Video-Assisted Minimal Access in Excision of Left Atrial Myxoma

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Background. **Minimal access surgery with video-assisted endoscopy has been applied to the correction of intracardiac lesions. We report our experience using this technique in surgical excision of left atrial myxoma in 3 patients.**

Methods. **From November 1995 to March 1997, 3 female patients, ages 45 to 80 years (mean, 62.7 years), received emergency operations for excision of left atrial myxoma. These operations were performed through a right anterior submammary minithoracotomy or right parasternal incision with the assistance of endoscopy during femoro–femoral cardiopulmonary bypass. The myocardium was protected by continuous coronary perfusion with fibrillatory arrest or cardioplegic arrest with aortic cross-clamping.**

Results. **All the tumors were excised completely through the right atrial approach. The bypass time was 92 to 148 minutes (mean, 111 minutes). The operation time was 3.2 to 4.4 hours (mean, 3.7 hours). There were no hospital deaths. Follow-up, which ranged from 6 to 19 months (mean, 10.5 months), was complete in all patients. Transthoracic echocardiographic examination showed good ventricular function without any residual tumors. Patients were found to be in New York Heart Association functional class I or II. They were satisfied with the good cosmetic healing of the incision.**

Conclusions. **Our experience demonstrates that minimal access surgery is a technically feasible, safe, and effective procedure in surgical excision of left atrial myxoma.**

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Intracardiac myxomas usually are managed by complete excision through a median sternotomy under direct vision with the use of cardiopulmonary bypass and hypothermic cardioplegic arrest [1–3]. However, the poor cosmetic effect and possible complications of median sternotomy are occasionally troublesome [4].

The concept of minimal access surgery (MAS), or minimally invasive cardiac surgery, has been introduced recently in the milieu of cardiac surgery to correct intracardiac lesions [5–15]. These open heart operations have been performed through minithoracotomy with or without the guidance of video-assisted endoscopy. The minimally invasive nature of these operations can lessen incisional pain, minimize incisional length, enhance functional recovery, and shorten hospital stay. However, the experience of MAS in surgical treatment of intracardiac tumors is rare [16]. In this review, we present our preliminary experience of MAS in 3 patients with left atrial myxomas operated on at Chang Gung Memorial Hospital, Taipei, Taiwan.

Material and Methods

Patients

From November 1995 to March 1997, 3 female patients underwent operation on an emergency basis with use of MAS techniques at Chang Gung Memorial Hospital, Taipei, Taiwan, for excision of left atrial tumors (Table 1). Their ages ranged from 45 to 80 years, with a mean of 62.7 years. The presenting symptoms were asthma in patient 1, syncope in patient 2, and dyspnea on exertion in patient 3. The diagnosis was established by transthoracic echocardiographic examination. The left ventricular ejection fraction ranged from 0.39 to 0.80. Severe tricuspid regurgitation was also noted by the echocardiographic examination in patient 2. Chronic obstructive pulmonary disease with pneumonia was also diagnosed in patient 1. Cardiac catheterization was not performed. Emergency operation was arranged after the diagnosis was confirmed. The patients or their family members were informed that a median sternotomy might be necessary and all signed the operative consent form.

Operative Techniques

The MAS techniques used in these patients had been previously described with some modification [13, 16]. Under general anesthesia, with single-lumen endotracheal intubation, patients were put in a left semidecubitus position (patient 1) or supine position (patients 2 and 3). Transesophageal echocardiographic monitoring was

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Table 1. Patient Information

Variable	Patient 1	Patient 2	Patient 3
Age (y)	80	45	63
Sex	Female	Female	Female
Presentation	Asthma	Syncope	Dyspnea
Preoperative LVEF	0.39	0.67	0.80
Associated lesion	COPD and pneumonia	Severe TR	None

COPD = chronic obstructive pulmonary disease; LVEF = left ventricular ejection fraction; TR = tricuspid regurgitation.

set up. The position of the pedicle of the tumors on the interatrial septum was identified by the transesophageal echocardiographic examinations.

