade (1 tailor, 3 seamstresses, 1 cabinetmaker, 1 painter, and 1 furniture-polisher); 1 woman supports herself by office work.

I have had an opportunity also to reexamine 5 of my earliest cases of arthrodesis, on whom the operation was performed about 25 years ago. The condition of the arthrodesis has kept practically unchanged since the last preceding examination, 15

years ago, both with regard to the function of the arm and to the character of the arthrodesis (osseous in 2 cases, fibrous in 3). The arm is very useful to all of them; 4 are self-supporting (1 iron-plate worker, 1 painter, 1 bookbinder, and 1 embroiderer). The fifth is unable to work on account of debility.

---

In connection with the reading of this paper, four cases were demonstrated in which arthrodesis of the shoulder had been performed after the method given above.

#### DISCUSSION:

*Camitz, Gothenburg:*

In my opinion these operations give good results in children and young people, while adults not infrequently have difficulty in putting up with a stiff shoulder.

*Waldenström, Stockholm:*

thinks that there is no reason not to operate on adults after the same principles as on children. In adults the after-treatment is more troublesome, it is true, but that is the whole difference, and the result may be excellent.

I have, for instance, one case in which the operation was performed on an adult, who later turned out to be a first-class golf player.

*Silfverskiöld, Stockholm:*

As far as the indication for arthrodesis of the shoulder-joint are concerned, I have extended the range. In cases presenting a marked degree of paralysis of the arm, but a good musculature of the shoulder girdle, I perform arthrodesis of the shoulder-, elbow- and wrist-joints if only the hand is practically somewhat serviceable as a prehensile organ. This enables the patient to use his hand actively.

*Langenskiöld, Helsingfors:*

In Dr. Asplund's paper two things have surprised me. One of them is that it seems practicable to perform arthrodesis of the shoulder on octennials. At this age I did not think it would be possible to obtain an osseous ankylosis.

The other thing that surprised me is that Dr. Asplund stated that an osseous bridge between the acromion and the head of the humerus would mean an obstruction to the function. I am not able to confirm this finding, on the contrary, it seems to me that such a bony bridge would be desirable, and that it would be apt to give a more sure and rapid result. Nor have I found that adults are apt to be less suitable for this operation than are children.

*Guildal, Copenhagen:*

G. agrees with Langenskiöld in the view that arthrodesis of the shoulder can and ought to be performed on adults too, and especially in the view that the acromion ought to be utilized for the fixation, as no doubt it promotes complete healing. G. recommends fixation by means of a nail through the head of the humerus into the scapula.

*Bentzon, Aarhus:*

In arthrodesis of the shoulder as well as in other arthrodeses the important point is to obtain the largest possible surfaces of contact of spongy osseous tissue in a precise position and really close contact. In the shoulder-joint this is obtained first by chiseling off some of the glenoid cavity and the inferior surface of the acromion, till one gets two good surfaces of spongiosa, and then shape the head of the humerus, so that it turns two surfaces of spongiosa against the bony surfaces of the scapula, in such a manner that there is always a solid contact when the arm is kept in the position desired, in relation to the scapula.

Like Guildal, I employ primary fixation by means of a nail.

As to the position of the arm in arthrodesis of the shoulder,

today I have noticed that Asplund puts the arm somewhat more in inward rotation than I am used to do. I think that the rotation position employed by Asplund is good—functionally as well as cosmetically. The rotation adjustment is important indeed, as movements in this direction have to be sacrificed when arthrodesis of the shoulder is performed.