

The Classic

Congenital Elevation of the Scapula

Robert D. Schrock MD (1884–1960)
The 9th President of the AAOS 1940

Dr. Robert D. Schrock was born in 1884 in Delaware, Ohio [3]. His father, William A., was a physician, as was his son, Robert D., Jr. The family subsequently moved to Decatur, Indiana. Dr. Robert Schrock obtained his undergraduate work at Wabash College, Crawfordsville, Indiana, in 1908 [2] and his medical degree at Cornell University Medical School in 1912 [2]. He completed postgraduate work at the New York Hospital in New York City. He briefly practiced in Omaha with Dr. John Lord, then served as a surgeon in WW I, working under Lt. Col. Joel Goldthwait in France. After the war he returned to Omaha to again practice with Lord. In 1921 he was appointed to the faculty of the University of Nebraska School of Medicine and became Professor and Chair in 1932, a post he held until 1949, when he became Professor Emeritus.

Dr. Schrock became active in many medical organizations and in 1928 was elected President of the Clinical Orthopaedic Society, one of the two major groups that founded the AAOS, and was also active in the other, the American Orthopaedic Association. He was, as a result, involved in the early foundations of the AAOS, and became its President in 1940. He served as a civilian consultant to the Secretary of War from 1943 to 1945. With great prescience he commented in his Presidential Address to the AAOS in 1941 about Board certification, “This is not a hallmark of excellence in perpetuity. Products are frequently certified for a definite period of time if maintained under certain optimum conditions. Some people, like products, improve with advancing years, others deteriorate and some in cold storage remain frigidly good but no better. Orthopaedic surgeons, like human beings, are influenced by environment, necessity, ambition, health and avocational interest in other pursuits of happiness...If the



Dr. Robert D. Schrock is shown. Photograph is reproduced with permission and ©American Academy of Orthopaedic Surgeons. *Fifty Years of Progress*, 1983.

measure of continued merit is to be maintained through our oncoming years, there need be an awareness of change, open mindedness to new concepts, elasticity in viewpoint, with a ready reception and stimulating encouragement to the newer generation whose future is in the making” [3].

The article we reprint describes a seemingly radical approach to a difficult problem: congenital elevation of the scapula (Sprengel’s deformity) [4]. Schrock noted the few previous attempts to address this problem were “...rather indefinite and in too many the results seemed discouraging. Most of the reports indicated considerable conservatism in the operative attack” [4]. He advocated “a far more radical procedure, but based upon the suggestions obtained from previous reports” [4]. As in earlier reports, he recommended sectioning the chondroosseous scapulothoracic bridge, but he then described a radical subperiosteal dissection of the scapula leaving the rhomboids, serratus magnus, and subscapularis muscles with the periosteal sleeve, then distally

transplanting the entire scapula within that sleeve. (Interested readers can also see Campbell's description in 1939 [1]). If this did not allow adequate drop of the scapula, he then performed an osteotomy at the base of the acromion. A postoperative dressing which maintained downward and backward pressure on the scapula was, he insisted, a critical detail. He reported two cases with good results in followup at 15 and 16 months postoperatively [4].

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3. Robert D. Schrock, M.D. 1884–1960. *J Bone Joint Surg Am*. 1961;43:155–157.
4. Schrock RD. Congenital elevation of the scapula. *J Bone Joint Surg Am*. 1926;8:207–215.

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Proper criticism of the use of the term “congenital elevation of the scapula,” is made by Greig of Edinburgh. He uses and suggests the more accurate “congenital high-scapula.” In America the shorter and equally descriptive “undescended scapula” should be more acceptable. Greig's contention is based on the developmental origin of the deformity. “In an embryo of five weeks the scapula becomes differentiated opposite the fourth, fifth, sixth, and seventh cervical vertebrae; at the ninth week the scapula begins to descend from the neck of the thorax.” Failure to descend gives rise to the deformity. This failure may be due to mal-development in bone, cartilage, and muscle, or the descent may be interrupted by abnormal pressure or position in utero. In the former group there are always associated abnormalities of bone or muscle. In the existing literature on this subject there may be found ample discussion of the phylogeny and ontogeny of this congenital deformity. This consideration is limited entirely to the operative treatment applicable in the moderate and severe cases.

