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Pericardial Tamponade due to Perforation of a Posterolateral Branch of the Circumflex Artery Caused by a Perforating Edge of a Resected Rib following Orthopedic Surgery in a 14-Year-Old Patient

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ABSTRACT

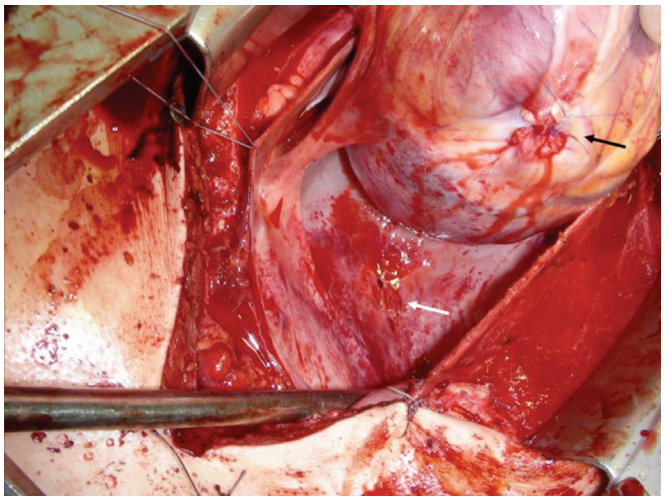
A 14-year-old female patient with Marfan syndrome was resuscitated because of pericardial tamponade following orthopedic surgery to correct scoliosis. The emergency sternotomy revealed injury to a posterolateral branch of the circumflex artery caused by pericardial perforation by the stump of a previously resected rib. Cardiopulmonary bypass immediately restored the circulation, and the primarily dilated, noncontractile heart regained its contractile function. The small posterolateral branch was sewn over, and the sharp edge of the rib stump was smoothed by abrasion and covered with a Gore-Tex membrane. The patient recovered completely during the remainder of her postoperative stay.

INTRODUCTION

Pericardial hemorrhage is a rare complication in orthopedic and trauma surgery. The mechanisms of iatrogenic pericardial tamponade described in case reports are mainly of 2 types. On the one hand, direct cardiac trauma can be caused by posterior spinal instrumentation [Heini 1998]. On the other, Kirschner wires can migrate and cause pericardial hemorrhage [Tubbax 1989; Goodsett 1999]. Posttraumatic pericardial tamponade can be caused by either blunt trauma [Onda 2003] or perforation by fractured ribs [Roth 2002; Grieve 2006]. These mechanisms have been reported in all age groups, from toddlers to adults [Pollak 1991; Testerman 2006]. Interestingly, posttraumatic pericardial tamponade can occur early or even be delayed by days [Pollak 1991; Roth 2002].

CASE REPORT

A 14-year-old female patient with Marfan syndrome underwent ventral mobilization of the thoracic and lumbar portion of the vertebral column for orthopedic correction of scoliosis. Postoperatively, the patient developed cardiogenic shock due to pericardial tamponade while she was in the intensive care unit (ICU). Pharmacologic and mechanical resuscitation was necessary, and she was brought immediately into the cardiac operating room. The worst findings of the arterial blood gas analysis were as follows: pH 7.16; PCO_2, 50 mm Hg; lactate, 78 mg/dL; and hemoglobin, 7.6 g/dL. Oxygenation was sufficient, with the worst PO_2 level being 98 mm Hg (ventilation with 100% oxygen). Pericardial drainage, which was initially placed via a subxiphoidal approach, delivered considerable amounts of arterial blood. An emergency sternotomy and open cardiac massage were performed. At this point, the heart was dilated, and no sufficient myocardial contraction was detectable. Cardiopulmonary bypass was instituted via an aortic 17F extracorporeal membrane oxygenator cannula and a right atrial 2-stage cannula. The source of the bleeding was a small posterolateral branch of the circumflex coronary artery that had been injured by the edge of the 10th rib, which had been resected during the orthopedic operation. The sharp edge had then perforated the back portion of the pericardium (Figure). The small posterolateral branch was



Shown is the oversewn posterolateral branch of the circumflex artery (black arrow) which was injured by a perforating sharp edge of the 10th rib, which was resected during orthopedic surgery in a 14-year-old patient Marfan syndrome. The pericardial perforation is shown (white arrow).

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sewn over on the beating heart with 3 Prolene sutures. After opening the pleura, we abraded the sharp-edged stump of the resected rib and covered it with parietal pleura and an additional Gore-Tex membrane. After a cardiopulmonary bypass time of 69 minutes, myocardial contraction had recovered sufficiently to allow the patient to go off bypass with moderate catecholamine support. The sternotomy was closed with steel wires in the usual manner, and the patient was transferred to the ICU without mechanical circulatory support. The young patient recovered completely during her remaining postoperative stay. A postoperative echocardiogram revealed the myocardial contraction to be almost normal, with a fractional shortening of 32%.

DISCUSSION

This case appears interesting for several reasons. It shows that pericardial hemorrhage via perforating ribs is possible and can be a life-threatening complication after orthopedic surgery. Therefore, diagnostic measurements carried out for postoperative shock occurring after orthopedic surgery with rib resection should include an echocardiography evaluation for pericardial hemorrhage. If pericardial tamponade is diagnosed, urgent sternotomy is required. Apart from that, this case is an impressive demonstration that myocardial tissue, especially in young patients, has an enormous capacity for regeneration. Even though the heart of our patient was dilated and showed no myocardial contraction before cardiopulmonary bypass was instituted, the patient could be transferred to the ICU without any mechanical circulatory support. She recovered completely from this drastic complication.

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