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Role of Limited Posterior Thoracotomy for Open-Heart Surgery in the Current Era

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Background. The earliest open-heart operations were performed employing the thoracotomy approach. Over the years, median sternotomy has become the routine way of approaching the heart. However, lately there has been progressive enthusiasm in minimally invasive techniques for accessing the heart. We present our technique of correction of congenital heart defects employing the limited posterior thoracotomy approach.

Methods. From June 1997 to April 1998, 27 patients underwent correction for various intracardiac defects without any mortality. There were 19 ostium secundum defects, with or without other associated anomalies. There were six sinus venosus defects with partial anomalous pulmonary venous connections. Two patients had perimembranous ventricular septal defects, while 2 patients had partial atrioventricular defects. In 2 other patients, pulmonary stenosis was repaired, using pulmonary valvotomy in 1 patient, whereas the other patient required short transannular patch.

Results. The median age was 7 years and the median weight was 20 kg. The median skin-to-skin time was 260 minutes. The median bypass time was 63.25 minutes and the median cross-clamp time was 35.0 minutes. All the

patients were extubated within 12 hours following surgery and the median ICU stay was 24 hours. Three patients required blood transfusions in the ICU for significant blood loss and the mean chest drainage was 85 cc per 24 hours. None of the patients had phrenic nerve palsies. None of the patients required additional analgesics other than routine ibuprofen or ketorolac tromethamine. Short-term follow-up revealed no functional or physical disability of the thoracic wall and the right arm. All who underwent surgery with this approach were happy with the limited visibility of their scars.

Conclusions. Limited posterior thoracotomy offers a viable alternative for midsternotomy and submammary thoracotomy. It has the advantage of a scar in the back that does not impede the future growth of the breast tissue and the pectoralis major. Our approach does not need any new instruments and hence no contraptions are necessary to perform the operation with this approach. Our results have shown satisfactory short-term results and better cosmesis.

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Minimally invasive surgical techniques are gaining in popularity as they continue to evolve [1]. In the earliest open-heart operations employing the heart-lung machine, submammary thoracotomy incision was routine [2]. However, over the years, median sternotomy has become the standard approach for accessing the heart during open-heart surgeries [3, 4]. Nonetheless, anterolateral thoracotomy has also gained acceptance, owing to its cosmetic superiority, and is being used for diverse indications [5]. However, our experience has shown that anterolateral thoracotomy frequently crosses the future breast tissue and becomes cosmetically disfiguring. Our paper discusses the utility of limited posterior thoracotomy in the current scenario for approaching the heart in addition to the existing approaches and discusses the advantage of the technique.

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Material and Methods

Between June 1997 and April 1998, 27 patients underwent open-heart procedures through posterior thoracotomy incision. All patients were given explanations of the various approaches for the surgical repair, and posterior thoracotomy was employed for those patients who were willing to undergo surgery with this approach. There were 6 male patients and 21 female patients. The median age was 7 years and the range varied from 2.1 years to 41 years. The median weight was 20.0 kg with a range of 10-64 kg. The heart defects that needed correction are described, with the procedures performed, in Table 1.

Surgical Technique

A limited posterior thoracotomy incision was made starting from posterior axillary line 2 inches below the inferior angle of the scapula to about 5.0-10.0 cm (Fig 1). The chest was opened in the fourth and fifth intercostal space. (To avoid rib fractures, we opened the retractor gently and gradually, as the intrathoracic dissection proceeded.) The right lobe of the thymus was excised and a patch of

Table 1. List of the Lesions Corrected With Posterior Thoracotomy Approach

S1.N0	Lesions	No. of Cases
1	Ostium secundum ASD	15
2	Ostium secundum ASD + pulmonary stenosis	2
3	Ostium secundum ASD + r. hemi-anomalous Pulmonary venous drainage	1
4	Sinus venosus ASD + PAPVC	6
5	Ostium secundum ASD + perimembranous VSD	1
6	Partial AV canal	2
7	Total	27

ASD = atrial septal defects; AV = atrio-ventricular; PAPVC = partial anomalous pulmonary venous connection; r. hemi-anomalous = right hemianomalous; VSD = ventricular septal defects.

pericardium was harvested. Retraction sutures were put on the pericardial edges and were held under traction with a hemostat forceps or were anchored to the chest wall (Fig 2), thereby exposing the aorta and the right atrium fully. Two traction sutures, one on either side of inferior vena cava, always brought the vessel fully into the operative field. Putting the purse-string sutures on the right atrial appendage and retracting it downwards always gave additional length of hitherto unexposed proximal aorta (Fig 2). Following full heparinization, the aorta was partially clamped with side-biting clamps. An adequate aortotomy was made and two purse-string sutures were put around the aortotomy in such a way that the snared purse-string sutures were alongside of the aorta; this always left enough room to cross-clamp the aorta and for cardioplegic infusion. The aorta was then cannulated and cardiopulmonary bypass was established in the standard way (Fig 3). The rest of the procedure progressed along the similar lines. Air removal was achieved optimally in all cases as in median sternotomy.

