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Case Report / Olgu Sunumu

A new technique to repair short vena cava inferior in heart transplantation

Kalp naklinde kısa vena kava inferiorun tamirinde yeni bir teknik

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ABSTRACT

In heart transplantation, surgical techniques and their long-term results are well-established in four decades. Although it may vary individually, a surgeon may still face surgical obstacles such as short vena cava inferior. This poses particularly a greater problem when using bicaval technique during surgery. Leading causes for short vena cava are donor-recipient size mismatch; inappropriate donor cardiectomy technique or extreme tissue adhesions in redo surgeries. In such cases, a simple patch can be used to repair the missing part of vena cava inferior. In this article, we report a 57-year-old male patient in whom we used a tubular patch, which was prepared from the recipient's atrial tissue in bicaval orthotopic heart transplantation.

Keywords: Heart; short vena kava; transplantation.

ÖZ

Kalp naklinde cerrahi teknikler ve uzun dönem sonuçları 40 yıldır iyi bilinmektedir. Kişiden kişiye değişmekle birlikte, cerrah halen kısa vena kava inferior gibi cerrahi engellerle karşılaşabilmektedir. Bu özellikle cerrahi sırasında bikaval teknik kullanımı sırasında daha önemli bir sorun teşkil etmektedir. Kısa vena kavanın başlıca nedenleri donör-alıcı büyüklüğündeki uyumsuzluk, uygunsuz donör kardiyektomi tekniği veya tekrarlanan cerrahilerde aşırı doku adezyonudur. Bu tür durumlarda, vena kava inferiorun eksik kısmını tamir etmek için basit bir yama kullanılabilir. Bu yazıda bikaval ortotopik kalp naklinde alıcının atriyal dokusundan hazırlanan tübüler bir yamanın kullanıldığı 57 yaşında bir erkek hasta sunuldu.

Anahtar sözcükler: Kalp; kısa vena kava; nakil.

Orthotopic heart transplantation is the gold standard for the treatment of end-stage heart failure.[1] Three different surgical techniques can be used in heart transplantation: biatrial technique, bicaval technique, and total technique.[1] Although each technique brings certain advantages, bicaval technique is currently the most commonly used.[2-4] With this technique, on the other hand, the size mismatch or short vena cava inferior (VCI) can be a drawback for anastomosis, which may yield a surgical challenge.[1,4] Herein, we present a case in whom we used a tubular patch, which was prepared from the recipient's atrial tissue in bicaval orthotopic heart transplantation.

CASE REPORT

A 57-year-old male patient was admitted to the intensive care unit with end-stage congestive symptoms. His body mass index (BMI) was 22.3 kg/m^2 with a body surface area of 1.78 m^2. His symptoms did not improve, despite inotropic infusions. In his medical history, he had atrial septal defect repair 20 years ago and mitral valve replacement with mechanical

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prosthesis 10 months ago. Echocardiography revealed normal prosthetic valve functions; however, the ejection fraction (EF) of the left ventricle was 15% and the patient was on inotropic agents. The patient was on the emergency call, as the donor heart was presented. The organ donor was 43-year-old female with a BMI of 24.2 kg/m^2 with a body surface area of 1.66 m^2. Harvesting donor heart was accomplished according to the standard procedures and the organ was stored and transported with a helicopter. Cold ischemia time (the time between cross-clamping of the donor heart and de-clamping after transplantation and re-warming) was four hours and 44 minutes. Meanwhile, arterial cannulation was chosen as the femoral region, as the patient was scheduled for a third sternotomy operation. The adhesions were removed and the vena cava superior (VCS) and VCI were prepared for venous cannulation. Both VCS and VCI were transected, after cross-clamping, by securing a certain length to perform the anastomosis safely. The recipient's cross-clamping time was 164 min. The anastomosis was performed in the following order: left atrium, VCS, pulmonary artery, aorta, and VCI. However, there was a gap between the VCI of the donor heart and the VCI of the recipient. Therefore, to avoid an unsafe and highly distended anastomosis, we prepared a tubular patch homograft using the recipient's right atrial tissue in a size of 3x7 cm yielding a length of 3 cm in a diameter of 2 cm. The recipient's height was 172 cm, whereas the donor's height was 160 cm. Mediastinal length of the recipient was greater in the vertical axis, namely the distance between the VCS and the VCI was longer than the donor heart could fit. The recipient's body surface area was also 7.2% larger. This patch was interposed between two VCI and the anastomosis was completed safely (Figures 1, 2). The weaning from the cardiopulmonary bypass was uneventful and the patient was extubated at postoperative 24th hour.



Figure 1. An intraoperative image of the right atrial tissue anastomosis.

DISCUSSION

Orthotopic heart transplantation has been performed over three decades.[1] Fifteen years ago, the gold standard for surgical technique was biatrial standard surgical method.[5,6] However, in recent practice, bicaval and total surgical techniques are most commonly used thanks to their improved postoperative results and hemodynamic properties.[1] Despite the easy-to-use nature of the biatrial technique, biatrial anastomosis yields an enlarged atrial cavity with a higher chance of atrioventricular valve regurgitation due to impaired geometry of the right atrial cavity.[1,4,7] Furthermore, due to the atrial suture line with this technique, sinoatrial junction may be injured, leading to bradyarrhythmias, which in some case necessitate a pacemaker implantation.[4] In the bicaval technique, however, some of these problems can be avoided, although left atrial complications may still remain.[4] In total technique, on the other hand, both left and right atrial tissue-related complications can be avoided; however, it adds six more anastomosis requiring more time and effort.[4] In our case, we used bicaval technique. Bicaval technique has also some disadvantages. Longer ischemic time in this



Figure 2. An intraoperative image of the completed anastomosis.

technique may be the major drawback, compared to the biatrial technique. Also, one of the most important complications with this technique is the risk of moderate anastomosis stenosis in the VCI and VCS region.[1,7,8] Fortunately, this complication is rarely reported by authors.[7,8] These complications, however, rarely make the anastomosis technique impossible. In this case, the VCI of the donor and recipient did not come across to allow an anastomosis, due to the smaller size of the donor's heart. The problem was considered related to the larger mediastinal length of the recipient in the vertical axis: the distance between the VCS and the VCI was longer than the donor heart could fit in. Therefore, simple patchplasty was not considered, since the gap needed a tubular grafting. As the recipient's right atrium was gigantic, biatrial technique was ruled out. A 3 cm long tubular graft was planned to repair the gap; however, the pericardium was scant due to repetitive surgeries previously. Thus, we decided to use the recipient's right atrial tissue to prepare a tubular graft. Tubular patches are widely used to repair congenital caval pathologies, as reported in previous studies.[9] In our case, it naturally extended the total operation time. Meanwhile, the donor's heart was perfused with antithymocyte globulin added blood cardioplegia on the operating table.

In conclusion, the heart of the recipient is a great source to create several grafts or patches, in particular, if there is no pericardium. As transplant surgeons face many challenging situations in daily practice, it may be helpful to keep in mind that the patient's own atrial tissues can be also used to prepare a patch.

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