Traumatic Aortic Aneurysm:
Excision and Anastomosis without a Graft

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Traumatic aneurysms of the aorta usually occur at the aortic isthmus. Typically, the patient is relatively young, free of diffuse vascular disease and the aneurysm arises from a linear, transverse disruption of the intima and media, with no significant loss by dissection of adjacent normal vessel. The basic therapeutic challenge, therefore, simply consists of the necessity of restoring continuity of normal aortic wall after the redundant adventitia forming the aneurysm has been excised. Since there has been no loss of substance and the adjacent aorta has the normal elasticity seen in a young adult, restoration of continuity without a graft should be possible in the majority of instances. This concept of the surgical management of traumatic aneurysm has been employed successfully in at least six instances,1-4 placing the rationale of the approach on a firm footing.

A therapeutic concept which seems so obvious in retrospect offers an interesting opportunity to examine the reasons for the delay in its use. In the evolution of the surgical therapy of aneurysms of the thoracic aorta during the past decade, tangential excision of sacciform aneurysms of all types was soon followed by definitive treatment of aneurysms requiring graft replacement, employing shunts and hypothermia to prolong the safe aortic occlusion time. A review of the surgical experience in the treatment of traumatic aneurysm during this period suggests that no special significance was attached to the pathologic features of traumatic aneurysm which distinguish it from those of luetic, arteriosclerotic, and others of generalized vascular disease origin, in planning the excisional therapy. During this developmental period, the surgeon was preoccupied by the technical problems inherent in the location of the pathology to be treated, and by the proper selection of prosthetic material, a field simultaneously undergoing rapid evolutionary change. The nuance of whether a graft was necessary hardly seemed appropriate in this context.

Hence, for descriptive purposes, in the larger series of surgically treated aneurysms of the thoracic aorta during the 1950's, we find the relatively rare traumatic aneurysms grouped with aneurysms due to diffuse vascular disease, segregated only according to their location on the aorta. Excision with replacement by a graft ranging in length from 3 to 5 inches, is usually described. Photographs of the surgical specimen usually display a spindle-shaped structure with a segment of normal aorta on each end. The routine use of grafts in the therapy of traumatic aneurysm was perhaps reasonable during this period, because of the necessity of conserving time when local shunts and hypothermia were the only modalities available during the period of aortic occlusion.

The introduction of bypass techniques for prevention of central nervous system damage and left ventricular failure during aortic occlusion, has now eliminated the premium on speed and greatly reduced morbidity and mortality factors. Excision of traumatic aneurysm of the descending aorta requires only the simple technique of

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left atrial-femoral artery bypass during the period of aortic occlusion.

It is our conviction that in most instances, whether acute or chronic, traumatic aneurysms should be susceptible to excision with direct restoration of aortic continuity and avoidance of a graft. The bypass technique offers a sufficient margin of safety to at least explore the aneurysm with this approach in mind, even if the findings should dictate restoration with a graft.

The two cases of traumatic aneurysm treated by our group employing graftless excision occurred in 20-year-old athletic men. In each instance, the aneurysm was the result of complete circumferential disruption of the intima-media with approximately a 6 cm. distraction of the divided layers. In one, the aneurysm had been present three months, and the other 18 months. There was no appreciable difference in the ease with which direct anastomosis was accomplished.

Based on this experience, an outline of the operative steps is offered. The elements of the procedure are shown in Figure 1.

1. Monitoring. The right radial artery is cannulated for continuous blood pressure recording. (Because of the proximity of

![Figure 1: Drawing illustrating the operative procedure of resection of traumatic aneurysm of the aortic isthmus. A. operative findings. B. left atrial-femoral artery, bypass. C. surgical restoration of aortic continuity by direct anastomosis. (From Arch. Surg., ALLEY, VANMIEROP, Li, KAUSEL AND STRANAHAN, Aug., 1961.)](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21382/ on 06/21/2017)
the left subclavian artery to the pathology, the left radial artery is not suitable for this purpose.)

(2) Position. A standard right lateral position with the hips rotated posteriorly to facilitate exposure of the left groin for femoral artery cannulation is employed.

(3) Incision. The thorax is entered through a standard left lateral thoracotomy incision, with entry into the pleural cavity through the bed of the non-resected fifth rib (fourth intercostal space).

(4) Isolation of inflow and outflow. The arterial inflow and outflow of the aneurysm is isolated by placing tapes about the left subclavian artery, aortic arch distal to the left common carotid artery, and the descending aorta distal to the aneurysm.

(5) Partial dissection of the aneurysm, with inflow and outflow occlusion available in the event of inadvertent hemorrhage, is then carried out.

(6) Isolation of femoral artery for cannulation is carried out through a transverse incision below and parallel to the inguinal ligament.

(7) Heparinization, employing 1.5 mg. of heparin per kilogram body weight, is established prior to cannulation for bypass.

(8) Cannulation of left femoral artery and left atrial appendage, employing large caliber cannulae connected by half inch plastic tubing which passes through an occlusive pump. The system must be filled with blood and all air removed before instituting partial bypass.