In patient 1, a right anterior submammary minithoracotomy (6 cm in length) through the fourth intercostal space was made without excision of the ribs [16]. A small rib spreader was used in these incisions to facilitate instrumentation. In patients 2 and 3, a right parasternal incision (8 cm in length, Fig 1) was made with excision of the third and fourth costal cartilage [13]. The right internal thoracic arteries of patients 2 and 3 were ligated and divided. The right atrium (Fig 2A), superior vena cava, and ascending aorta were exposed after pericardiotomy.

Fig 1. Picture of patient 2's incision taken 1 week after operation.

Cardiopulmonary bypass was established through cannulation of the femoral artery and femoral vein. The

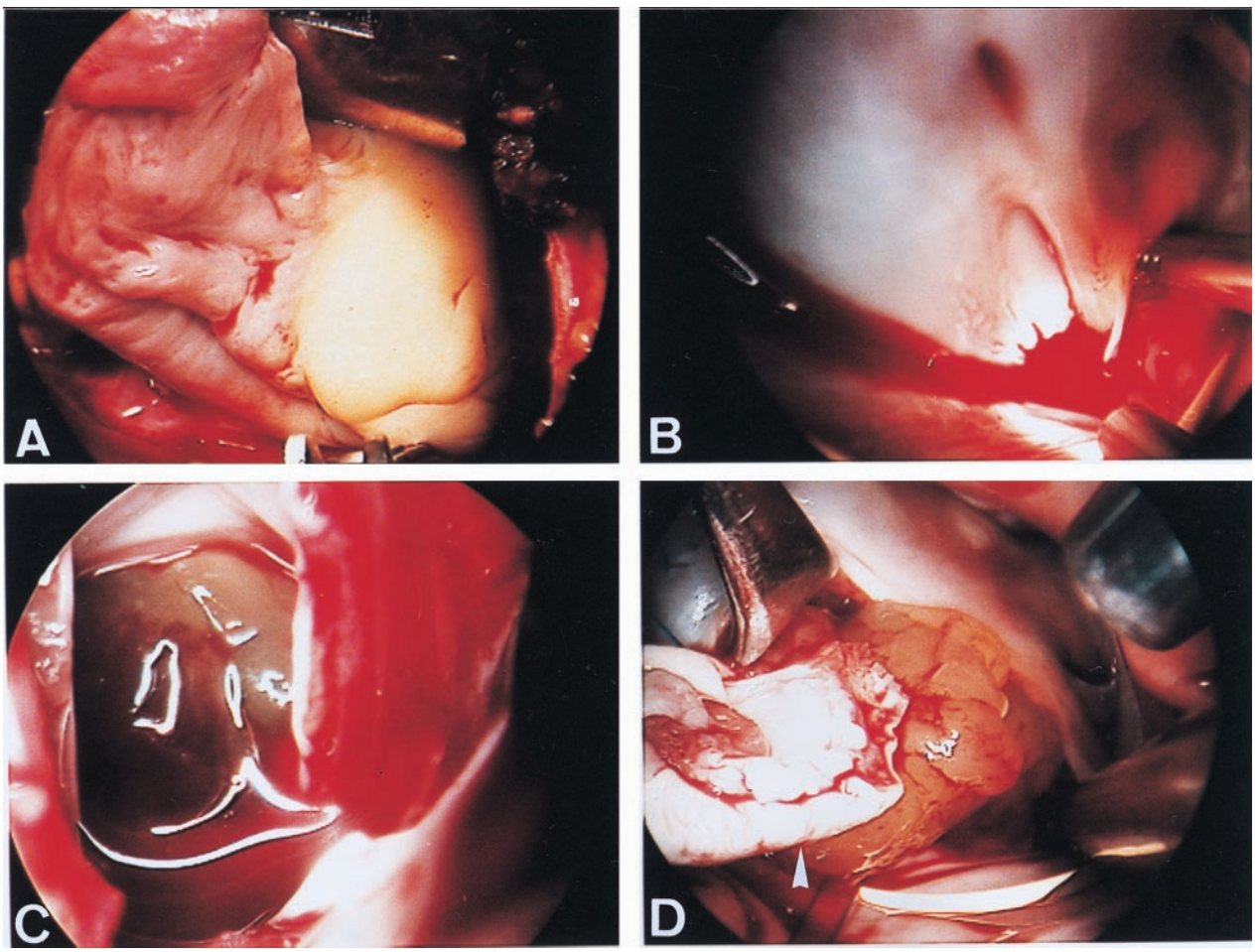

Fig 2. (Patient 3.) (A) The right atrium was exposed after right parasternal incision, excision of the third and fourth costal cartilages, and pericardiotomy. (B) Fossa ovalis was found after right atriotomy. (C) The interatrial septum was incised and the myxoma was exposed. (D) The myxoma was removing through the right atrium with full thickness of interatrial septum. Arrowhead *indicates interatrial septum attached with pedicle of the myxoma.*

venous cannula was inserted to the level of retrohepatic inferior vena cava. A membranous oxygenator was used. Systemic hypothermia began immediately after the start of extracorporeal circulation. Cannulation and snaring of the superior vena cava through the right atrium was performed. In patient 1, the aorta was not cross-clamped and the heart was protected with continuous coronary perfusion with fibrillatory arrest, without infusion of cardioplegic solution. In patients 2 and 3, the aorta was cross-clamped and cold-blood cardioplegic solution was delivered into the aortic root for myocardial protection. Topical cooling of the heart was not performed.

