

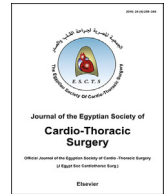
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Modified Hamburger procedure for the repair of post-infarction ventricular septal defect: A novel technique “On-pump beating approach with shunt calculation (Qp/Qs) as a guide”

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ABSTRACT

Our case report describes a novel surgical strategy for the repair of antero-apical Post-infarction ventricular septal defect (PIVSD). We are reporting the management of 75 years old gentleman diagnosed with antero-apical PIVSD using the Hamburger procedure with the modification of performing it using the on -pump beating technique.

This technique has shown to be safe and effective for closure of PIVSD in critically ill patient due to unstable hemodynamics, ongoing ischemia or severely impaired LV and/or RV. This category of patients would not tolerate open ventriculotomy and patch repair using the conventional cardioplegic arrest technique.

In the absence of transesophageal echocardiography, shunt calculation (Qp/Qs) has been tested and proven to be a valid alternative to confirm closure of the defect.

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1. Introduction

Post-infarction ventricular septal defect (PIVSD) is a rare sequelae of myocardial infarction (MI) occurring at a rate of 1–2% [1]. It generally occurs 1 week after the acute event [2]. Latham first described PIVSD in 1846 [3].

Shock is considered the most important predictor of mortality [4]. The most important risk factors for death in the early phase are poor hemodynamics and right ventricular dysfunction developing before the patient arrives theatre [5,6].

Medical management is dismal and surgical management is usually the definitive option. The 30-day mortality ranges from 23% to 42% [7–9]. PIVSD, characterized by hemodynamic compromise, is treated by intra-aortic balloon pump (IABP) followed by early surgical repair [10]. Recently, an off-pump closure technique called the Hamburger procedure was performed as an alternative to open procedures that require caopulmonary bypass CPB and ventriculotomy [7].

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The objectives of our case report are: Firstly, to describe how PIVSD may be repaired using a modified Hamburger procedure, where an on-pump beating approach is adopted rather than the classic off-pump one. Secondly, We aimed to highlight the importance of shunt calculation using blood oxygen saturation measurements to confirm the success of the repair in absence of transesophageal echocardiography (TEE) [6].

2. Case presentation

A 75 years old gentleman with no past relevant medical history arrived to his local hospital with an anterior STEMI, and was initially treated with thrombolysis. Following failure of thrombolysis, patient was transferred 24 hours later to our tertiary cardiac centre for angiography ± PCI. Angiography showed total proximal LAD occlusion, and otherwise normal coronaries. PCI was not performed due to calcified LAD. Patient was admitted to CCU to receive his anti-ischemic medical treatment.

4 days later, patient started to become dyspnic and tachypnic with an evident pansystolic murmur on auscultation. Transthoracic echo-cardiography (TTE) revealed akinetic ventricular apex, severely impaired LV (EF: 20%), and an antero-apical VSD measuring 8 mm with PPG across = 51 mmHg.

Patient received diuretics and nitrates and IABP was inserted. Patient was planned for emergency surgical repair.

Patient underwent a modified Hamburger procedure for PIVSD repair, where the conventional off-pump approach was replaced by an on-pump beating approach. Patient also received a saphenous vein graft (SVG) bypassed distal to his occluded LAD concomitantly.

As the only TEE in the department was out of order, shunt calculations were used as a guide to defect closure, where the ratio between pulmonary flow (Q_p), and systemic flow (Q_s) corellates to shunt size.

2.1. The procedure

In our case, after median sternotomy, samples were taken from ascending aorta, right atrium, left atrium, and pulmonary artery to obtain measurements of oxygen saturation.

Results were as follows:

Aortic blood O₂ sat = 95.3%

Mixed venous sat (rt atrial blood O₂ sat) = 63.8%

Left atrial blood O₂ sat = 94.5%

Pulmonary artery blood O₂ sat = **81.3%** (Fig. 1)

The ratio Q_p/Q_s = sat Ao-sat MV/sat LA-satPA = **2.38**.

Following that, heparin was administered, and heart was cannulated in preparation to commence CPB. CPB was instituted, and after achieving full flow, lungs were deflated and heart was emptied.

Posterior -anterior septal plication was performed using 4 double armed mattress prolene 2/0 sutures, preloaded to a Teflon felt strip. Needles were passed through the posterior/inferior interventricular septum and delivered through the anterior interventricular septum 10 mm lateral to the LAD. Needles were then passed through a second same sized Teflon strip. Sutures were smoothly tied starting from the apex all the way upwards after asking the perfusionist to empty the heart. (Fig. 2–4).

Following that and with the help of the octopus stabilizer, SVG is anastomosed to LAD distal to the total occlusion.(Fig. 5) (Fig. 6).

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PATIENT REPORT	Synthe - S - 95uL	Sample #	30353
Identifications			
Patient ID			
Patient First Name			
pH	7.433		7.350 - 7.450
pCO ₂	38.7	mmHg	32.0 - 45.0
pO ₂	95.2	mmHg	90.0 - 105
eBase(t) f _o	0.9	mmol/L	-2.0 - 2.0
eHCO ₃ P _o	24.9	mmol/L	22.0 - 28.0
eHb	11.6	g/dL	12.0 - 18.0
sO ₂	81.3	%	90.0 - 100.0
eK ⁺	3.9	mmol/L	3.2 - 5.3
eNa ⁺	138	mmol/L	132 - 147
Notes			
↓ Mild to low resistance range			
C40-100-04.0.0.0			
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Fig. 1. Pulmonary artery O₂ saturation before intervention.

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