

RETROESOPHAGEAL SUBCLAVIAN ARTERIES: SURGICAL MANAGEMENT OF SYMPTOMATIC CHILDREN

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Aberrant subclavian arteries, which form a type of vascular ring, elicit symptoms of dysphagia and chronic respiratory problems. Simple division of the encircling vessel has been the accepted treatment but has frequently led to various long-term complications. These include ischemia of the arm, which in turn results in claudication and the subclavian-vertebral "steal syndrome." Improved methods of reconstructive vascular surgery allow reestablishment of direct flow to the subclavian artery by means of graft insertion or reimplantation of the aberrant artery. With the use of these newer techniques, vascular continuity has been restored in two young patients.

The retroesophageal subclavian artery represents a variety of aortic arch malformation that can be included in the category of "vascular rings." Several reviews have documented the various anatomical configurations and clinical presentations of these congenital anomalies.¹⁻³ Symptoms associated with retroesophageal subclavian arteries are not as prominent as those associated with complete vascular rings, such as the double aortic arch. The latter may represent a life-threatening respiratory complication during early infancy. Dysphagia or chronic respiratory infections in older children or adults, however, are likely to be caused by an aberrant subclavian artery and ligamentum arteriosus, which produce an incomplete circular constriction of the esophagus and trachea.

Since Gross⁴ first described surgical treatment of patients with vascular rings, the method of correction has been to divide the encircling vessel at some appropriate point. In a patient with an aberrant subclavian artery, however, division of the artery will leave the peripheral vascular bed with a nonpulsatile, collateral flow. Most reports^{3, 5, 6} have deemed this result acceptable because of adequate collaterals to the distal subclavian artery.

With improvements in reconstructive vascular surgery, a better method is to reestablish direct flow into the subclavian artery by inserting a graft or by reimplanting the aberrant artery. In this manner, claudication of the arm and

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“subclavian steal” can be avoided.^{7,8} We recently used these techniques to treat two symptomatic young patients with retroesophageal subclavian arteries.

Case 1

A 15-year-old girl was admitted to this institution for evaluation. She had a 2-year history of chest pain that was associated with eating. An esophagogram revealed a posterior indentation of the esophagus that suggested an anomalous right subclavian artery. An aortogram showed a left aortic arch and descending aorta. The right subclavian artery arose, characteristically, just distal to a normally-positioned left subclavian artery (Fig. 1A) and coursed posteriorly through the mediastinum to the thoracic outlet. Operation was performed by means of a right posterolateral thoracotomy through the third intercostal space. The aberrant subclavian artery was dissected to its origin, posterior to the esophagus. The artery was divided, and the proximal end was oversewn. The esophagus was dissected free from the surrounding tissue at the point of impingement: After a preclotted 8 mm double velour graft had been anastomosed to the end of the artery and to the side of the ascending aorta (Fig. 1B), immediate pulsatile flow was established in the subclavian artery. The patient experienced an uneventful recovery and has remained asymptomatic.

Case 2

A 4-year-old girl was admitted to this institution for evaluation. Her history included a chronic respiratory infection and a recent episode of pneumonia. Results of a barium study revealed a ring-like constriction of the esophagus, with compromise being most prominent posteriorly. After the patient had been treated for the pulmonary infection, she underwent angiographic study and was found to have a right-sided aortic arch and descending aorta (Fig. 2A). A retroesophageal left subclavian artery arose distal to the origin of the right subclavian artery. The origin of the other arteries followed in line from the arch, with the left common carotid artery being the first arterial branch to arise. Operation was performed through a left thoracotomy. Dissection in the posterior mediastinum revealed a ligamentum arteriosus between the aberrant artery and the left pulmonary artery (Fig. 2B). The ligamentum arteriosus was divided and the esophagus dissected free from surrounding tissue. The origin of the anomalous subclavian artery was exposed, divided, and oversewn. Retrograde flow through the divided distal artery was noted to be minimal. The left carotid artery was easily exposed and joined to the end of the subclavian artery in an end-to-side fashion with 5-0 monofilament suture. (Fig. 2C). The immediate postoperative course was complicated by pulmonary congestion that was soon resolved, and the patient was discharged with bounding pulses in the left arm. Subsequently, the child has experienced a cessation of postprandial vomiting, and no further acute respiratory infections have occurred.