In searching the literature for adequate information as to procedure in cases of this more severe type, only generalizations were available. The descriptions were rather indefinite and in too many the results seemed discouraging. Most of the reports indicated considerable conservatism in the operative attack. In that group presenting a chondro-osseous bridge, simple resection of the bridge was advocated by several writers. In that group with only muscle shortening, myotomies were advised. In both groups the results did not seem encouraging.

By using a far more radical procedure, but based upon the suggestions obtained from previous reports, very satisfactory results were obtained in two cases. This radical subperiosteal transplantation of the scapula with osteotomy of the base of the acromion process was not found to have been previously described. The generalizations in earlier

reports have been incorporated in this concrete procedure as applied in two cases of undescended scapula with scapulo-vertebral attachment and short neck.

Procedure

The incision is curved from the mid-supra-scapular region about one inch external to the medial margin of the scapula to two inches below the inferior angle. The deeper incision is carried through the cartilaginous medial margin of the scapula with subperiosteal removal of the combined attachments of rhomboids, serratus magnus, and subscapularis. The subscapularis is completely removed. Similar subperiosteal elevation is made of the infraspinatus, teres major and minor, completely freeing the inferior angle and lower two-thirds of the axillary border. The same procedure is applied to the insertion of the trapezius on the spine, to the supraspinatus, and to the structure of the superior margin of the scapula, using special care at the supra-scapular notch. This is the only point at which there is danger to nerve or vessel of any consequence.

The chondro-osseous bridge from the vertebrae to the supero-medial margin of the scapula is removed as completely as possible. The margins of the scapula are freely removed; the supraspinous portion is resected, and much of the spine, if this be at all prominent. If the shoulder then cannot be brought back freely, an osteotomy of the base of the acromion is done. This gives a very appreciable downward and backward drop of the shoulder. One strut of the shoulder suspension has in this way been removed. The inferior angle of the scapula is anchored with heavy chromic to the lowest rib possible. Suture of muscle layers should be made anatomic, with special care in the triangular area between the trapezius, infraspinatus, and rhomboids.

Fig. 1 CASE I. Congenital Elevation of Scapula, Left.

