Comparison of early postoperative quality of life in minimally invasive versus conventional valve surgery

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Abstract

Purpose. Minimally invasive cardiac surgery (MICS), an approach in which full sternotomy is avoided and the surgical incision is minimal, has been shown to produce less postoperative discomfort and to enable earlier mobilization and discharge than conventional cardiac surgery (CCS). This study was performed to retrospectively evaluate quality of life following MICS in comparison with CCS valve surgery.

Methods. Sixty-six patients scheduled for MICS and 50 patients scheduled for CCS for isolated aortic or mitral valve surgery from January 1999 to June 2001 were enrolled in the study. The clinical records for the two groups were compared across intraoperative parameters and those associated with postoperative quality of life.

Results. The aortic clamp and cardiopulmonary bypass times in the MICS group were longer than those in the CCS group (144 ± 42 and 224 ± 58 min vs 112 ± 21 and 179 ± 27 min, \( P < 0.001 \)). Postoperative pain medication (rectal buprenorphine and intramuscular pethidine) was administered to 18 of the 66 MICS patients (27%), as compared with 26 of the 50 CCS patients (52%, \( P = 0.007 \)). Postoperative delirium was less frequent in the MICS group than the CCS group (26% vs 44%, \( P = 0.039 \)). Initial postoperative food intake and urine catheter removal were possible earlier in the MICS than in the CCS group. MICS patients had shorter stays in the intensive care unit than CCS patients (37.4 ± 7.3 vs 45.9 ± 8.7 h, \( P < 0.001 \)).

Conclusion. Although longer aortic clamp and cardiopulmonary bypass times remain a problem in MICS procedures, our results suggest that MICS, as compared with CCS, facilitates earlier recovery of daily activities and provides improved quality of life in the early postoperative period.

Key words Minimally invasive cardiac surgery · Postoperative pain · Postoperative delirium · Quality of life

Introduction

Minimally invasive cardiac surgery (MICS) has been growing in popularity over the past several years, and incisions have become increasingly smaller as video-assisted endoscopic techniques have been developed. MICS has evolved two subcategories: beating heart myocardial revascularization without cardiopulmonary bypass, and valve surgery using femoral perfusion via a smaller incision, such as anterolateral minithoracotomy or various types of partial sternotomies. At our institution, MICS valve surgery was introduced in December 1996, while conventional valve surgery via a median sternotomy has also been traditionally used.

MICS valve surgery, an approach in which full sternotomy is avoided and the size of the surgical incision is minimal, has been shown to produce less postoperative discomfort and to enable earlier mobilization and discharge than conventional cardiac surgery (CCS) [1,2]. The term “minimally invasive” is derived from a reduction in surgical trauma and implies similar reductions in postoperative pain, impairment of usual activities, and length of hospital stay and rehabilitation. However, whether or not MICS procedures are really “minimally invasive” in this expanded sense remains unproven, as there is no general agreement on the definition and no standard approach to the measurement of outcomes covered by the term.

In cardiothoracic surgery, the measurement of outcome traditionally involves evaluation of cardiac symptoms, including mortality, complications, and recurrence of symptoms. Recently, increased attention has been given to postoperative quality of life, to provide a more comprehensive assessment of the impact of disease and treatments on the daily living activities of individual patients. Quality of life comprises self-perception of symptoms, well-being, and physical and mental function. In the present study, postoperative pain, incidence of postoperative delirium, and recovery...
of usual activities were evaluated as a means of assessing quality of life, and we retrospectively compared the quality of life in the early postoperative period following MICS and CCS valve surgery.

**Materials and methods**

We retrospectively reviewed the clinical records of patients scheduled for isolated aortic valve replacement or mitral valve replacement or repair from January 1999 to June 2001. Patients who needed reoperation and those who were tracheally extubated on and after the second postoperative day were excluded from the study. All valve operations were performed by teams of two staff surgeons using the MICS or CCS approach. The choice of the approach was based on the surgeon’s preference and the patient’s choice. This study was approved by the institutional ethical committee for human research.