(9) Bypass commenced and the aorta proximal to the aneurysm is occluded. The occlusive clamp is applied slowly and the bypass pump accelerated progressively, using the right radial artery pressure as a guide. An effort is made to maintain the radial artery pressure at or near normal, with the safe assumption that bypass will be adequate for the nutrition of the spinal cord and the abdominal viscera. Usually, approximately one-half the normal cardiac output will result, but for reasons only partially appreciated the bypass require-

ment to maintain a steady blood pressure in the radial artery varies from moment to moment. For this reason, a blood pressure cuff, intermittent registration of the right brachial artery pressure is inadequate for this purpose.

(10) Occlusion of the aorta distal to the aneurysm is carried out after establishment of bypass equilibrium.

(11) Exploration of interior of the aneurysm and appropriate excision. If a complete circumferential disruption of the intima-media is present, a circumferential excision at each end of the aneurysm will be required, followed by end-to-end anastomosis. If only a partial disruption of the media has resulted in an aneurysm, after resection of the aneurysm a transverse closure of the orifice is the rational approach. (Rupture of the intima and media usually occurs in the transverse direction, since the stress responsible for it is delivered by a horizontal force and because the healthy aorta has a transverse grain.)

(12) Release of occlusive clamps while still on bypass.

(13) Discontinuation of bypass after any necessary adjustments of blood volume have been made.

(14) Decannulation of atrium and femoral artery.

(15) Neutralization of heparin by protamine, 1.5 mg. per kg. body weight.

(16) Closure of incisions.

Summary

Traumatic aneurysms of the thoracic aorta differ from arteriosclerotic, luetic, and other aneurysms due to diffuse vascular disease, in important respects. Typically, the patient is young, healthy, and the aneurysm arises from a linear, transverse disruption of the intima and media with no significant loss of adjacent, normal vessel. These distinctive pathologic features form the basis for the therapeutic concept that traumatic aneurysm should usually be susceptible to excision with direct, graftless restoration of aortic continuity. The validity
of this concept is apparent on pathologic grounds; its practical application has now been established by clinical usage.

Based on experience with two cases so treated with the aid of left-atrial femoral artery bypass, the authors outline the steps of the operative procedure.

STUDY OF PRIMARY TUBERCULOSIS AND DRUG RESISTANT BACILLI

This study is concerned with both INH and streptomycin resistant bacilli. The resistance to INH was studied in 107 children with primary tuberculosis who had never been treated with this drug or any other antituberculous drug. It was found that 8.4 per cent were infected with bacilli already resistant to INH and that 13 per cent showed reduced sensitivity to this drug. The resistance to streptomycin was studied in 237 children with primary tuberculosis who had never been treated with this drug. It was found that 5.9 per cent were resistant and that 7.6 per cent showed decreased sensitivity to streptomycin. A serious effort was made to verify the source of infection and it was found that the contact was usually extrafamilial and frequently of short duration. In one case of tuberculous meningitis, the bacilli were resistant to both isoniazid and streptomycin, but were nonpathogenic for the guinea pig.


CALCIFICATION OF MITRAL ANNULUS

Massive noninflammatory calcification of the mitral annulus producing clinically significant distortion of the orifice was found in 0.2 per cent of necropsied individuals 51 years of age and older, but was not encountered below that age. In the 14 cases suitable for clinicopathologic analysis, all the patients were women, with an average age of 75 years. Mitral insufficiency was present in all and significant stenosis in 9. The lesion had produced a clinical picture that was often distinguishable from that of rheumatic heart disease. Stenosis resulted from protrusion of the calcific lesion beneath the valve leaflets into the cardiac lumen. Insufficiency occurred when the process extended toward the atrium, immobilizing the valve ring and elevating the base of the leaflets. The characteristic radiologic finding of a density with a "J", "U" or oval shape in the mitral area proved to be the most important clue to the correct clinical diagnosis. Histologic study of these 14 cases and comparison with the valvular changes encountered in patients of varying age who died as a result of other diseases suggested that the massive noninflammatory calcification of the mitral annulus was an exaggeration of aging changes. In 5 cases, the mitral lesion was accompanied by calcific aortic sclerosis for which a similar pathogenesis has been suggested.


ISONIAZID WITH ETHIONAMIDE IN TUBERCULOUS MENINGITIS

In 1957, a case of tuberculous meningitis was reported in which recovery was attributed to ethionamide, since the bacilli were resistant to both INH and streptomycin. Thirteen cases of this disease are presented in which it was felt the recovery was either due to ethionamide or facilitated by its use with isoniazid. Ethionamide often produces unpleasant gastrointestinal, neurologic or cutaneous reactions which seem to be ameliorated by administration of vitamin B6. It was found that intravenous administration resulted in increased tolerance of the drug and that ethionamide level in the spinal fluid was four times as great as when given orally. The authors feel that this drug can be a useful adjunct in the treatment of certain problem cases of tuberculous meningitis.