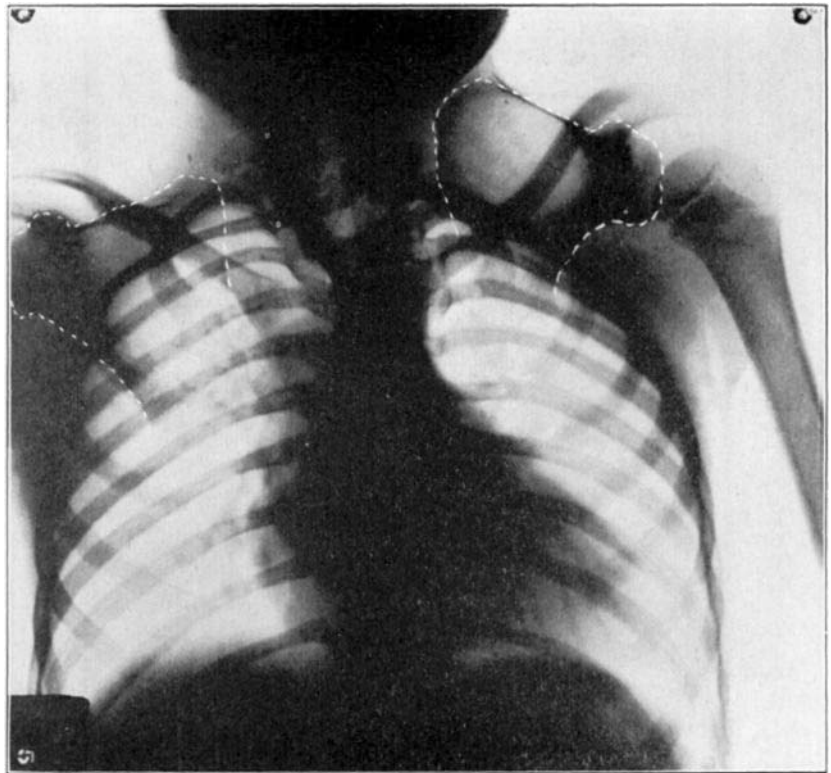
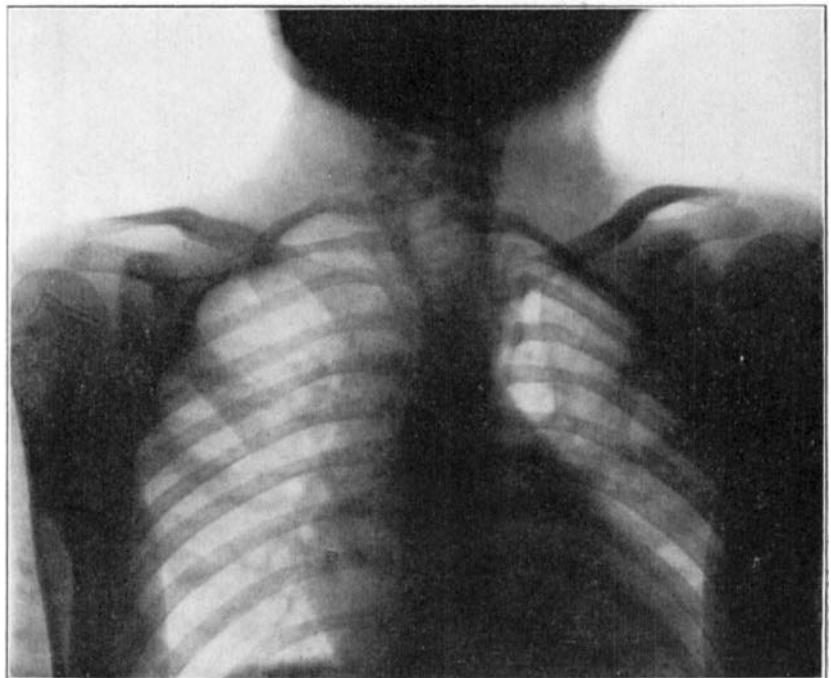


Fig. 2 CASE I. Congenital Elevation of Scapula, Left. Sixteen months post-operative.



The dressing is with a pressure pad over the shoulder and long adhesive extending well down on to the trunk. This is a very important detail and considerable downward and backward pressure can be applied in this manner. Over this is placed a figure-of-eight of the shoulders as commonly used in fracture of the clavicle.

CASE 1. H. M. University Hospital. Admitted December 12, 1923. Age, 6. No other congenital deformities in family. Maternal puerperium said to have been normal.

Physical examination shows a girl somewhat small for her age, well nourished, carrying her head forward and

Fig. 3 CASE I. Congenital Elevation of Scapula, Left.

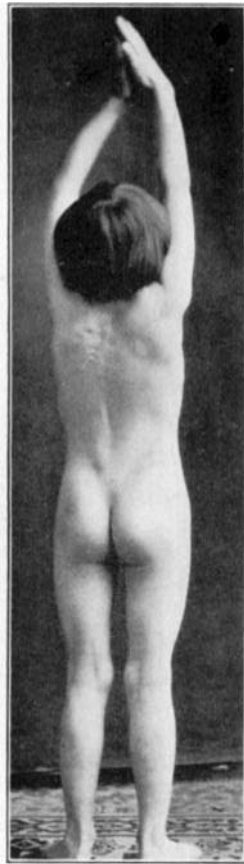


Fig. 4 CASE I. Sixteen months post-operative.



flexed. She extends upper trunk to get her line of vision on the horizontal plane. The neck is abnormally short. The head is held in some flexion to the left. Flexion to the right is limited to one-third normal and accompanied by elevation of the left shoulder.

