Totally endoscopic mitral valve repair

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Although 34 cases of endoscopic mitral valve repair with the da Vinci Surgical System (Intuitive Surgical, Inc, Mountain View, Calif) had been performed as of March 2000, a small right thoracotomy was used for all of them. A totally endoscopic mitral valve repair was performed on March 17, 2000, at our institution.

Clinical Summary

A 48-year-old woman had dyspnea and tachyarrhythmia on exertion of more than 8 months' duration. Transesophageal echocardiography revealed grade IV mitral valve regurgitation caused by rupture of the chordae of the posterior leaflet and an enlarged left atrium (Figure 1). Coronary angiography showed no significant coronary disease. The pulmonary artery pressure was 51/21 mm Hg. The V wave was determined, by means of the pulmonary capillary wedge pressure, to be 36 mm Hg and the left ventricular end-diastolic pressure, 25 mm Hg.

The operation was performed with the da Vinci Surgical System. The system consists of a surgeon's console, a patient-side cart, a high-performance 3-dimensional system, and various endoscopic instruments. By means of computer-enhanced technology, the system seamlessly translates the surgeon's hand movements at a console into corresponding micro movements of the instruments positioned inside the patient through small puncture incisions, or ports. For totally endoscopic mitral valve repair, a right-sided approach was used with four ports (Figure 2): one 12-mm port for delivery of the endoscope and three 10-mm ports, two of which accepted the instruments. The fourth port was used as the supply port for managing sutures and inserting a flexible atrial retractor

Figure 1. Preoperative transesophageal echocardiogram demonstrating prolapse of the posterior leaflet caused by chordal rupture.

Figure 2. Incisions for port placement.

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secured to the upper edge of the left atrium. For extracorporeal circulation, the Heartport system (Heartport, Inc, Redwood City, Calif) was used. The right jugular vein was punctured by the Seldinger technique and a 20F cannula was introduced into the superior vena cava. The right femoral artery and vein were cannu-

lated through the right groin. Cardioplegic arrest was established by occluding the ascending aorta with an EndoClamp catheter (Heartport) introduced via the side port of the arterial cannula through the descending aorta. After the ascending aorta had been occluded by inflation of the balloon, cardioplegic solution was administered into the aortic root from the tip of the balloon catheter. Cardioplegic arrest of the heart was achieved by application of 1500 mL of Bretschneider solution. The operation was conducted at 26°C.

A quadrangular resection of the posterior leaflet was performed (Figure 3) and the gap was repaired with interrupted sutures. The repair was completed with a combined technique of interrupted and running sutures for the implantation of a flexible ring (Duran ring; Medtronic, Inc, Minneapolis, Minn). The left atrium was closed with a running suture after deairing of the heart by forcing carbon dioxide gas into the blood-filled left atrium via a suction line. The crossclamp time was 115 minutes, and the total operative time was 480 minutes. Intraoperative transesophageal echocardiography confirmed the competency of the mitral valve after the patient was weaned from cardiopulmonary bypass. The patient was transferred to the intensive care unit without any inotropic support and was extubated in the intensive care unit 8 hours after the operation. Echocardiography was performed on postoperative day 10 on the ward and confirmed the intraoperative results.

Figure 3. Intraoperative photograph shows resection of the posterior leaflet.

Despite a long operative time, totally endoscopic mitral valve repair can be performed safely with the da Vinci Surgical System. More experience is needed to shorten the operative time.

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