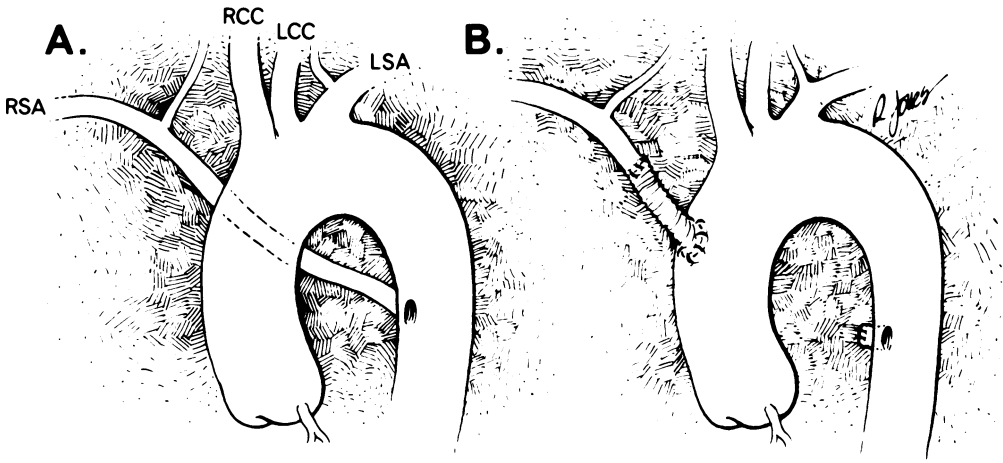


Fig. 1 Drawing showing (A) anomalous origin of right subclavian artery, and (B) completed repair with 8 mm graft. The artery should be dissected as far proximally as possible.

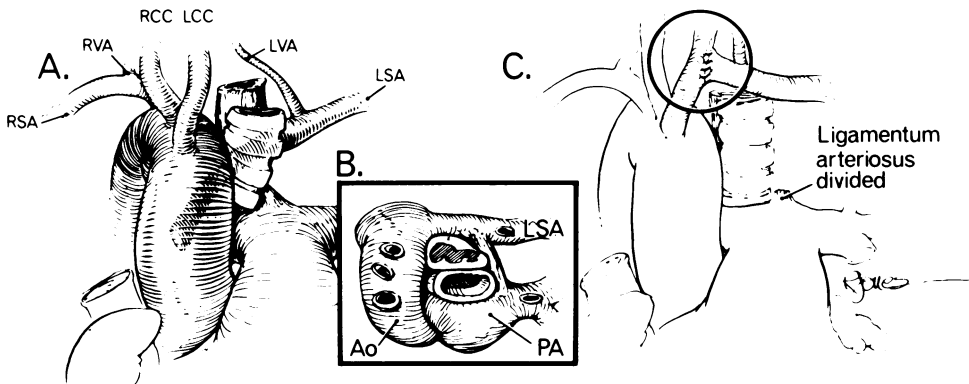


Fig. 2 Drawing showing (A) anomalous origin of the arch vessel, (B) esophagus and trachea completely encircled by vascular structures and the ligamentum, and (C) completed reconstruction.

DISCUSSION

Hallman and Cooley⁹ have discussed the desirability of reestablishing pulsatile flow into anomalous subclavian arteries concomitantly with the surgical treatment of vascular rings, but few subsequent reports have espoused this principle. Reports of restoration of direct flow into the subclavian artery have been limited mainly to adults.¹⁰ Abundant information, however, has accumulated concerning the possible deleterious effects of interrupting antegrade flow. With refinement of vascular reconstructive techniques and the materials with which they can now be accomplished, reappraisal of the operative approach should be made. Disability may be caused by the previously accepted treat-

ment as well as the anomaly. In instances where previous division without reconstruction has been performed, the technique of cervical carotid-subclavian bypass^{11, 12} may be used to avoid repeat thoracotomy.

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