Türk Göğüs Kalp Damar Cerrahisi Dergisi 2013;21(3):743-745
doi: 10.5606/tgkdc.dergisi.2013.5757

Case Report / Olgu Sunumu

Robotic-assisted double valve intervention: the first national experience

Robotik yardımlı çift kapak girişimi: İlk ulusal deneyim

Ahmet Ümit Güllü,[1] Şahin Şenay,[2] Muharrem Koçyiğit,[3] Cem Alhan[2]

[1]Department of Cardiovascular Surgery, Acıbadem Maslak Hospital, İstanbul, Turkey
[2]Department of Cardiovascular Surgery, Medicine Faculty of Acıbadem University, İstanbul, Turkey
[3]Department of Anaesthesiology and Reanimation, Acıbadem Maslak Hospital, İstanbul, Turkey

Robotic surgery is an important step in the evolution of cardiac surgery. In this article, we report a 55-year-old male case who underwent first robotic-assisted double valve intervention in Turkey.

Key words: Minimal invasive cardiac surgery; robotic surgery.

Robotik cerrahi, kalp cerrahisinin gelişiminde önemli bir adımdır. Bu yazıda, ülkemizde 55 yaşında bir erkek olguya yapılan ilk robotik yardımlı çift kapak girişimi sunuldu.

Anahtar sözcükler: Minimal invaziv kalp cerrahisi; robotik cerrahi.

Robotic surgery is the natural progression in the evolution of cardiac surgery, and robotically-assisted mitral valve intervention is now being performed in some specialized centers.[1] However, mitral valve replacement (MVR) together with tricuspid valve repair/replacement is a rare procedure. In this report, we present a case of robotically-assisted MVR and tricuspid valve repair.

CASE REPORT

A 55-year-old man with severe mitral and moderate-to-severe tricuspid regurgitation was referred to our center for surgical intervention. We found a sinus rhythm on electrocardiogram and cardiomegaly on chest radiography. Furthermore, transthoracic echocardiography (TTE) revealed normal left ventricular size and function with severe mitral and moderate-to-severe tricuspid valve regurgitation. Additionally, cardiac catheterization showed an absence of significant coronary artery disease (CAD).

Technique

Anesthesia and patient positioning

General anesthesia was initiated with sodium thiopental 2-4 mg/kg, midazolam 0.1 mg/kg, fentanyl 5-10 mcg/kg, and vecuronium 0.1 mg/kg intravenously. A double-lumen endotracheal tube and a multiplane transesophageal echocardiography (TEE) probe was then inserted, and external defibrillator pads were put into position, with the first one being on the right shoulder and the second at the left posterior thoracic wall through the lower limit of the heart. Next, the right arm was elevated with a chest roll and placed below the operating table, which was rotated 20° in the right-side up position. The incision sites were also marked.

Cannulation

Under the guidance of TEE, a 17-French (17-F) venous cannula (Medtronic Bio-Medicus, Eden Prairie, MN, USA) was inserted percutaneously via the right internal jugular vein, and the tip of the cannula was then inserted into the superior vena cava (SVC). Afterwards, the right common femoral artery was cannulated with a 17-F aortic cannula (Medtronic Bio-Medicus, Eden Prairie, MN, USA), and a 21-F venous cannula (Medtronic Bio-Medicus, Eden Prairie, MN, USA) was inserted into the right common femoral vein, with the tip located in the inferior vena cava (IVC).

Available online at
www.tgkdc.dergisi.org
doi: 10.5606/tgkdc.dergisi.2013.5757
QR (Quick Response) Code

Received: July 18, 2011 *Accepted:* November 10, 2011

Correspondence: Ahmet Ümit Güllü, M.D. Acıbadem Maslak Hastanesi, Kalp ve Damar Cerrahisi Kliniği, 34457 Maslak, İstanbul, Turkey.
Tel: +90 216 - 545 29 59 e-mail: aumitgullu@yahoo.com

Port implantation

A small incision was made in the right fourth intercostal space approximately 3 cm lateral to the nipple, and a small soft tissue retractor was placed into position. A camera port was deployed through this incision. The right thorax was insufflated with carbon dioxide to 8-10 mmHg, and two additional 8-mm port incisions were placed in the third and sixth intercostal spaces along the left and right anterior axillary lines. The left atrial retractor port was then placed approximately 3 cm medially to the camera port in the fourth intercostal space, and the robotic arms were connected to the ports.