After the heart fibrillated, right atriotomy was performed. An endoscope (0 degree and not flexible; Stryker Endoscopy, San Jose, CA) was inserted through a separate thoracostomy incision (2 cm in length) that was used later for pleural tube insertion. The intracardiac lesions were approached by the endoscope after the heart was arrested by means of projected images on the video monitor. The fossa ovalis was identified (Fig 2B), the interatrial septum was incised with 1 cm margin around the pedicle of the myxoma (Fig 2C), and the myxoma was then removed through the right atrium with full thickness of interatrial septum (Fig 2D).

All four chambers of the heart were then explored using the endoscope for any simultaneous or dislodged tumors (Figs 3A, 3B). The interatrial septal defect was repaired using a patch of autologous pericardium. Before completeness of the repair of the interatrial patch, the left ventricle and the left atrium were filled with blood. A venting catheter was inserted in the aortic root. The air was then carefully evacuated while rotating the operating table in all directions and expanding both lungs by manual ventilation. There were no obvious air bubbles noted by transesophageal echocardiographic examination. The patients were kept in a head-down position. Cardioversion was easily performed by putting the cardioverter pads on the surface of heart through the incision. Sinus rhythm recovered in each patient. In patient 2, the tricuspid valve was repaired by annuloplasty; transesophageal echocardiographic examinations showed trivial to mild tricuspid regurgitation.

Cardiopulmonary bypass was terminated after rewarming of the patients. Hemostasis and closure of the incisions were easily achieved. The femoral arteriotomy and venotomy were carefully repaired with interrupted nonabsorbable sutures. Intercostal block and epidural analgesia were not used in these 3 patients.

The excised tumor (Fig 3D) was sent for histologic examination.