The left scapula is more than two inches higher than the right—definitely smaller, more oblique to mid-dorsal plane. From the upper third of the medial border, a firm mass is extending upward and attached to lower cervical spine. Motions of the scapula are definitely limited.

The left forearm and hand seem normal in contour; active abduction of the arm is limited to 90 degrees; with undue effort the hand can be placed on top of the head, but this position cannot be maintained.

X-ray examination shows the left scapula smaller than the right, relatively higher with its lower angle at the level of the fourth intercostal space. There is an unusual congenital abnormality in the cervical and upper dorsal spine, deficiency in number and contour of vertebrae, with failure of union of posterior laminae. The ribs are symmetrical, but only eleven on each side.

Operation

December 20, 1923. Radical subperiosteal dissection of left scapula. Resection chondro-osseous plate extending from scapula to low cervical spine. Resection curved supraspinous portion with major portion of spine. Depression of scapula three inches and anchoring with heavy chromic about rib.

Pleura was penetrated; child showed some reaction. Plastic repair of muscle layers, deep fascia, and skin.

Dressing

Fixation of dressings and shoulder in depressed position with long adhesive straps on chest, figure-of-eight, as for fracture of clavicle.

Convalescence

Moderate shock; quick recovery; on fourth day in wheel chair. Continued active use of forearm and hand. After second week allowed use of arm and shoulder; figure-of-eight dressing for four weeks.

At the fourth week the left hand could be actively placed on top of the head and held for a few minutes at a time.

The result at fifteen months shows much improved position of head and neck—the shoulders practically level with abduction closely comparable to the right upper.

The improvement has been satisfactory from both a functional and cosmetic stand-point.

Fig. 5 CASE II. Congenital Elevation of Scapula, Bilateral.

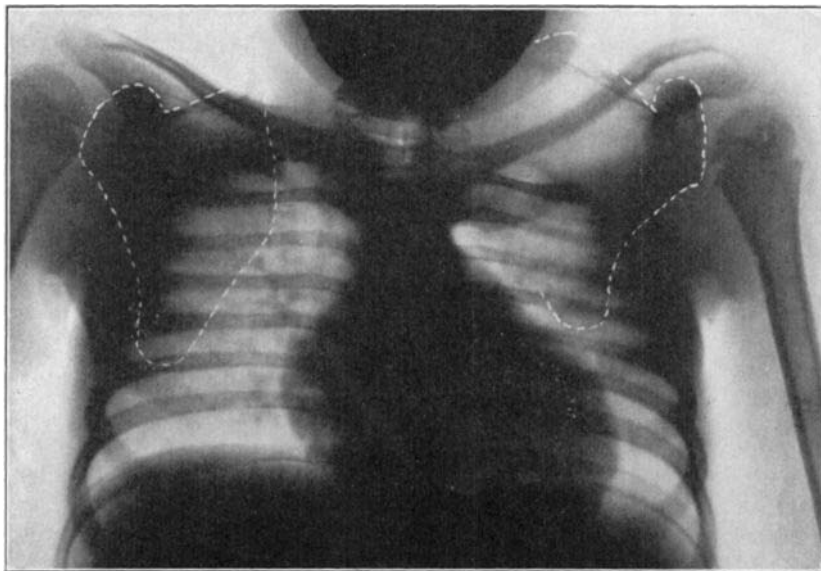


Fig. 6 CASE II. Before Operation.