Cardiopulmonary bypass (CPB), cardioplegia and cross clamping

Cardiopulmonary bypass with moderate hypothermia was instituted, and a pericardiotomy was performed using the forceps and cautery attachments. Snared pericardial stay sutures were then pulled through the lateral chest wall inferior to the thoracotomy and fixed externally. Next, endoscopic bulldog clips (Aesculap AG, Tuttlingen, Germany) were placed on the SVC and IVC with the aid of an applicator (Aesculap AG, Tuttlingen, Germany). In addition, a Chitwood aortic cross-clamp was also put into place. Afterwards, antegrade cold blood cardioplegia was administered through the cardioplegia cannula, and cardiac arrest was confirmed.

Valve procedure

After a 3-4 cm left atriotomy was created, the atrial retractor was manipulated into the left atrium, where a left atrial sump sucker maintained a dry operative field. Furthermore, intrathoracic carbon dioxide was insufflated continuously to displace the intracardiac air.

Unfortunately for this patient, mitral valve repair was not possible due to the thickened and restricted leaflets, fussed commissures, and foreshortened chordal attachments. The valve was then excised and replaced with 33 mm mechanical valve (St. Jude Medical Inc., St. Paul, MN, USA) via a series of 12 pledgeted mattress sutures (Figure 1). After a right atriotomy, the tricuspid valve was repaired using the De Vega annuloplasty technique. After the procedures were completed and the atrial incisions were closed, the bulldog clamps were removed, and the patient was weaned from CPB following de-airing. The cross-clamp time was 200 minutes, and the perfusion time was 323 minutes. Intraoperative TEE showed normal functioning mitral prosthesis along with no tricuspid insufficiency or paravalvular leak.

After adequate hemostasis was achieved, the robotic arms were removed from the chest, and a small flexible drainage tube was inserted into the pericardium through the existing port incision. After decannulation, the percutaneous catheter was removed from the internal jugular vein, and all incisions were closed in layers (Figure 2). The postoperative course was complicated by right-sided pneumonia. However, it resolved after proper antibiotherapy, and the patient was discharged on the 10th postoperative day. At the three-month follow-up, the patient was doing well and had improved functional status.

DISCUSSION

Although robotic cardiac surgery is in a state of evolution, the early results are encouraging, with evidence demonstrating fewer blood transfusions, shorter hospital stays, a faster return to preoperative function levels, and improved quality of life (QoL) compared with cardiac surgery performed via a

Figure 1. Image of the prosthetic mitral valve during the operation.

Figure 2. Skin closure after the operation.

sternotomy. These outcomes translate into improved utilization of limited healthcare resources.[1]

To our knowledge, this is the first reported case of robotic-assisted double valve intervention in a patient who underwent MVR and tricuspid valve repair. Even though the patient had postoperative right-sided pneumonia, he recovered in a few days and was discharged from the hospital 10 days after his surgery.

The CPB and cross-clamp times are longer during robotic surgery compared with conventional surgery, but these times became progressively shorter in consecutive patients in our series. In addition, CPB, cross-clamp, and total procedure times decrease significantly as surgical teams become more skilled and gain experience.[2]

Stepwise progression of robotic technology and procedure development will continue to make robotic operations easier and more efficient, which will encourage more surgeons to take up this technology and extend the benefits of robotic surgery to a larger patient population.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. Lehr EJ, Rodriguez E, Chitwood WR. Robotic cardiac surgery. Curr Opin Anaesthesiol 2011;24:77-85. doi: 10.1097/ACO.0b013e328342052d.
2. Mihaljevic T, Jarrett CM, Gillinov AM, Williams SJ, DeVilliers PA, Stewart WJ, et al. Robotic repair of posterior mitral valve prolapse versus conventional approaches: potential realized. J Thorac Cardiovasc Surg 2011;141:72-80. e1-4. doi: 10.1016/j.jtcvs.2010.09.008.