Results

All the tumors were excised completely. The duration of cardiopulmonary bypass was 92 to 148 minutes (mean, 111 minutes). The operation time was 3.2 to 4.4 hours (mean, 3.7 hours) (Table 2). Cardiotonic drugs and intraaortic balloon pumping were not used. All patients regained consciousness in the early postoperative period and the endotracheal tubes were removed on the night of operation or the first postoperative day. There were no hospital deaths. Histologic examination of the tumors showed myxoma (Fig 4). The surgical margins of the tumors were free of tumor cells as shown on the final pathologic inspection. Oral analgesics were prescribed to the patients. Parenteral narcotic injection was given if the patients asked for it. The total incidence of parenteral narcotic injections during hospitalization was one to three episodes with a mean of 1.7. Antibiotics were given in patient 1 for preoperative pneumonia. There was no wound or lower limb vascular complications. Transient subcutaneous emphysema, which subsided spontaneously, occurred in patient 3. The postoperative length of stay was 5 to 12 days with a mean of 7.7 days. Follow-up of 6 to 19 months (mean, 10.5 months) was complete in all patients. Transthoracic echocardiographic examination showed good ventricular function without any residual or recurrent tumors. Trivial regurgitation of the tricuspid valve was noted in patient 2. They all were found to be in New York Heart Association functional class I or II. They were satisfied with the good cosmetic healing of the incision (Fig 1).

Comment

We report 3 patients with left atrial myxomas who were operated on in a emergency basis with the use of MAS. They were critically ill because of mechanical obstruction. However, they recovered rapidly from the operations indicating that MAS could be effective and safely performed in these critically ill patients.

Myxoma is the most common primary tumor of the heart. In adults, 50% of all benign cardiac tumors are myxomas [1]. Myxoma arises from the endocardium as a polypoid, often pedunculated, tumor that extends into a cardiac chamber. Most myxomas arise singly in the atria, and approximately 75% occur in the left atrium. Multiple myxomas occur in 5% of patients. Atrial myxomas are commonly attached to the septum in the region of the fossa ovalis.

Traditionally, standard cardiac operations for excision of intracardiac tumor required a long and painful median sternotomy incision [1–3]. The results are generally excellent. Most patients do well after resection, and operative mortality is less than 3% [2]. However, the poor cosmetic effect and possible complications of median sternotomy are troublesome occasionally [4]. From the experience of minimally invasive thoracic operations, video-assisted endoscopic techniques can be applied to replace the classic standard procedures without compromising the treatment [17]. Experience in MAS of our and other series showed that MAS can provide the promise of expediency, safety, minimal discomfort, less postoperative pain, quick functional recuperation, excellent cosmetic healing, shortened hospital stays, and therefore savings in cost [5–15]. In this preliminary experience of MAS in left atrial myxoma, there were no operative deaths, no wound or lower limb vascular complications, and no neurologic deficits. The incision length was short and patients were satisfied with the cosmetic healing. These indicate that MAS is a safe procedure with the expectation of the previously mentioned benefit of MAS.

