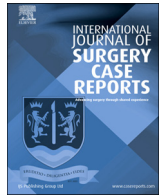




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## Preoperative optimization with levosimendan in heart failure patient undergoing thoracic surgery

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## ABSTRACT

**INTRODUCTION:** We present the case of a patient with dilatative cardiomyopathy waiting for heart transplantation with pleural effusion to be subjected to pleural biopsy, treated with preoperative infusion of levosimendan to improve heart performances.

**PRESENTATION OF CASE:** A 56-year-old man (BMI 22,49) with dilatative cardiomyopathy (EF 18%) presented right pleural effusion. The levosimendan treatment protocol consisted of 24 h continuous infusion (0,1 ug/kg/min), without bolus. The patient was under continuous hemodynamic monitoring prior, during and after levosimendan administration. The surgery for pleural biopsy was performed with uniportal Video Assisted Thoracoscopic approach (VATS).

**DISCUSSION:** A significant increase of Cardiac Index (CI) and Stroke Volume Index (SVI) were observed at 4 h after infusion initiation and was sustained during the next 24 h after the end of infusion. Levosimendan administration was safe.

**CONCLUSION:** In this case the prophylactic preoperative levosimendan administration is safe and effective in cardiac failure patient undergoing thoracic surgery, but prophylactic preoperative levosimendan treatment in these patients merits further study.

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## 1. Introduction

Heart failure is an important risk factor for mortality and cardiovascular complications after non cardiac surgery [1,2]. Levosimendan, in contrast to other positive inotropic agents, has the advantage to improve cardiac performance and hemodynamics in CF patients without increasing myocardial oxygen consumption or showing any proarrhythmic effects [3].

The use of levosimendan for perioperative optimization of patients undergoing cardiac surgery has been reported in several studies [4,5], however it has not been thoroughly evaluated in cardiac failure patients undergoing non cardiac surgery.

We present the case of a patient with dilatative cardiomyopathy waiting for heart transplantation with pleural effusion to be

subjected to VATS for pleural biopsy, treated with preoperative infusion of levosimendan to improve heart performance.

Consent was obtained from the patient.

## 2. Presentation of Case

A 56-year-old man (height 170 cm, weight 65 kg, BMI 22,49) with dilatative cardiomyopathy (EF 18%) presented right pleural effusion. Cytological examination of pleural fluid was not diagnostic to exclude a malignancy therefore needed surgical pleural biopsies to get diagnosis in order to be put in list for transplantation.

The patient previously underwent surgery for aortic and mitral valve replacement and implanted a pacemaker (INCEPTA CRT-D P162).

The patient was admitted to our PACU the day before the surgery for levosimendan administration.

The levosimendan treatment protocol consisted of 24 h continuous infusion (0,1 ug/kg/min), without bolus. The patient was under continuous hemodynamic monitoring prior, during and after levosimendan administration.

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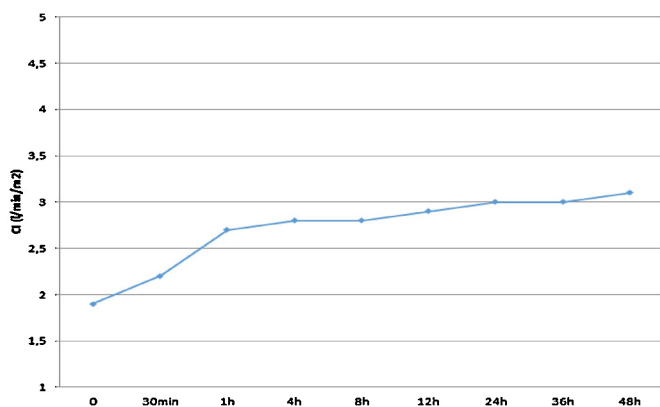


Fig. 1. Changes in Cardiac Index.

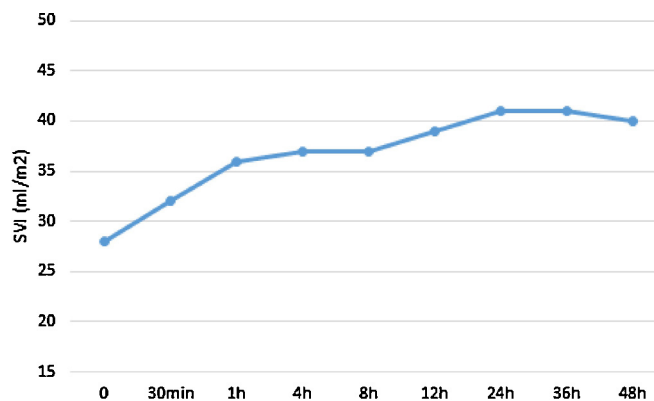


Fig. 2. Changes in Stroke Volume Index.

