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# Rigid sternal fixation in the management of pediatric postmedian sternotomy mediastinitis: A 20-year study<sup>☆</sup>

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## KEYWORDS

Mediastinitis;  
Pectoralis flaps;  
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**Summary** *Background and aim:* Pediatric patients are at a risk of mediastinitis, a life-threatening complication of median sternotomy, following cardiac surgery for congenital conditions. Our experience with rigid internal sternal fixation in pediatric patients with postmedian sternotomy mediastinitis is presented.

*Methods and materials:* A retrospective chart review was performed of patients <18 years of age diagnosed with postoperative mediastinitis between January 1, 1990 and December 31, 2009. Charts were reviewed for demographic data, cardiac history, causative microorganism, and infectious risk factors. The methods of surgical intervention including flap coverage and use and type of sternal plating (resorbable and/or titanium) were also recorded. The primary end point of interest was overall survival.

*Results:* Twenty-five pediatric patients were diagnosed with postoperative mediastinitis. Rigid fixation of the sternum following debridement was performed in 20 patients (age range: 1 month–18 years), all of whom successfully tolerated the procedure. Resorbable plates were used in 13 patients. Five patients did not undergo rigid fixation due to either serious ill-health or lack of adequate sternal bone stock. No patient experienced recurrent sternal wound infection. A total of 20 patients (80%) survived to discharge. Three patients succumbed to their heart condition prior to rigid fixation, one died following sternal closure from unrelated causes, and one patient was lost to follow-up.

*Conclusions:* Post-sternotomy mediastinitis in pediatric patients may be addressed using wide debridement, rigid sternal fixation, and flap coverage. In our series of 25 patients with

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pediatric mediastinitis, none died from mediastinitis. Placement of hardware did not adversely affect patient survival. This study demonstrates the feasibility of rigid sternal fixation.

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## Introduction

Postmedian sternotomy mediastinitis is a life-threatening infection affecting up to 2% of pediatric patients undergoing median sternotomy.<sup>1–7</sup> Mortality in pediatric cardiac surgery is significantly increased by the development of mediastinitis, in one report from 5% to 35%.<sup>8</sup> Risk factors for the development of mediastinitis in the pediatric population include young age, a higher American Society of Anesthesiologists (ASA) score, complex congenital heart lesions, hypothermia, hyperglycemia, and, in many reports, delayed sternal closure.<sup>1–4,6,9</sup> The management of mediastinitis, as described in the literature, has evolved significantly in the past 50 years from debridement with simply open chest drainage<sup>10</sup> to closed chest drainage with antibiotic infusion catheters,<sup>11,12</sup> to radical sternal debridement and use of muscle flaps for dead-space obliteration and coverage, and, more recently, the use of negative pressure wound therapy (NPWT) to essentially “seal” the chest wound.<sup>13</sup> In 1993, Gottlieb et al. introduced the concept of sternal salvage and rigid internal fixation based on the traditional paradigm of bony healing requiring stability.<sup>14</sup>

To date, no studies specifically address rigid sternal fixation in children for the management of mediastinitis. Pediatric patients develop postmedian sternotomy mediastinitis in the setting of congenital heart lesions, which necessitate the initial intervention; these patients have tenuous organ perfusion as a result of their congenital defect. Furthermore, pediatric patients may require multiple interventions and are often hospitalized in intensive care units for prolonged periods both before and after surgical intervention. Finally, pediatric and adult patients have widely differing comorbidities including the virtual absence of diabetes in the pediatric population. In this paper, the institutional experience with surgical intervention for postmedian sternotomy mediastinitis in the pediatric population is reported and an additional approach in the reconstructive surgeon’s armamentarium for timely management of this significantly morbid condition is presented.

## Methods

### Rigid fixation technique

In this series, rigid sternal fixation evolved as absorbable plates became available in 1996. Plating was approached differently depending upon the age group affected. In neonates, under 1 year, a single absorbable mesh plate was used and affixed to the cartilaginous sternum with wire

cerclage and titanium screws (Figure 1). Lactosorb plates and screws were used (Figure 2) in toddlers and young children (1–9 years). Finally, titanium plates and screws were used (Figure 3) in older children with bony sternums.

### Data collection

An institutional review board (IRB)-approved retrospective chart review (IRB# 16718A) was conducted on all pediatric patients, 18 years old and younger, diagnosed with postmedian sternotomy mediastinitis between January 1, 1990 and December 31, 2009, who were treated by the senior authors (LJG and DHS) at an academic medical center. Patient charts were reviewed for demographic data, cardiac history, causative microorganism, and infectious risk factors including immunologic dysfunction, redo sternotomy, delayed sternal closure, and presence of prosthetic material. The methods of surgical intervention including



**Figure 1** Absorbable mesh plates with wire cerclage and titanium screws are used to rigidly fix the cartilaginous neonatal sternum (<1 year).

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