

# Minimally Invasive Aortic Valve Replacement under Thoracic Epidural Anesthesia in a Conscious Patient: Case Report

Tomislav Klokocovnik, MD, PhD, Jiri Hollan, MD, Maja Sostaric, MD, Tatjana Pintar, MD, Tomislav Mirkovic, MD

Departments of Cardiovascular Surgery and Anesthesiology and Intensive Therapy, University Medical Center Ljubljana, Ljubljana, Slovenia



## ABSTRACT

Cardiopulmonary bypass and full median sternotomy have been recognized as major morbidity factors in cardiac surgery. Additional morbidity factors are general anesthesia and endotracheal intubation. Over the past several years high-thoracic epidural anesthesia (hTEA) has emerged as a potentially beneficial supplement to general anesthesia in the care of patients undergoing cardiac surgery. We report a case of ministernotomy aortic valve replacement performed with hTEA. The procedure was not converted to general anesthesia or to a conventional operation and was performed without adverse incidents. The patient was discharged from the hospital on the 2nd postoperative day. There were no complications within 30 days after surgery. This case demonstrates that thoracic epidural anesthesia without endotracheal intubation used for aortic valve replacement performed through ministernotomy is feasible. Further experience is necessary to determine the safety of this method and the effect on outcome.

## INTRODUCTION

Cardiopulmonary bypass and median sternotomy have been recognized as major morbidity factors in cardiac surgery [Benetti 1985, Arom 2000]. Additional morbidity factors are general anesthesia and endotracheal intubation. Over the past several years high-thoracic epidural anesthesia (hTEA) has emerged as a potentially beneficial supplement to general anesthesia in patients undergoing cardiac surgery [Tuman 1991, Meisner 1997, Diegeler 1999]. We report the case of a patient undergoing ministernotomy aortic valve replacement performed with hTEA. Because of the preoperative finding of impaired pulmonary function, the patient was at moderate

risk for surgery with conventional general anesthesia and endotracheal intubation.

## CASE REPORT

Minimally invasive aortic valve replacement with hTEA was performed on a 64-year-old patient with severe aortic valve stenosis. Ejection fraction was 52%. The epidural catheter (Arrow International, Reading, PA, USA) was introduced at the T3-T4 interspace 1 day before surgery. A dose of 8 mL of 1% lidocaine (without epinephrine) was given to test the efficacy of the block and to rule out intrathecal or intravascular catheter placement. To achieve motor and sensory block, 0.75% bupivacaine with 0.05 µg of fentanyl was given. Additional doses were given throughout the procedure to maintain the block. Oxygen was given by 100% rebreathing mask. The patient was monitored in standard fashion, including continuous end-tidal CO<sub>2</sub> monitoring. Serial blood gas analysis was performed during the procedures. Propofol 1 mg/kg per hour was administered for sedation during surgery.

Prior to the operation and after he agreed to be operated on with the hTEA method, the patient was psychologically assessed and prepared for dealing with the conscious state during the procedure. Self-adhesive external defibrillator pads and pediatric defibrillator pads were available for defibrillation if necessary.

We made a straight 6-cm skin incision and J-shaped partial sternotomy at the level of the 2nd intercostal space, through which we opened the pericardium longitudinally. Both mammary arteries were preserved. The partly opened pericardium was then suspended to the skin, to help expose the ascending aorta, the right ventricular outflow tract, the right atrium, and, in part, the pulmonary artery and the superior vena cava. The aorta was retracted with a tape to facilitate exposure of the aortic root. Then followed cannulation of the ascending aorta, superior vena cava, and inferior vena cava through the right atrium. After we established vacuum cardiopulmonary bypass (CPB), we cross-clamped the aorta and infused cardioplegic solution into the ascending aorta to achieve cardiac arrest. The valve was approached through a transverse aortotomy. During aortic valve replacement, a vent was placed in the left ventricle through the aor-

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Address correspondence and reprint requests to: Tomislav Klokocovnik, MD, PhD, Department of Cardiovascular Surgery, University Medical Center Ljubljana, 7 Zaloska, 1000 Ljubljana, Slovenia; 386-15224941, 386-41787902; fax: 386-15224941 (e-mail: tomi.klokocovnik@siol.net).

tic annulus. The native valve was completely removed and replaced with a St. Jude valve, which was secured by polytetrafluoroethylene (Teflon) pledgets and sutures. After valve replacement and restoration of cardiac function, we de-aired the heart through the aortic vent. Then followed weaning from CPB, infusion of protamine, and removal of the cannulas. Electrodes placed on the right ventricular outflow tract were used for temporary electrical stimulation. A drainage tube was inserted in the anterior mediastinum, and hemostasis was achieved. Two steel wires were used for closing the sternotomy. The cross-clamp time was 42 minutes, and the CPB time was 51 minutes.

The procedure was not converted to general anesthesia or to conventional operation. The patient did not develop hemorrhagic complication or epidural compression caused by the use of high-dose heparin (3 mg/kg), despite the epidural puncture done 24 hours before surgery. The length of hospital stay was 2 days. Follow-up echocardiography showed normal valvular function. There were no complications within 30 days after surgery.

## DISCUSSION

Minimally invasive valve surgery with epidural anesthesia may be an effective alternative for high-risk patients. In particular, the technique may be useful for patients with severe pulmonary disease, which can increase perioperative risk if the patient undergoes an operation with general anesthesia and endotracheal intubation. Use of a small upper sternotomy in selected cases may further improve the results of aortic valve replacement with hTEA by reducing surgical trauma. Because this patient's sympathetic nerves were blocked with local anesthetic agents, the sympathetic response to surgical manipulation did not occur. Use of the epidural catheter for postoperative pain management was clearly beneficial and facilitated recovery [Kirno 1994, Liem 1998]. Therefore we make great effort preoperatively and during the operation to talk to patients and to explain every stage of the procedure. Regional anesthesia minimizes the

amount of anesthetic drugs required. Under light sedation, patients feel comfortable, and continuous monitoring of brain function during CPB can be conducted.

Use of thoracic epidural anesthesia without endotracheal intubation in aortic valve replacement performed through partial upper sternotomy is feasible. Minimally invasive approaches with hTEA can be used for replacing mitral valves and for other cardiac procedures, such as mitral or tricuspid valve repair, closure of atrial septal defect with sutures, and replacement of the ascending aorta. Further experience is necessary to understand the safety of this method and its effect on outcome.

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