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Review

Surgical management of tricuspid valve endocarditis in the current era: A review

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ABSTRACT

The incidence of isolated tricuspid valve infective endocarditis is increasing. Medical management is the mainstay of treatment but surgical intervention is required in a subset of patients. Surgical treatment options include valve excision and replacement or valve reconstruction. We searched PubMed and the Cochrane library to identify articles to be included in this review of surgical outcomes. References of selected articles were crosschecked for other relevant studies. Surgical management of tricuspid valve endocarditis can be achieved with satisfactory outcomes. However, the optimal indication and timing of surgery remain unclear, and the frequent association with intravenous drug use complicates management. Repair techniques are preferable though there is no clear evidence supporting one method over another.

1. Introduction

Isolated tricuspid valve (TV) infective endocarditis (IE) accounts for approximately 5–36% of cases of IE [1–4]. Despite the relatively rare occurrence, evidence exists that the frequency of TV IE is increasing [3,5]. Medical management is generally successful [6] and surgical intervention is only required in a subset of patients. Surgical treatment options include valve excision and replacement or valve reconstruction. Valvectomy without replacement was used in the past as a possible answer to the high intravenous drug use recidivism rate but rarely used in the current era. In this article, we review the literature regarding the surgical management of isolated TV IE.

2. Methods

On the 15th June 2014 a PubMed search of the medical terms (MeSH) "Tricuspid valve" and "Endocarditis" was conducted, limiting publications from 2004 to 2014 in humans and in the English language. In addition, the Cochrane library was searched for "Tricuspid valve endocarditis" in title, abstract or key words. Articles that described outcomes of surgical intervention of TV IE were included for study. References of selected articles were crosschecked for other relevant studies.

3. Results

3.1. Epidemiology

Right-sided IE primarily involves the TV [2,7]. The key predisposing factors include intravenous drug use (IVDU), cardiac implantable electronic devices (CIEDs), long-term central venous access catheters and congenital heart disease [5,8]. Up to 86% of IE among intravenous drug users (IVDUs) is right-sided [9]. The major microbiological cause is *Staphylococcus aureus* (60–90%) in both IVDUs and non-IVDUs [7,10,11]. Other organisms include coagulase-negative staphylococci, streptococci, HACEK organisms (*Haemophilus aphrophilus*, *Actinobacillus actinomycetemcomitans*, *Cardiobacterium hominis*, *Eikenella corrodens* and *Kingella kingae*), Enterococci spp. and fungi [8,10–13]. Mixed infection is also frequently encountered in IVDUs [14].

Athan et al. [15] published a prospective cohort study that described a 6.4% (n = 177) incidence of CIED among 2760 patients with IE. Among these 177 patients with CIED, 66 (37%) patients had coexisting valve infection with predominantly TV involvement (n = 43) [15]. Rates of CIED implantation increased 96% from 1993 to 2008, and CIED-related infection increased from the mid-2000s onwards [16], frequently affecting patients with multiple comorbidities.

Changes in other risk factors will also affect the incidence of TV IE. There has been a well-recognized increase in the number of adult patients with previously repaired congenital heart disease [17]. It is also likely that changes in the number of IVDUs will affect the incidence of TV IE [3], although assessment is difficult [18]. While it has been observed that the numbers of IVDUs is relatively stable, the reduced

Abbreviations: CIED, Cardiac implantable electronic devices; IE, Infective endocarditis; IVDU, Intravenous drug use; TV, Tricuspid valve.

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cost of illicit drugs may lead to increased numbers of injections (and higher risk of IE) [19]. Access to needle exchange programs may offset this possible increase in IE.

3.2. Indications for surgery

Medical therapy is the primary treatment strategy for isolated TV IE with proven effectiveness with an in-hospital mortality of less than 5% [6,9]. Surgery may be required in up to 20% of patients [20]. According to current studies and guideline recommendations, surgery is considered for persistent right-sided heart failure despite medical therapy, recurrent pulmonary septic emboli, septic shock, abscess formation or failure of antimicrobial therapy to control the infection [6,21–23]. The decision to perform surgery may also be directed by echocardiographic findings such as right ventricular dilatation associated with severe tricuspid regurgitation [21,24].

The 2009 European Society of Cardiology guidelines are based on limited evidence and suggest surgery according to (A) microorganisms (fungi or failure to eradicate), (B) vegetations >20 mm with recurrent pulmonary emboli, or (C) right heart failure due to severe tricuspid regurgitation with poor response to diuretic therapy [7]. They recommend similar strategies and peri-operative approaches in IVDU and non-IVDU groups [7]. The recent American Heart Association/American College of Cardiology guidelines do not describe indications for surgical intervention in TV IE [25]. Instead, they state: "given the high non-surgical cure rates of right-sided IE combined with the significant concern of reinfection of prosthetic material in surgical intervention, an even more coordinated effort of surgical and non-surgical experts in management of [IE] is necessary for [IVDU]" [25].

