

# Cannulation strategies for aortic surgery: which is the best one?

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The choice of the optimal arterial cannulation strategy for surgery on proximal aorta and arch remains a controversial area and a subject of intense debate. The search for the best cannulation strategy for aortic surgery assumes increasing importance due to its impact on clinical outcomes. Several cannulation strategies have been proposed to establish cardiopulmonary bypass (CPB) for aortic surgery and each one of these has its pros and cons. These cannulation strategies can be broadly classified into central and peripheral cannulation strategies. Sites of central cannulation (CC) include the ascending aorta itself as well as the innominate, subclavian and axillary artery whereas femoral artery cannulation is synonymous with peripheral cannulation (PC).

Traditionally, the femoral artery has been the preferred arterial cannulation site for establishing CPB for proximal aortic and arch surgery. However, more recently, femoral artery cannulation is reserved for complicated cases when aortic cannulation is deemed challenging, such as in aortic dissection or chronic proximal aortic and arch aneurysms. The decreasing reliance on routine femoral artery cannulation is secondary to the perceived increased risk of retrograde cerebral embolization, organ malperfusion, perfusion of the false lumen and retrograde dissection due to flow reversal in the thoracoabdominal aorta (1). There has been a simultaneous increase in published reports of CC with axillary artery cannulation emerging as the favoured strategy due to it being a safe and easy technique, especially in patients with a diseased ascending aorta or when femoral artery cannulation is precluded such as in the presence of aortoiliac aneurysms, severe peripheral occlusive disease, atherosclerosis of the femoral vessels, and distal extension

of the aortic dissection (2).

In the current era of evidence-based medicine, it is vital that strategies that are backed by current best available evidence are adopted to ensure that clinical outcomes for complex procedures such as proximal aortic and arch surgery are further improved. Interestingly, there is a lack of gold standard evidence from randomized controlled trials comparing CC and PC. Majority of the evidence on the subject is in the form of observational cohort studies of variable reporting quality and conflicting results (3,4). Our group attempted to provide some clarity on the subject by undertaking a meta-analysis of comparative studies reporting operative outcomes following CC and PC (5). This meta-analysis included a total of 4,476 patients. CC was used in 2,797 cases and PC in 1,679 cases. CC showed a protective effect on in-hospital mortality (RR 0.59; 95% CI, 0.48–0.7;  $P < 0.001$ ) and permanent neurologic deficit (RR 0.71; 95% CI, 0.55–0.90;  $P = 0.005$ ) when compared to PC. A trend towards an increased benefit in terms of reduced in-hospital mortality was observed when the right axillary artery only was used as CC approach (RR 0.35; 95% CI, 0.22–0.55;  $P < 0.001$ ;  $I^2 = 0\%$ ) (5). This trend seems to be attributed to antegrade cerebral perfusion (ACP), which avoids complete circulatory arrest or reduces its duration to a minimum.

Axillary cannulation can be accomplished either directly or through the interposition of a small Dacron graft to achieve optimal haemostasis and decrease the chance of injury to the vessel. In both cases, by simply clamping the major cerebral vessels at their bases, and employing a proper flow rate, it is possible to conveniently swap from standard CPB to unilateral ACP, minimizing any potential risk

related to vessel manipulation, cannulation or air embolism. The increasing experience with axillary cannulation has, in recent years, encouraged the use of the innominate artery as a site for cannulation in an attempt to reduce the number of incisions and further simplify the procedure (6). More importantly, antegrade body perfusion as a result of axillary cannulation decreases the risk of retrograde flow both in the acute setting (malperfusion) and in the chronic condition (atheroembolism) (7).

Cannulation strategy represents a critical choice that may play a crucial role in determining operative outcomes in aortic surgery (5). Although, it takes time for new evidence in the literature to translate into common practice there is no doubt that in most centres, worldwide, axillary cannulation is rapidly emerging as the preferred strategy for both acute as well as chronic cases. This is contrary to the practice more than a decade ago when the femoral artery was considered the main cannulation site for dealing with dissections and very often also for tackling cases of chronic aneurysms involving the arch. At present, a general recommendation endorsing axillary artery cannulation as the site of first choice in patients requiring surgery on proximal aorta and arch is difficult to be made due to lack of robust evidence from prospective, randomised multicenter trials. However, considering the theoretical advantages as well as the published experience it is obvious that axillary artery cannulation is currently the best strategy. Of course, as for any other surgical strategy one must always remember the golden rule that the cannulation strategy for proximal aortic and arch surgery should be chosen taking into account the patient's characteristics.

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### Footnote

*Conflict of Interest:* The author has no conflicts of interest to declare.

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