How-to-do-it

Axillary artery cannulation for arterial inflow in patients with acute dissection of the ascending aorta

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Abstract

The axillary artery is an alternative site for arterial cannulation that avoids manipulation of the ascending aorta or aortic arch and provides antegrade blood flow during surgery for acute type A aortic dissection. Right axillary artery cannulation has been used in 27 patients for arterial perfusion. There were no complications related to the technique of axillary cannulation. All patients but one awoke neurologically intact from operation and suffered no complications. Hospital mortality occurred in two (7.4%) patients. Axillary cannulation is easy to establish and may safely be used for arterial inflow during surgery for acute type A dissection of the ascending aorta. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The choice of an adequate, non-diseased cannulation site for arterial inflow during cardiopulmonary bypass (CPB) is an important point, in particular for dissections involving the ascending aorta, the aortic arch and/or the abdominal aorta. These pathological conditions demand the use of a distant arterial site of cannulation for CPB inflow [1–6].

It may be difficult to find a safe site for placement of a perfusion cannula when performing surgery of ascending aorta and aortic arch for acute type A aortic dissection [2,3]. Cannulation of the possibly dissected vessels might induce irreparable damage.

Pressurization of the false lumen and subsequent brain and visceral malperfusion is one of the most severe complication for patients with acute dissection by using femoral arterial perfusion. In order to minimize the risk of malperfusion caused by retrograde flow during CPB, femoral cannulation should be avoided. To overcome these disadvantages, arterial perfusion through the axillary artery may be a good alternative.

We herein report our experience with axillary cannulation.

2. Technique

A transverse skin incision, 8–10 cm in length running from a point just lateral to the sternal head of the clavicle to the upper deltopectoral groove, is made below the clavicle to expose the right axillary artery (Fig. 1).

The fibers of the right pectoralis major muscle are separated between the clavicular and sternal heads of the pectoralis major. The pectoralis minor is retracted laterally to allow exposure of the axillary artery medial to the pectoralis minor muscle. The proximal part of the axillary artery is mobilized by means of sharp dissection without touching the medial and lateral brachial plexus cords.

After heparinization femoral artery clamps are used proximal and distal to the site of cannulation. A single 5-0 polypropylene (Prolene, Ethicon Ltd., Edinburgh, UK) purse-string suture is placed surrounding the arteriotomy and passed through a tourniquet.

Through a transverse arteriotomy, the axillary artery is cannulated with either 20F or 22F straight flexible arterial cannula (Jostra Arterial Cannulae, JOSTRA Medizintechnik AG, Hirrlingen, Germany). It is inserted and advanced 3–4 cm into the artery being removed by the proximal clamp. The tip of the cannula should not obstruct the orifice of the right common carotid artery. The cannula is tied to the tourniquet and sutured to the skin. After evaluating the flow through the cannula by back-bleeding it is connected to the CPB pump tubing circuit. At the end of CPB the artery
is allowed to back-bleed to ensure that no thrombus is present. Preferably, the artery is then primarily repaired using an interrupted 6-0 Prolene suture.

3. Results

Axillary artery cannulation has been used in 27 patients for arterial perfusion in surgical repair for acute type A dissection involving the ascending aorta.

Direct cannulation has been applied in all patients. There were no complications related to the technique of axillary cannulation. No patient had weakness and numbness of the right arm caused by brachial plexus alteration and there were no vascular injuries. False channel perfusion, however, has not been a problem in our experience with axillary cannulation.

The mean circulatory arrest time was 25.8 min (range 10–43 min), the mean retrograde cerebral perfusion time was 23 min (range 9–41 min), and the mean CPB time was 156.7 min (range 72–293 min).

One (3.7%) patient, who had mentally obtunded preoperatively, had suffered transient confusion postoperatively, which resolved spontaneously within 12 h after extubation. No focal neurologic deficits were detected in the remaining patients. Hospital mortality occurred in two (7.4%) patients due to intestinal ischemia and multi-organ system failure, respectively, 3 and 20 days after operation.

4. Discussion

Axillary cannulation eliminates the necessity for a separate groin incision and avoids the malperfusion of the cannulated leg that can occur when the femoral artery is used for retrograde perfusion. Unlike the femoral artery, because of the rich collateral network of the scapular region, occlusion of the axillary artery does not cause severe digital ischemia or reperfusion injury unless there is associated embolization [2,3,5–7].

The axillary artery may be cannulated directly or through a 8 mm Dacron side-arm. Direct axillary cannulation is more expeditious, and an advantage in patients with type A aortic dissection [2,3,5,6]. If the axillary artery is fragile, a graft interposition technique avoids the trauma of direct cannulation. It also allows perfusion of the arm and avoids the malperfusion of the vertebral artery during CPB. In addition, this technique facilitates decannulation, which is accomplished simply by transecting the Dacron graft and oversewing the stump [4,5]. Stenosis of the artery is also avoided at closure by tailoring the proximal graft as a patch in the graft interposition technique. However, it is more difficult to evacuate air from the graft than from the cannula, and this may be disadvantageous.

Good clinical results related to axillary cannulation have been reported [3,4–6]. In our experience, we had seen no local infections, drainage, brachial plexus injuries, or vascular compromise. Furthermore, false-channel perfusion has not been a problem in our patients.

Unlike the potential advantages of axillary cannulation, there are some potentially fatal complications [8]. Acute dissection involving the subclavian and axillary artery may potentially result in malperfusion. If a perfusion cannula is advanced a little more, it may obstruct the common carotid artery. Thus, it leads to inadequate flow and even brain ischemia.

Axillary cannulation is easy to perform, and does not increase the risk of the procedure [1–6]. It offers the advantage of antegrade perfusion with standard aortic cannulation when the ascending aorta and arch aorta are unavoidable in aortic dissection.

References

