Case report - Valves

Percutaneous cardioplegia delivery using the miniport in minimally invasive mitral valve surgery

Kuan-Ming Chiu*, Tzu-Yu Linb, Jer-Shen Chenc, Shu-Hsun Chua

aDivision of Cardiovascular Surgery, Far-Eastern Memorial Hospital, 13F, 21, Sec 2, Nan-Ya S Rd, Ban-Ciao, Taipei County, 220, Taiwan
bDepartment of Anesthesia, Far-Eastern Memorial Hospital, Taipei, Taiwan

Received 31 July 2007; received in revised form 12 September 2007; accepted 17 September 2007

Abstract

Minimally invasive cardiac surgery involves limited exposure of cardiac structures. Extracorporeal circulation is usually conducted by peripheral cannulation. Cross-clamp can be achieved by remote ways of either balloon endoclamp or transthoracic clamp. Effective delivery of cardioplegic solution is somewhat more difficult than those abovementioned tasks. In order to prevent additional expenses, we sought to deliver cardioplegic solution in a simple, reproducible, and cost-effective way. The miniport is used for this application. The procedures are reported in detail.

© 2008 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Minimally invasive surgery; Mitral valve; Cardioplegia; Miniport

1. Introduction

Minimally invasive cardiac surgery is becoming popular. Among them, sternum-sparing mitral valve operations provide the most promising cosmetic results.

In most cases, increased resource usage in the operation room is not uncommon. Specially designed cannulae for peripheral cannulation, transthoracic clamp or balloon endoclamp, and even the extended-length instruments, are all different to conventional approach. Delivery of cardioplegia is a crucial step in the context of minimally invasive mitral valve surgery. In this technical report, we introduced our experience of using a readily available miniport to accomplish the task.

2. Surgical techniques

Less invasive mitral valve surgery was employed in our institute since 2004. Up to the present time, 127 patients have undergone this procedure with technical success. From the beginning of this series, cardioplegic solution was delivered through the AutoSuture™ MiniPort™ 2 mm introducer (Fig. 1a) (USSC, Norwalk, CT). The miniport is used for mini-laparoscopic procedures. A trocar is formed from a cannula and an interfitting obturator. The obturator is provided with a piercing tip having a pointed blade and a locking shield design. The cannula has seals to maintain gas insufflation of the body cavity. However, a cardioplegic line was connected instead of carbon dioxide in our practice.

The patient was placed in a supine position with a small pillow under the right shoulder. Cardiopulmonary bypass was commenced via right femoral cannulation. A 6–7 cm right anterior-lateral thoracotomy was performed through the 4th intercostal space. After one-lung ventilation, the pericardium was opened parallel to the right phrenic nerve under direct vision through the mini-thoracotomy. Then a purse-string, plegetted suture was made on the top of the ascending aorta. The chest wall was then pierced by a 2-mm miniport toward the pre-made purse-string suture (Fig. 2a). Since there was no stopper in the miniport, the depth of insertion was controlled by marking the miniport. Then the central obturator was withdrawn and the side arm of the miniport was connected to the cardioplegic line. After application of a transthoracic aortic crossclamp, cardioplegia was delivered via the miniport (Figs. 1b and 2b). Before removal of the cross-clamp, the miniport was withdrawn. Ambu-bagging and compression of ventricles using a malleable plate helped to expel residual air. After removal of the cross-clamp, the puncture hole was kept open for de-airing purposes in a head down position. After a final check by trans-esophageal echocardiography, the purse-string suture was tied down using a knot-pusher before conclusion of cardiopulmonary bypass.

3. Discussion

Most cardiac surgeries are conducted with the assist of cardiopulmonary bypass. Cardioplegic arrest is usually a necessity. Delivery of cardioplegic solution in sternum-sparing procedures is a difficult task. The ascending aorta is remote from the surgeon’s access. Techniques to achieve aortic occlusion, like transthoracic clamp [1] and endo-aortic balloon clamp [2], are well demonstrated. However, techniques to deliver cardioplegic solution are seldom men-
The miniport is inserted through the chest wall and aimed at the preformed purse-string suture over the ascending aorta. The surgeon's right hand keeps adequate exposure of the entire aortic root using a pump sucker. The schematic drawing shows the transthoracic clamp, the miniport and the wound.

Fig. 1. (a) The miniport consists of one piercing-tip obturator and one outer-sheath cannula. (b) The operative photograph shows a rib spreader over the ministhoroacotomy. C: Chitwood transthoracic clamp; M: miniport; T: snaring tourniquet over ascending aorta for the miniport.

Fig. 2. (a) Under direct vision, the miniport is inserted through the chest wall and aimed at the preformed purse-string suture over the ascending aorta. The surgeon's right hand keeps adequate exposure of the entire aortic root using a pump sucker. (b) The schematic drawing shows the transthoracic clamp, the miniport and the wound.

Minimally invasive mitral valve surgery now-a-days provides low peri-operative risks and equivalent long-term outcomes [4]. Our application using the miniport provides advantages in easy handling, manipulation, re-positioning and high-flow delivery in regard to cardioplegic delivery. To adopt this simple technique in routine minimally invasive mitral valve surgery is recommended.

References