Results

There were no hospital deaths in the perioperative period. The skin-to-skin time (from the time of incising the skin to closure of the skin after the procedure) varied from 60-360 minutes with a median time of 260 minutes. The median bypass time was 63.25 minutes (range 28-155

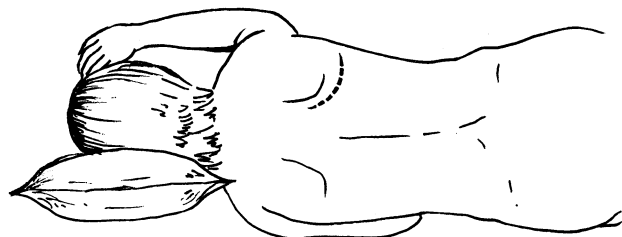


Fig 1. Illustration showing the limited posterior thoracotomy.

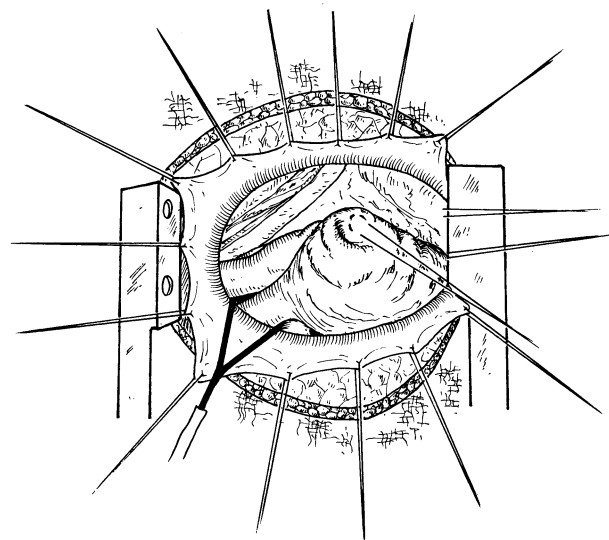


Fig 2. Exposure of cardiac structures after the pericardial traction stitches.

minutes). The median cross-clamp time was 35 minutes with a range of 11-58 minutes. Five patients underwent repair under fibrillatory technique and the remaining patients had the surgical procedures under cardioplegic arrest with topical ice slush. In one patient, a tear developed in the inferior vena cava during vessel looping and had to be repaired. Twenty-four patients had pericardial patch closure of atrial septal defects (ASDs) and 3 had direct closure of the defects. Two patients required pulmonary valvuloplasty; 1 of them had a short transannular patch augmentation of the outflow tract as well. None of the patients required any inotropes; in 1 patient, an atrial tachycardia developed that responded to digitalization (total digitalizing dose, 40 micras/kg for 24 hours). All patients were extubated a few hours after surgery and the median chest tube drainage was 85 cc with a range of 20-450 cc. Three patients required whole-blood transfusions in the first 24 hours, either for significant blood loss or for hemoglobin concentration less than 8 gm/dL following surgery. The median ICU stay was 24 hours with a range of 15.5-90 hours. The patient who had the longest stay in the ICU (90 hours) developed significant atelectasis, requiring aggressive physiotherapy for 3 days after the surgery. Wound infections did not develop in any of the patients; 1 patient had wound dehiscence at the skin level and was treated conservatively. All patients were put on analgesics for a period of 5 days, like those patients who had sternotomies, and none of the patients had intractable pain. All the patients were discharged from the hospital after 6 days following the surgery. The follow-up of this group of patients was complete and the duration of follow-up was 10 days to 3 months. All patients are doing well and are not on any medications. No patients had any disability or restriction of limb movements.