A biatrial exposure is recommended to limit manipu-

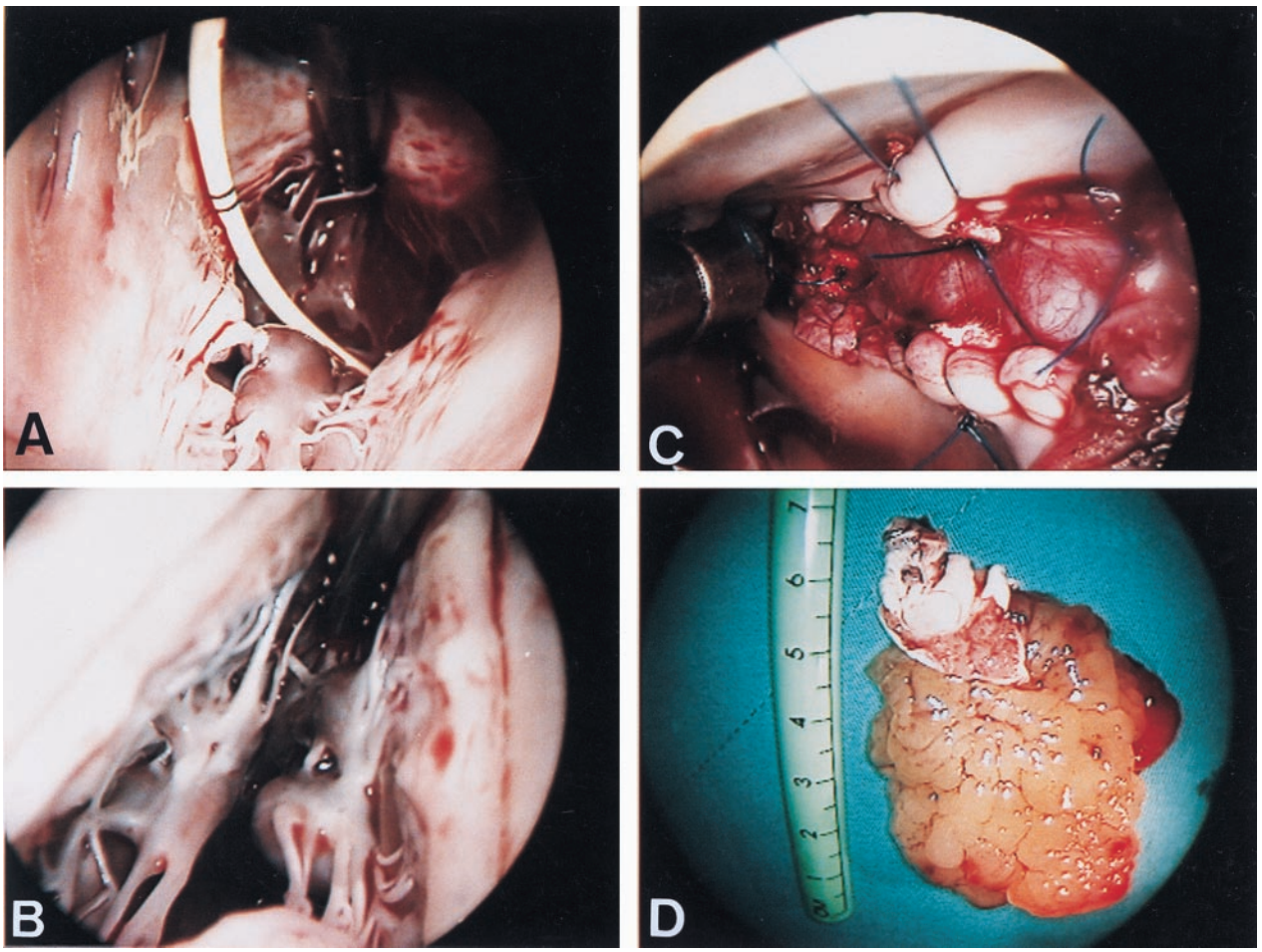

Fig 3. (Patient 3.) (A) The right ventricle was explored by the video-assisted endoscope for any simultaneous or dislodged tumors. (B) The left ventricle was explored by the video-assisted endoscope. (C) The interatrial septal defect was repaired by autologous pericardium. (D) The excised myxoma (3 × 5 × 6 cm).

lation of the tumor and to allow visualization of all four chambers of the heart [3, 18, 19]. To avoid recurrence, the surgical margin of the excision must include a wide base of atrial septum. For surgical removal of the myxomas attached to the atrial septum, part of the atrial septal wall to which the pedicle of the tumor is attached must be removed en bloc with the pedicle of the tumor. The defect is closed either primarily or with a native pericardial patch [1]. In our series, the tumors were exposed with a right atriotomy and a transseptal approach. With this method, access is provided to the atrial septum, mitral valve, and free atrial wall, and left atrial myxomas can be readily resected with an adequate button of normal interatrial septum. The interatrial defects were repaired with a patch of autologous pericardium.

