

Treatment of Type A dissection: searching for the Holy Grail

The role of axillary cannulation.

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Abstract:

Surgical treatment of type A dissections is based on best evidence practice for the lack of controlled randomized studies providing definitive scientific evidence. Despite its widespread use, axillary cannulation still remains a debated topic as the preferred method of cannulation and perfusion strategy in the treatment of this complex condition.

I read with interest the manuscript by Nishant and Pochettino, "Cannulation strategies and circulation management in Type A aortic dissection". The authors did an exceptional job describing the complex pathophysiology of this condition, remarking how the understanding of its features is paramount in the implementation of the appropriate surgical strategy. The ability to tailor cannulation strategy and circulation management to the patients' characteristics and to the anatomy of the dissection is key to optimize surgical results.¹⁻³

The main objective of emergent surgery in acute type A dissection is to save the patient's life^{2,3} from the occurrence of cardiac tamponade, free aortic rupture, acute myocardial ischemia, stroke or visceral/limb malperfusion. Therefore, the true goal of the operation is to replace the aortic segments (ascending/root) prone to rupture and reestablish conditions of aortic flow compatible with preventing any of the other life-threatening malperfusion complications described above.³ At times, this may entitle that maintaining patency of the false lumen distally to the aortic graft replacement can be beneficial for preserving flow to the aortic branches fed by it, even though postoperative false lumen patency is associated with reduced rate of actual and event-free survival at 5 years.^{3,4}

As pointed out by the authors, preoperative evaluation, physical exam, imaging and laboratory studies, are very important to establish the appropriate plan for cannulation and perfusion management. The presence of unstable hemodynamic conditions or the presence of life-threatening blood flow compromise to organs and/or limbs may suggest to choosing one type of approach versus another. In this contest the authors analyze the advantages and disadvantages of establishing arterial inflow with access through the femoral artery, the subclavian/axillary artery, and/or the ascending aorta or the proximal arch.

In the experience of the past decade, right axillary cannulation has merged as the preferred arterial inflow site in the treatment of type A dissections with evidence of better short and long-term survival and lower incidence of stroke compared to femoral cannulation.^{2,3,5-11}

Right Axillary cannulation has the significant advantage of maintaining antegrade aortic flow and allows to easily establish selective antegrade cerebral perfusion during circulatory arrest.^{2,3,5-12}

In our experience, we routinely select right axillary cannulation as the primary arterial inflow site.¹³ In fact, in our evaluation, the axillary artery, being rarely involved by the dissection, represents the safest site to establish reliable antegrade perfusion. Through the years we applied a simple technical modification by using an arterial perfusion cannula advanced with Seldinger technique through an 8 mm Dacron graft sewn to the artery (figure 1). This simple technical adjustment has improved the quality of arterial inflow by having minimal occurrence of high flow-resistance, has completely removed the risk of over-circulation to the right upper extremity (which occasionally can cause severe edema), and has significantly reduced the occurrence of bleeding at the cannulation site during CPB.

Only in a situation of hemodynamic instability we select an alternative inflow cannulation site. In general, we consider femoral cannulation the preferred way to establish emergent cardiopulmonary bypass (CPB), before proceeding with the sternotomy to typically relieve a cardiac tamponade, and we limit central cannulation to cases of patients 'crushing' on the operating table and requiring chest compression, as can occur with cardiac arrest secondary to tamponade or myocardial ischemia. Once CPB is established, we regularly switch to axillary cannulation as the primary inflow site.

Central aortic cannulation can be dangerous by exposing to the risk of free aortic rupture, propagation of the dissection and distal embolization.^{2,3} Furthermore, preliminary studies seem to show higher incidence of stroke and long-term mortality compared to axillary cannulation.^{2,5-}

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Besides the cannulation strategy selected, as dictated by clinical judgement based on the patients' conditions and the anatomy of the dissection, a fundamental aspect is to assess the adequacy of body perfusion at time of initiation and during CPB by continuous monitoring of the invasive blood pressure in the left radial (contralaterally to the axillary cannulation site) and femoral arteries, by bilateral assessment of the cerebral oximetry and by around-the-clock measurements of serum lactate and arterial pH.^{8,9}

There is no Holy Grail in the treatment of this condition. Its complex pathophysiology, the rapidly changing conditions and the multiple and unpredictable variables that can affect its presentation and evolution, make impossible to define a surgical strategy which would work for every case. The key to optimize results is to tailor the surgical strategy to the patient, the characteristics of presentation, the extension of the dissection, the features of involvement of the aortic branches and to adapt to the continuously changing conditions that may require to readjust the surgical strategy.

Based on best evidence practice, only a few aspects of the surgical treatment of acute type A dissections seem to be accepted as safe and effective to have become mainstay of therapy. Replacement of the ascending/root of the aorta, 'open' distal anastomosis under moderate or deep hypothermia and cerebral protection with antegrade cerebral perfusion seem to find most of the consensus as part of the preferred surgical strategy.^{2,8-16} We may wonder if it would be fair to acknowledge that axillary cannulation is ready to become part of the list.

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Legend to figures:

Figure 1.

Arterial inflow cannula is advanced through the Dacron graft into the right axillary artery with Seldinger technique, positioning the tip of the cannula 3 to 5 cm distal to the anastomosis to ensure direct and unobstructed flow into the artery.