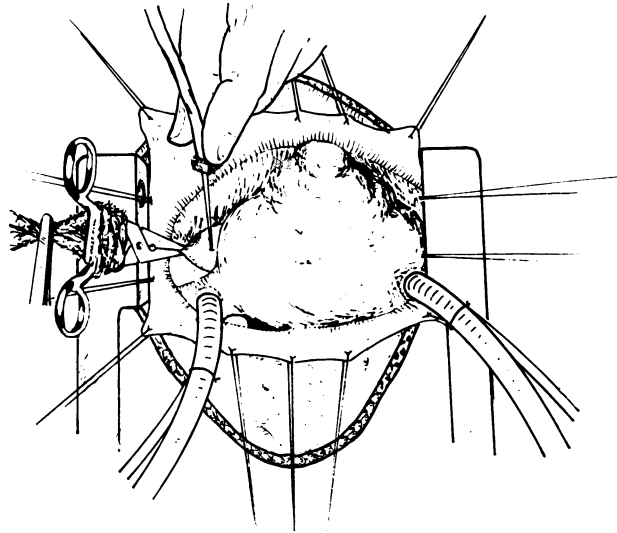


Fig 3. Cardioplegia after the cardiopulmonary bypass with bicaval cannulation.

Comment

The posterolateral thoracotomy is one of the most frequently used incisions in closed cardiac and thoracic surgeries. However, the midsternotomy has been a successful way of approaching the heart since open-heart surgery started as a successful therapeutic option in medicine. Nonetheless, the concept of cosmesis in cardiac surgery started only when the safety of the open-heart surgery was beyond any doubt. We reported our experience with anterior thoracotomy approach for management of various open-heart procedures [6]. One of the important reasons behind use of that technique was better cosmesis with less incidence of keloid formation.

However, our experience with the anterior thoracotomy over the years revealed a drawback when the technique is employed in prepubertal age group of patients. The flaw is that it is very difficult to predict the quantum of the breast growth in individual female children after they attain puberty. Our experience has showed that anterior thoracotomy incision infrequently crosses the future breast line and becomes cosmetically disfiguring. The recognition of the maldevelopment of breast and pectoralis muscle spurred us to try this new approach. There are several earlier reports that have revealed this drawback associated with the periareolar numbness or hypoesthesia [5, 7, 8]. In addition, it is reported in the literature that the breast tissue extends beyond the nipple-areola complex; obviously this tissue is susceptible to anterior thoracotomy incision [9]. However, we initially applied the approach to all consecutive patients who presented to us for closure of atrial septal defects, irrespective of their gender and age. For a wider margin of safety, we selectively chose patients with lesions other than ASDs. Nonetheless, our experience has shown that this approach carries no additional morbidity. However, the surgeon should have expertise in anterolateral thoracotomies to employ this approach. We

have employed the anterolateral thoracotomy approach for surgical interventions in diverse lesions, experience which has been previously published [6]. In addition, there are recent reports that advocate minimally invasive limited sternotomies with or without elaborate instruments to enhance the exposure, which we have found to be unnecessary [1, 10-13]. Moreover, as reported earlier, complete visualization of cephaloid structures may be restricted and anomalous pulmonary venous connection could require surgery if the anomalous vein drains more cephaloid into the superior vena cava and with these approaches, they could be a demanding surgical exercise [7]. In our experience with this approach, access to the aorta and the cavae was never a problem and hence none of the patients had femoral cannulation.

None of our patients had intractable pain because of the incision, because electively all the patients received oral ibuprofen or parental ketorolac tromethamine depending upon their feeding status. We presume the lower incidence of intractable pain is due to our more limited incision (compared to the incision used in a formal posterolateral thoracotomy). However, we hasten to add that we do not have objective evidence to support this claim. So far, we have not had phrenic nerve palsies, because the nerve is readily visible with our approach and the dissection always is carried out away from the nerve.

The repeat sternotomy carries always some morbidity vis-à-vis thoracotomy followed by sternotomy. Hence, it has been proposed that the thoracotomy as the initial/subsequent approach is a safer way of approaching the heart.

Additionally, the posterior thoracotomy offers the benefit of total absence of scarring in situations where the breast is undergrown during adulthood and wherein there is a high possibility of cosmetic disfigurement. Moreover, it allows access to the heart through the midline in the event the patient has to undergo a repeat open-heart surgery, without the chances of aortic or right-ventricular injury unlike in redo sternotomy. This is unlike that of a repeat sternotomy. To the best of our knowledge, English literature does not have any mention of this approach so far. Uva [14] and associates have reported in the French literature about their experiences with their approach. However, the ICU stay remains the same as that for anterolateral thoracotomies. The incidence of significant drainage and blood transfusions in the first 24 hours remains no different from that of other approaches.

In conclusion, we are convinced that this approach has given satisfactory short-term results in terms of cosmesis. In addition, it is the incision of choice in prepubescent girls, considering the breast line in anterolateral thoracotomy.