3.3. Timing of surgery

The optimal timing of surgery is unclear. The role of early surgical intervention has been established in left-sided IE [26] but indications and utility of early surgery are not well defined for TV IE [6,27]. Akinosoglou et al. [22] suggested this should depend on (A) the cause of endocarditis (e.g. urgent in pacemaker, prosthetic IE), (B) causative infective organisms (fungal, *S. aureus*), (C) coexistent left-sided disease, (D) response to antibiotic treatment, (E) toxicity of medical treatment, and (F) complications of disease. Baraki et al. [28] reviewed patients with isolated TV IE and suggested early surgery prior to the onset of heart failure or secondary organ dysfunction. Furthermore, Taghavi et al. [24] compared early surgical intervention with medical therapy. Their findings suggest that early surgery may be warranted in a subset of TV IE patients who are bacteremic and/or demonstrate septic emboli [24]. In the surgical intervention group, they observed more rapid resolution of infection, improved right ventricular mechanics and a trend towards reduced length of intensive care unit stay and ventilation time with no increase in mortality or morbidity [24]. In the medical treatment group, a large proportion had long-term moderate to severe tricuspid

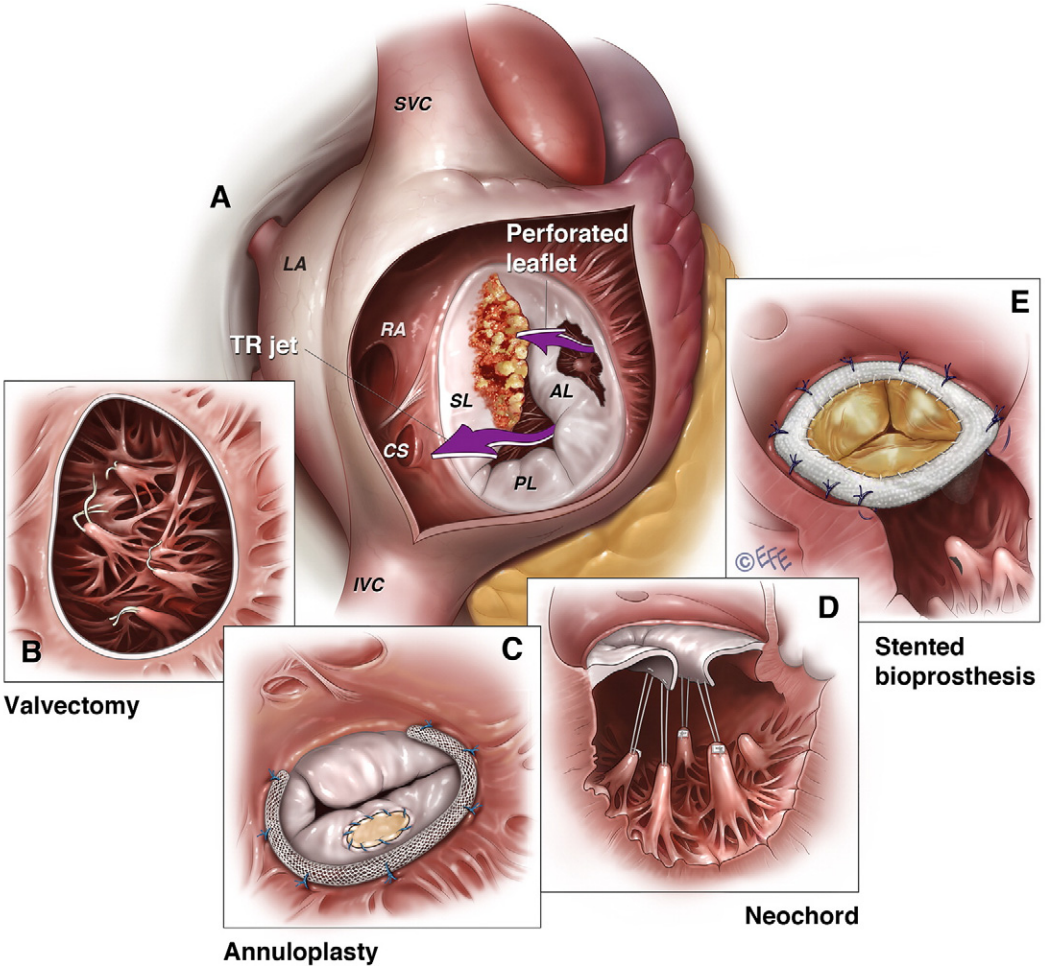

Fig. 1. (A). Anatomy of tricuspid valve and right atrium — surgeon's view. Findings include large perforation of the anterior leaflet, large vegetations on the septal leaflet, dilated tricuspid valve annulus and resultant severe tricuspid regurgitation. AL — anterior leaflet, CS — coronary sinus, IVC — inferior vena cava, LA — left atrium, PL — posterior leaflet, RA — right atrium, SL — septal leaflet, SVC — superior vena cava, TR — tricuspid regurgitation. (B). Appearance of right atrium and ventricle following valvectomy. (C). Tricuspid valve repair following band annuloplasty and patch repair of the anterior leaflet. (D). Use of neochords to repair tricuspid valve. (E). Tricuspid valve replacement using a bioprosthetic valve.