MICS aortic valve replacement was performed using a 6- to 8-cm median skin incision and a “J” ministernotomy with upper semitransverse division at the level of the second rib with the aid of video-assisted endoscopic technique. The left femoral artery and the right femoral vein were cannulated to establish cardiopulmonary bypass. MICS mitral valve operations were performed using the ministernotomy technique described above, and cardiopulmonary bypass was established through cannulation of the left femoral artery, the right femoral vein, and the right internal jugular vein.

The CCS aortic valve replacement employed a full sternotomy and cannulation of the ascending aorta and the right atrium for cardiopulmonary bypass. CCS mitral valve operations were performed using the full sternotomy, and cardiopulmonary bypass was established through cannulation of the ascending aorta and the superior and inferior venae cavae.

Except for the cannulation, cardiopulmonary bypass and myocardial preservation were same in the MICS and CCS procedures. The ascending aorta was cross-clamped and cardiopulmonary bypass was conducted at a moderately hypothermic temperature (bladder temperature, 28°C) using a centrifugal pump, a membrane oxygenator, and an arterial line filter. Nonpulsatile pump flow was maintained at 2.2–2.6 l·min⁻¹·m⁻² with mean systemic pressure maintained between 50 and 80 mmHg. Myocardial preservation was performed by antegrade cold potassium blood cardioplegia in patients other than those with aortic valve stenosis, whereas patients with aortic valve stenosis received antegrade and retrograde cold potassium blood cardioplegia.

The anesthetic regimen for both the MICS and the CCS procedures consisted of induction with midazolam (2–4 mg), fentanyl (5 µg·kg⁻¹), and vecuronium (0.15 mg·kg⁻¹), followed by maintenance infusion of fentanyl (50–75 µg·kg⁻¹), midazolam (0.2–0.3 mg·kg⁻¹), and vecuronium. Intraoperative monitoring parameters included five-lead electrocardiography, arterial pressure, central venous pressure, pulmonary artery catheter, pulse oximetry, capnography, urine output, and nasopharyngeal and bladder temperature. Transesophageal echocardiography was also routinely used to assess ventricular and valvular function and to confirm the complete removal of intracardiac air.

Following completion of the surgery, patients were transferred to the intensive care unit. Postoperative care was standardized and was delivered by the same two staff anesthesiologists for all patients in the study. The patients were sedated with propofol (1–1.5 mg·kg⁻¹·h⁻¹) until the next morning and then were evaluated for tracheal extubation according to criteria including hemodynamic stability, adequate pulmonary function, adequate urine output, and minimal chest tube output. With tracheal extubation, the nasogastric tube was removed. About 6 h after extubation, the patients were allowed oral feeding of clear liquids if mentally alert. If the patient tolerated a clear liquid diet, a regular diet was provided on the next postoperative day. When a patient reported wound pain and required analgesics for it, rectal buprenorphine 0.4 mg was administered in the intensive care unit and in the ward. If the patient was not satisfied within 30 min, pethidine 35 mg was given intramuscularly. Chest tubes were removed when the drainage volume decreased to less than 40 ml in the previous 8 h and an air leak was not evident. The urinary catheter was removed after removal of the chest tubes and when the patient was able to ambulate around the bed and void without the catheter.

The clinical records were reviewed and the following variables were noted: aortic cross-clamp and cardiopulmonary bypass times, time to extubation, duration of postoperative inotropic support, time to first postoperative intake of food (regular diet), removal of chest tubes and urinary catheters, and intensive care unit and total hospital lengths of stay. In addition, the number of patients who required postoperative pain medication and those who developed postoperative delirium were evaluated. A patient was classified as having had delirium if the data from the medical records met ICD-10 Classification of Mental and Behavioural Disorders criteria [3,4]. A psychiatrist confirmed the diagnosis of delirium. The results are expressed as means ± SD. Statistical analysis was performed using the Student’s unpaired t-test and the chi-square test. Differences were considered significant when \( P < 0.05 \).