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Case report

Mitral valve repair via right thoracotomy for multidrug resistant Pseudomonal endocarditis in a burn patient: Case report and review of the literature

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ABSTRACT

Diagnosis and management of infectious endocarditis are particularly challenging in patients with severe burns. Cases requiring operative intervention are likely to have higher complication rates as a result of poor wound healing, recurrent bacteremia secondary to burn wound manipulation, and sequelae of anticoagulation in patients who require repeated reconstructive and cosmetic procedures. Few case reports exist describing mitral valve replacement for infectious endocarditis in burn patients. In this article, we review the literature to describe and address these challenges, and present what we believe to be the first case of mitral valve repair for infectious endocarditis in a thermally injured patient.

1. Background

Patients with severe burns are inherently at risk for a multitude of infectious complications. Destruction of an intact skin barrier and presence of necrotic tissue promotes bacterial proliferation, colonization, and occasionally bacteremia. The critical nature of extensive burns belies invasive hemodynamic lines and intubation that also predispose to infection. Infectious endocarditis (IE) is one of the more devastating complications and occurs up to six times more frequently in burn patients compared to the general hospital population [1]. Though management is often medical, when indicated, surgical intervention can prove challenging. We present the case of a patient with 90% total surface area burns involving the anterior chest who developed multidrug resistant (MDR) Pseudomonal mitral valve endocarditis and antibiotic toxicity necessitating valve repair. We believe this to be the first report of successful mitral valve repair for active IE in a burn patient and discuss diagnostic challenges, indications for surgical intervention, and choice of valve repair versus replacement.

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2. Case report

A 33-year-old male with no significant past medical history was transferred to the Massachusetts General Hospital after suffering a burn from a boat explosion. Notably, he had mixed superficial and deep partial thickness burns involving 90% total body surface area (TBSA). He had no additional trauma burden. Over the subsequent months following admission, the patient was taken to the operating room and underwent serial tangential excision and grafting of all burned areas with a combination of autograft, allograft and cultured epithelial autograft (CEA). His course was notable for multiple episodes of gram-negative rod (GNR) bacteremia, including Pseudomonal bacteremia. Four months into his course and after cessation of all antibiotics for one week, MDR Pseudomonal bacteremia recurred and was sensitive only to amikacin, tobramycin, and colistin. A transthoracic echocardiogram (TTE) demonstrated a 12 mm × 7 mm mass consistent with posterior leaflet mitral valve vegetation with moderate mitral regurgitation, new compared to a TTE obtained earlier in his course. Antibiotic therapy was initiated with colistin and aminoglycosides, however, the patient developed acute kidney injury as well as central hypercarbic respiratory failure that was ultimately attributed to neurotoxicity from colistin. These complications precluded optimal medical management of endocarditis.

Five months into his hospital course, with burn wounds having been completely excised and grafted, he was taken to the operating room for mitral valve repair. Exposure was achieved via a right anterior thoracotomy with shingling of the fourth rib which avoided incising through open wound or unstable scar. Arterial cannulation was achieved with a wire-wound perfuser placed through the distal ascending aorta and directed into the descending aorta under transesophageal echocardiographic (TEE) guidance. Bicaval venous cannulation was achieved through the right atrium with a 24 French wire-wound cannula directed into the superior vena cava and a 28 French catheter directed into the inferior vena cava. The patient was cooled and systemic heparin administered. Once an adequate activated clotting time was achieved, the aorta was cross-clamped and cold oxygenated blood cardioplegia administered with subsequent prompt electrical arrest. The mitral valve was exposed through the interatrial groove revealing a vegetation in the middle of the P2 segment of the posterior leaflet. Debridement of the vegetation revealed a moth-eaten underside of the leaflet necessitating triangular resection followed by repair with two layers of 5-0 prolene. Passive testing showed good coaptation, however, upon de-airing the left atrium and separating from bypass, TEE revealed moderate-to-severe regurgitation. The aorta was crossclamped once more, cardioplegia re-administered, and the left atrium re-opened to reveal a small cleft near the triangular resection site, which could not be closed primarily. Instead a 28 mitral sizer was utilized as an anvil and a two-row posterior suture annuloplasty was employed taking the rows up beyond the fibrous trigones then back down followed by tying over a piece of autologous pericardium posteriorly. After separation from bypass, TEE revealed minimal mitral regurgitation and a mean gradient of 6 mmHg across the valve. The chest was closed with pericostal figure-of-eight sutures, followed by multiple running layers of 2-0 vicryl. The skin was closed with interrupted 3-0 nylon vertical mattress sutures. The patient recovered well with excellent healing of the surgical site (Fig. 1) and no further recurrence of his endocarditis. TTE obtained four months after repair demonstrated improvement in left ventricular ejection fraction, stable mild mitral regurgitation, and a mean gradient of 4 mmHg across the repaired valve.

3. Discussion

The largest series reviewing published cases of infectious endocarditis (IE) in patients with thermal injury from 1964 to 2004 identified 103 cases, 89 of which resulted in death with an all-cause mortality rate of 81% [1]. The Brooke Army Medical Center Burn Unit review of patients with endocarditis placed the IE mortality rate at 95% [2]. Though etiologies of IE are manifold, burn patients typically lack traditional risk factors such as structural valve disease or history of rheumatic fever [3] and are presumably at increased risk because of recurrent bacteremia [1]. Studies have demonstrated a concomitant increase in rates of IE with the introduction of invasive hemodynamic monitoring (indwelling central venous and pulmonary artery catheters) to burn care since 1969 [4]. Catheter-induced intracardiac trauma also results in a predisposition to forming valvular vegetations [5]. Though pulmonary artery catheters come into direct contact with the myocardium, tricuspid, and pulmonic valves, malpositioning of the tip of central venous catheters beyond the cavo-atrial junction is associated with myocardial injury and reported higher rates of IE [4]. While this theory provides a plausible mechanism for right-sided endocarditis, it does not account for the observation that left-sided aortic and mitral valves are more commonly affected in thermally injured patients. Our patient had no risk factors for mitral valve disease and, intra-operatively, there was only evidence of acute structural valvular damage secondary to IE.

The Duke criteria, proposed in 1994 to incorporate echocardiographic findings, are the current clinical standard for IE diagnosis [6] which requires either two major (positive blood cultures plus vegetations or new valvular regurgitation on echo), one major and three minor, or five minor criteria

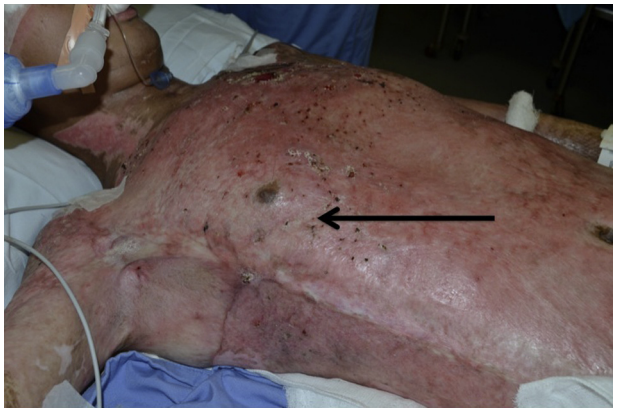

Fig. 1 – Arrow indicating well-healed thoracotomy incision.