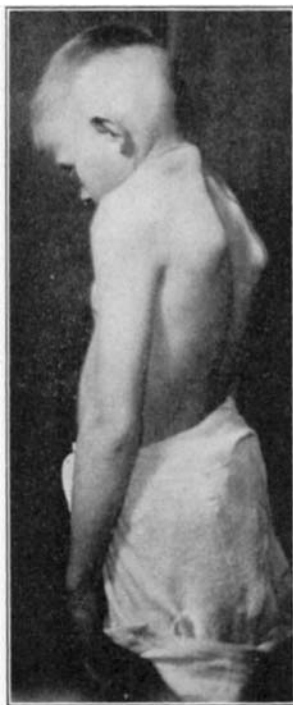
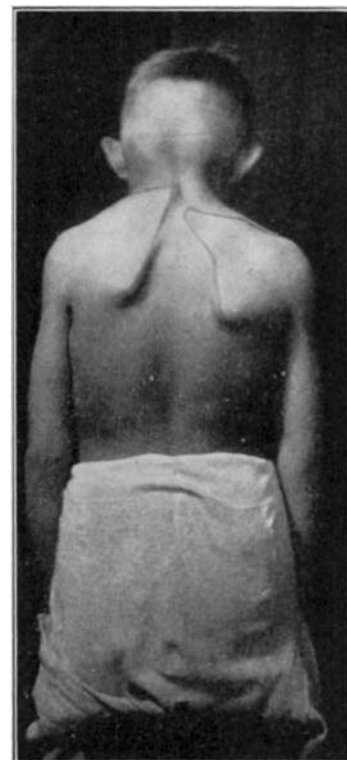


Fig. 7 CASE II. Before Operation.



CASE 2. R. C. Clarkson Hospital. Admitted April 28, 1924. Age, 8. No other congenital deformities in family. Maternal puerperium reported as normal. Physical examination shows sturdy boy; average size for his age, an apparently short neck, very broad posteriorly. The motions of head and neck are about two-thirds normal in all planes. Moderate lordosis.

The scapulae are abnormally high; the left higher than the right. Both inferior angles are unduly prominent. Near the upper angle each scapula has a tongue-like process extending upward and medially and apparently jointed to

the low cervical and upper dorsal spine. This process seems cartilaginous and allows motion of the scapula only by rotation about these fixed points.

The arms can be abducted to only 90 degrees; only by flexion of the head from side to side can the vertex be reached with the finger tips. Forced passive elevation of the hands brings them less than six inches from the head. The hands cannot then be approximated.

Roentgenogram shows scapulae with poorly outlined medial and superior margins; both abnormally elevated; the

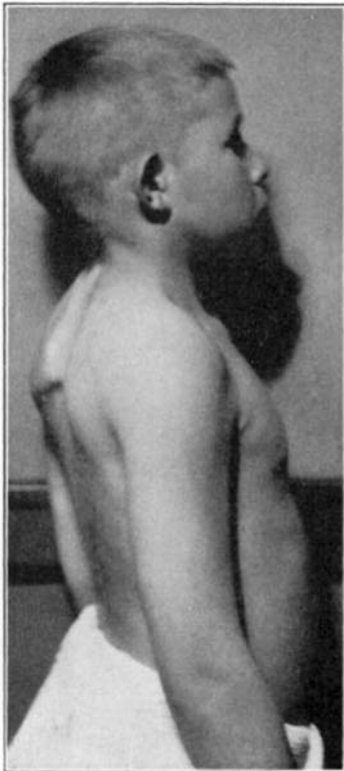


Fig. 8 CASE II. Congenital Elevation of Scapula, Bilateral.



Fig. 9 CASE II. Congenital Elevation of Scapula, Bilateral.

lower angle of the right at the level of the sixth rib; the lower angle of the left in the fourth interspace. There are six cervical vertebrae incompletely developed, with spina bifida; ribs are symmetrical, but eleven on each side. There are five lumbar vertebrae with a rudimentary sixth.

Operation

May 1, 1924. Subperiosteal dissection of the left scapula; resection of cartilage plate extending from supero-medial margin to low cervical spine; resection suprascapular portion of scapula with major portion of spine; also about one inch of cartilaginous medial margin and inferior angle; depression of scapula and anchoring to rib with heavy chromic. Plastic repair in layers, adhesive dressing, and figure-of-eight of shoulders.

Convalescence uneventful. Two weeks after operation could abduct left upper easily fifteen degrees more than the right.