Recurrence of myxoma could be prevented by complete resection with removal of an adequate margin of normal atrial septum. Tumor manipulation should be minimal during cannulation and before aortic cross-clamping and cardioplegic arrest to prevent intraoperative tumor dislodgment and embolization [1]. In our series, using MAS techniques, the manipulation of the heart could be reduced to the minimum, which reduced the chance of embolization. Exploration of all heart chambers could be easily performed using the endoscope to detect any simultaneous myxoma or dislodgment of

Table 2. Surgical Information

Variable	Patient 1	Patient 2	Patient 3
Incision	Submammary	Parasternal	Parasternal
Myocardial protection	Fibrillatory arrest	Cardioplegic arrest	Cardioplegic arrest
Aortic cross-clamp time (min)	. . .	60	56
Bypass time (min)	148	93	92
Operation time (h)	4.4	3.5	3.2
Concomitant procedure	None	Tricuspid annuloplasty	None

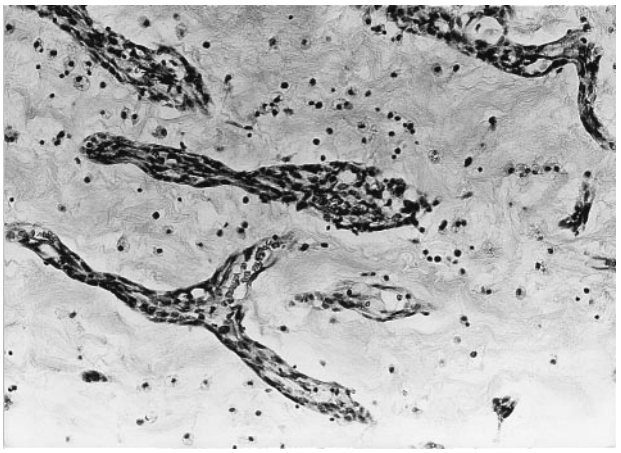

Fig 4. Histologic examination of myxoma from patient 1. It consists of a myxoid, loose matrix. The myxoma cells aggregate around blood vessels and form vascularlike channels. (Hematoxylin and eosin; ×320 before 55% reduction.)

the myxomas. All of our patients recovered with good ventricular function, no neurologic deficits, and no residual or recurrence of tumor, indicating no tumor embolization or dislodgment.

In cardiac operations, cardiopulmonary bypass can be performed through cannulation of the femoral artery and vein [4]. In MAS, numerous experiences demonstrated that simple femoro–femoral bypass could provide satisfactory perfusion of all vital organs, including the brain [5–16]. In this series, there was no organ failure after operation, indicating good tissue perfusion. There were no lower limb vascular complications noted during the follow-up period.

There are several different methods of myocardial protection in MAS for intracardiac lesions. Continuous perfusion of the heart without cross-clamping the ascending aorta while the heart is in fibrillatory arrest is an old but effective method of myocardial protection [20] and has been used in MAS frequently [5–11]. Cardioplegic arrest is the standard procedure for myocardial protection. In MAS, cardioplegic arrest can be performed with aortic cross-clamping [12–14] or with endoaortic occlusion [21]. In this series, using continuous coronary artery perfusion with fibrillatory arrest in patient 1 and cardioplegic arrest with aortic cross-clamping in patients 2 and 3, there was no low cardiac output postoperatively. Cardiotonic drugs and intraaortic balloon pumping were not used. These indicated adequate myocardial protection.

The major advantage of MAS is avoidance of sternotomy. The minimally invasive nature of this procedure might reduce the incidence of postoperative mediastinitis and wound pain to a minimum. There was no wound infection, mediastinitis, or respiratory failure in our patients. Patients were satisfied with the minithoracotomy incision. The postoperative length of stay (mean, 7.7 days), including postoperative antibiotic treatment for preoperative pneumonia in patient 1, was short in these critically ill patients. This was slightly shorter than that of uncomplicated coronary artery bypass grafting performed through median sternotomy in our institute (8.2 days) [14]. These demonstrated that MAS for excision of left atrial myxomas could offer quick functional recovery, excellent cosmetic healing, shorten hospital stay, and therefore medical cost. Video-assisted minimal access surgery might be an alternative for surgical excision of left atrial myxoma.

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