The monitoring included continuous heart rate monitoring via electrocardiogram, arterial blood pressure via femoral artery catheter, urine output, pulse oximetry, PVC through venous catheter in internal jugular vein, cardiac output (CO), cardiac index (CI), stroke volume index (SVI), central venous oxygen saturation (ScvO<sub>2</sub>) and oxygen delivery (DO<sub>2</sub>) via EV1000 (Edwards Lifesciences). Blood tests were performed every 12 h and blood gas analysis every 4 h. Before levosimendan infusion CI was 1.9, SVI was 28, ScvO<sub>2</sub> was 48%. The surgery was performed at the end of levosimendan treatment.

Intraoperative monitoring included continuous electrocardiogram, SpO<sub>2</sub>, blood pressure, bispectral index monitor (BIS), train of four watch (TOF), INVOS 5100C cerebral somatic oximeter (Medtronic, Dublin, Ireland) to assess the cerebral oxygenation, EV1000 to assess hemodynamic parameters. Midazolam premedication (0.03 mg/kg) was administered i.v. 10 min before induction of anesthesia. General anesthesia was induced with a target controlled infusion of propofol/remifentanyl and rocuronium bromide (0.6 mg/kg) and maintained with propofol/remifentanyl and supplemental bolus of rocuronium according to TOF values. A left DLT 39 Fr (Rusch, Durham, NC) was positioned and checked with FOB, the lungs were mechanically ventilated with an oxygen-air mixture (FiO<sub>2</sub> 50%), the OLV was performed with CMV-AF 5 ml/Kg, RR for EtCO<sub>2</sub> <40 mmHg, PEEP 5.

The surgery for pleural biopsy was performed with uniportal Video Assisted Thoracoscopic (VATS) approach at V intercostal space. The time of intervention was 70 min. One thoracic drainage was placed at the end of surgery. Patient awake comfort full.

No complications occurred during anesthesia and hemodynamic and respiratory parameters were stable during surgery.

The monitoring was continued postoperatively in the PACU until 24 h post infusion. An evident increase of CI and SVI were observed at 4 h after infusion initiation and was sustained during the next 24 h after the end of infusion (Fig. 1 and Fig. 2). Additionally, ScvO<sub>2</sub> was increased at 4 h after infusion initiation and kept increasing during the 24 post infusion hours (Fig. 3). Levosimendan showed no harmful effect on HR, SAP, DAP or MAP, administration was safe, no adverse drug reaction or complication occurred during follow up.

Pleural biopsies reported histological evidence of chronic pleurisy.

### 3. Discussion

A decreased preoperative EF has been associated with increased postoperative morbidity and mortality, while perioperative left ventricular dysfunction is one of the major predictors of postoperative cardiac complication [6].

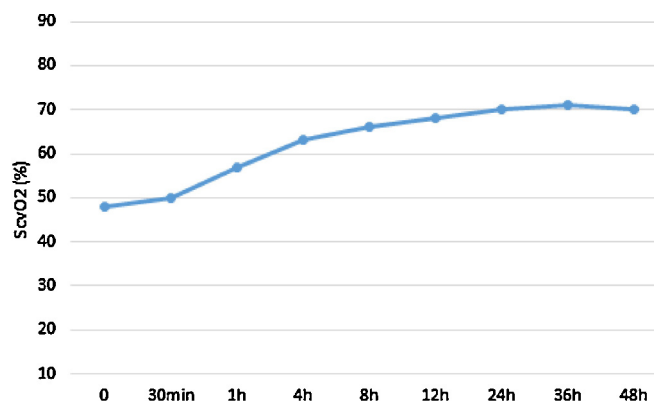


Fig. 3. Changes in Central Venous Oxygen Saturation.

During the last years an increasing number of patients with high perioperative risk and decreased left ventricular function are referred to cardiac and non cardiac surgery; heart failure is the major cause of perioperative morbidity and mortality.

The effect of levosimendan as an inodilator are based on a triple mechanism of action that provides positive inotropy equal or even superior to any of the other commercially available inotropic agents with a neutral effect on oxygen consumption and with preconditioning, cardioprotective, antistunning and antischemic effects [7–13].

Levosimendan produces significant dose-dependent increases in stroke volume and cardiac output and decreases in pulmonary capillary wedge pressure, mean blood pressure, mean pulmonary artery pressure, mean right atrial pressure and total peripheral resistance [14].

Clinical studies show that levosimendan effectively improves general and pulmonary haemodynamics in patients undergoing cardiac surgery, thereby reducing the need for inotropic agents and mechanical circulatory support and additionally optimising renal and hepatic function.

The unique inotropic and cardioprotective properties of levosimendan can provide sustained effects for several days and can thus help to reduce complications in the postoperative period [4].

Tritapepe and colleagues reported that short infusion of levosimendan before the initiation of CABG results in higher postoperative cardiac index and lower troponin concentration, in significant reductions in tracheal intubation time, length of ICU stay and number of patients requiring inotropic support [15].

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