At the time of publication, we have used this approach on 71 patients, which includes 1 atrial septectomy with a BT Shunt in a 10-month-old infant, 1 intermediate atrioventricular canal and 1 subpulmonary VSD. So far there has been no mortality.

References

1. Barbero-Marcial M, Tanamati C, Jatene MB, Atik E, Jatene AD. Transxiphoid approach without median sternotomy for repair of atrial septal defects. *Ann Thorac Surg* 1998;65:771-4.
2. Cooley DA. *Techniques in cardiac surgery*. 2nd ed. Philadelphia: WB Saunders, 1984.
3. Gerbode F, Braimbridge MV, Melrose DG. Median sternotomy for open cardiac surgery during total heart-lung bypass. *Arch Surg* 1958;76:821-4.
4. Julian OC, Lopez-Beliom M, Dye WS, Javid H, Grove WV. The median sternal incision in intracardiac surgery with extracorporeal circulation: a general evaluation of its use in heart surgery. *Surgery* 1957;42:753-61.
5. Dietl CA, Torres AR, Favalerio RG. Right submammary thoracotomy in female patients with atrial septal defects and anomalous pulmonary venous connection: comparison between the transpectoral and subpectoral approaches. *J Thorac Cardiovasc Surg* 1992;104:723-7.
6. Cherian KM, Pannu HS, Madhusankar N, et al. Thoracotomy approach for congenital and acquired heart defects: its possible applications in the current era. *J Card Surg* 1996;11:37-45.
7. Black MD, Freedom RM. Minimally invasive repair of atrial septal defects. *Ann Thorac Surg* 1998;65:765-7.
8. Cherup LL, Siewers RD, Futrell JW. Breast and pectoral muscle maldevelopment after anterolateral and posterolateral thoracotomies in children. *Ann Thorac Surg* 1986;41:492-7.
9. Dehner LP. The integumentary system. In: Kissane JM, ed. *Pathology of infancy and childhood*. St. Louis: Mosby, 1975: 1172-94.
10. Levinson MM, Dewhurst T, Han MT, Fooks G, Fonger J. Cosmetic minimally invasive surgical closure of a patent foramen ovale. Report and surgical technique. In: *The heart surgery forum*. http://www.hsforum.com/Heart_Surgery/Directories/ArticlesL/Levinson_MM/MISAD/1996-12451.hsf.oct.15.1996.
11. Tatebe S, Eguchi S, Miyamura H, et al. Limited vertical skin incision for median sternotomy. *Ann Thorac Surg* 1992;54:787-8.
12. Komai H, Naito Y, Fujiwara K, et al. Lower midline skin incision and minimal sternotomy—a more cosmetic challenge for pediatric cardiac surgery. *Cardiol Young* 1996;6:76-9.
13. Wilson WR Jr, Ilbawi MN, DeLeon SY, Piccione W Jr, Tubeszewski K, Cutilleta AR. Partial median sternotomy for repair of heart defects: a cosmetic approach. *Ann Thorac Surg* 1992;54:892-3.
14. Uva MS, Roussin R, Petit J, Lacour-Gayet F, Serraf A, Planche C. Thoracotomie postero-droite pour le traitement des lésions simples et isolées du cœur. *Presse Med* 1995;24:402-4.

REVIEW OF RECENT BOOKS

Healing the Heart of Croatia

Joseph Kerrigan, MD, and William Novick, MD
Mahwah, NJ, Paulist Press, 1998
250 pp, illustrated, \$19.95
ISBN: 0-8091-0501-2

Reviewed by Thomas E. Williams, MD

This is a fascinating book about war-torn Croatia and the mission surgery performed in both Europe and the United States. It tells the story of Father Kerrigan and Dr Novick, and their work, over approximately the last 10 years, with the children of Croatia. More than this, it is a book written about people, for it also tells the story of the Croatians and the Americans who hosted them. The Croatians are clearly seen as brave, strong people, who have been subjected to a terrible

series of events. They are resourceful and courageous when dealing with the problems of congenital heart disease seen in their children. The authors also give great credit to the many American hosts described in the book. *Healing the Heart of Croatia* gives the reader the flavor of a well-organized mission effort in which many different people from many different spheres participate.

In addition to these elements, a history of Croatia has been woven into the tale. This history is informative and useful to those who may not understand the history and many difficulties found in the Balkans.

In short, this is an interesting book from many different perspectives, and can be recommended to any reader who is interested in mission surgery or in the difficulties in Croatia.

Columbus, Ohio

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