Second Operation

July 24, 1924. Same procedure as above, except much freer marginal resection, and osteotomy at base of acromion, so

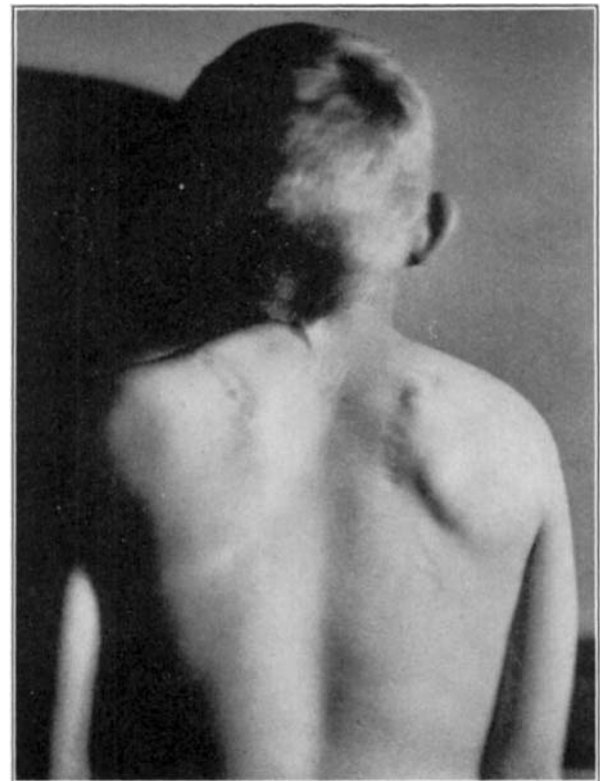
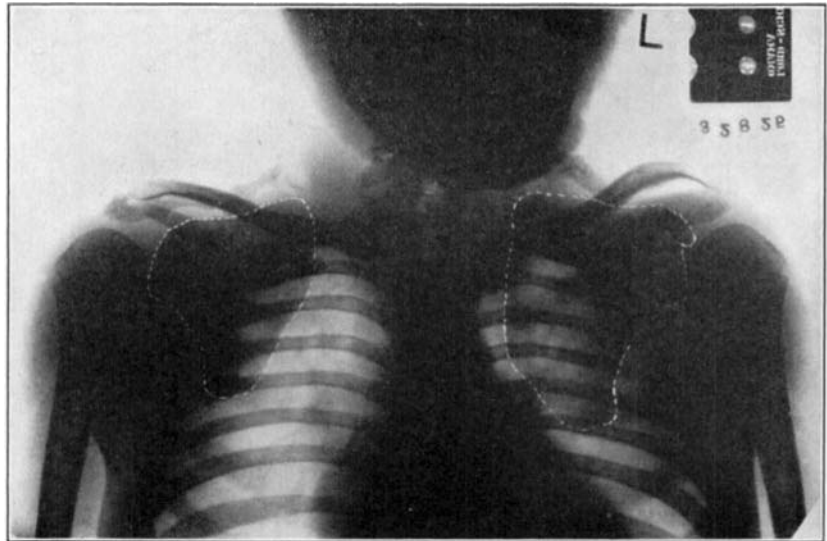


Fig. 10 CASE II. Left—Twenty months post-operative. Right—Eighteen months post-operative.

Fig. 11 CASE II. Left—Twenty months post-operative. Right—Eighteen months post-operative.



permitting shoulders to be placed more posteriorly as well as inferiorly. (It is my feeling that the shortened acromion accounts for this scapula lying flatter on the back, and for this shoulder having a better slope and giving the appearance of greater length to the neck.)

Convalescence

Rather stormy for four days but not dangerously ill. Figure-of-eight dressing maintained for four weeks.

The functional result at the end of eight months is more than 80 per cent. normal; the cosmetic result is very satisfactory to the boy and his parents.

This procedure for undescended scapula may well be called a subperiosteal transplantation to a lower plane in the muscular envelope of the scapula. The anatomic and physiologic relations of the muscles are maintained; there

is little probability of injury to important vessels or nerves, as the suprascapular nerve and artery are the only ones presenting. The greatest danger arises from the anchoring of the inferior angle about a rib; the haemo-pneumo-thorax should be of only short duration.

References

Very complete bibliographies are given under detailed articles by

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