Axillary artery and transapical aortic cannulation as an alternative to femoral artery cannulation

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Abstract

We present an experience with axillary artery and transapical aortic cannulation for cardiopulmonary bypass according to our indication. We could simply achieve antegrade flow using the two methods with satisfactory result.

Keywords: Axillary artery cannulation; Transapical aortic cannulation; Femoral artery cannulation; Cardiopulmonary bypass

1. Introduction

Although the femoral artery has been widely chosen as an alternative arterial inflow to the diseased ascending aorta for cardiopulmonary bypass, complications due to retrograde perfusion, such as retrograde atheroembolism or organ malperfusion, have also been reported. Therefore, the usefulness of the axillary artery and transapical aortic cannulation with antegrade flow has been demonstrated [1–3]. However, the indications and techniques vary. We therefore present our experience with the successful use of the two methods and our indications.

2. Indications

Our primary alternative access for a diseased ascending aorta is the femoral artery. However, we choose the axillary artery or transapical aortic cannulation according to the following indications:

1. coexistence of abdominal or iliac aneurysm;
2. coexistence of chronic peripheral arterial occlusive disease;
3. dissection of femoral artery due to extension of aortic dissection;
4. considerably narrow true lumen with crescent shape, compressed by the false lumen in aortic dissection.

In principle, we choose the left axillary artery rather than the right. The left axillary artery is isolated from the carotid system and debris or microbubble embolization can be avoided at the beginning of perfusion. Moreover, in patients with aortic dissection, the left subclavian artery is less prone to obstruction due to dissection than the right [4]. We prefer transapical aortic cannulation to axillary artery cannulation in thoracotomy.

3. Technique

In the axillary artery cannulation, the skin incision is made in the middle of the subclavicular portion before a median sternotomy. The pectoralis major muscle and the clavipectoral fastia are cut, and small veins and the thoracoacromial artery and vein, if necessary, are ligated. The lateral pectral nerve should be preserved. The traction of the subclavian vein often allows the exposure of the artery easy. If the axillary artery is small or deeply located, an 8 or 10 mm Dacron tube graft is anastomosed to the artery. After venous cannulation, the axillary artery is clamped and a transversal incision is made. We should take care of the nerves of the brachial plexus behind the artery. The axillary artery is directly cannulated with a 22 or 20Fr Sarns cannula, or 19Fr percutaneous arterial femoral
cannula (Bio-Medicus cannula, Medtronic, Grand Rapids, Mich). If the tube graft is anastomosed to the artery, a 22Fr Sarns cannula is connected to the graft.

In transapical aortic cannulation for aortic surgery in thoracotomy, after intubation with a double lumen endotracheal tube, a thoracotomy is performed and the pericardium is incised. The femoral vein is cannulated with a 29Fr Bio-Medicus cannula. A 3-0 polypropylene mattress suture with small felters is placed at the apex, which is incised, and the cannula is inserted into the ascending aorta via the left ventricle and aortic valve (Fig. 1). The cannula is secured by a tourniquet. Aortic regurgitation due to cannula via the aortic valve is evaluated by transesophageal echocardiography. In our study, a 22Fr Sarns cannula was used in one patient, a 19Fr Bio-Medicus cannula in one, and a 28Fr wire reinforced venous cannula (Thin-Flex single stage venous drainage cannula, Edwards Lifescience, Irvine, CA) in one. The main pulmonary artery and left atrial appendage also are cannulated. The cardiopulmonary bypass is begun. The proximal anastomosis is performed under deep hypothermic circulatory arrest (20°C) and cardioplegia is performed with Foley balloon catheter inserted to the ascending aorta through the arch. After completion of proximal anastomosis, another 22Fr Sarns cannula is inserted into the branch of the graft and the cardiopulmonary bypass is begun slowly. De-airing is accomplished through a cannula placed at the apex, then this cannula is removed and the cannulation site is closed. The distal anastomosis is completed and the graft is declamped.

4. Comment

Use of an axillary artery and transapical aortic cannula-