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EDITORIAL

The Destructive Power of Microorganisms: Aortic Root Endocarditis Continues to Be a Threat to the Patient and a Challenge for the Surgeon

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In this issue of Heart, Lung and Circulation, the article by Elgalad et al. — Surgery for Active Infective Endocarditis of the Aortic Valve with Infection Extending Beyond the Leaflets — reflects on a challenging surgical problem [1].

Osler was first, in 1885, to describe infective endocarditis (IE) and established the groundwork for its diagnosis: an existing lesion in one valve exposed to an infective injury [2]. The condition was almost 100% fatal in the pre-antibiotic era. The mortality of the disease dramatically dropped following the introduction of antibiotics in clinical practice by Sir Alexander Fleming 1982 [3].

Regardless of antibiotic therapy, approximately a third of patients require surgery to save their lives and stamp out the infection [4]. The crude incidence of IE, reported from 10 countries, ranged between 1.5 and 11.6 cases per 100,000 people [5].

The infection may outspread to the valve annulus and surrounding structures causing tissue damage and forming abscesses, fistulas and false aneurysms. This can depend on the duration of illness before its diagnosis, appropriateness of antibiotics selected, the virulence of the organism, and whether the infected valve is native or prosthetic [6].

Aortic root infection is challenging to manage due to the destruction affecting the fibrous skeleton of aortic and mitral valves. In such situations, an uncompromising surgical approach is required. The reconstruction of the fibrous skeleton through the so-called ''Hemi-Commando'' or ''Commando'' operations represent a radical option that entails double valve replacement (Figure 1) [7].

Timing for surgery continues to be problematic. Ideally, patients should be operated when on antibiotic therapy. Urgent or emergency surgery must be considered in cases with complications like abscesses, cardiac fistulas, false aneurysms, persistent large vegetations (>10 mm), fungal or multiresistant organism, persisting positive blood cultures and prosthetic valve endocarditis (PVE) caused by staphylococci or non-HACEK (*Haemophilius* species, *Actinobacterium*, *Cardiobacterium*, *Eikenella* and *Kingella* species) gram-negative bacteria. However, vegetation size should not be considered as an isolated indication for urgent or emergency surgery [8]. As outlined by Anantha et al., if the patient is stable, at least 2 weeks of antibiotics helps to reduce the risk of the operation [9].

The primary goals of surgery are to save the patient's life, improve function and rebuild anatomy to near normal. During surgery, it is necessary to excise all infected tissue apparent on gross examination, followed by meticulous washing of all infected areas.

It is understandable that severe regurgitation accompanied by large vegetations and leaflet tissue destruction will dictate replacement. Wallace et al. were the first, in 1965, to replace the valve and the ascending aorta, with the addition of coronary bypass grafting, for the treatment of abscess of the aortic root [10]. In 1974, Danielson et al. implanted the aortic valve in a distal position in the aorta with bypass of the coronary arteries, which was called ''translocation'' of the aortic root [11]. Root destruction needs comprehensive reconstruction, which is often a technically demanding in a sick patient.

The phenomenon of biofilm formation, where adherent bacteria on vascular prostheses or felt is not uncommon, was found to be a factor in the pathogenesis of late graft infection. This has been further explored and confirmed, as some pathogens, specifically *Staphylococcus aureus* [12], have an increased tendency for biofilm development.

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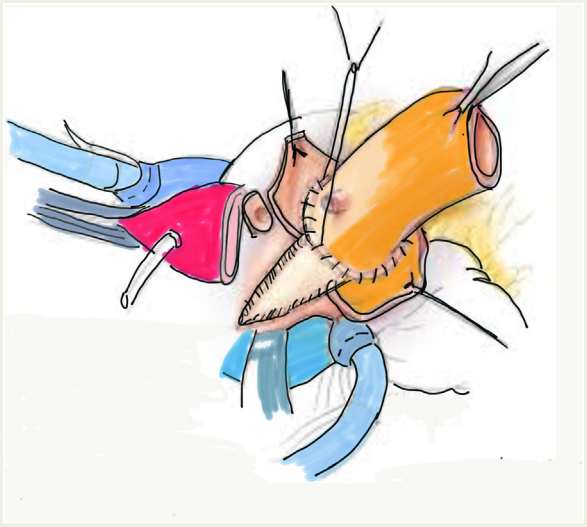

Figure 1 Commando operation fibrous skeleton repair.

Despite the available experience available on the Bentall-De Bono operation using mechanical or biological composite conduits in patients without IE, controversies remain about which material is better to use in managing IE — such as whether synthetic prostheses are more prone to develop infection.

But while the choice of the ideal valve is an issue for much debate, there is no alternative for thorough debridement and excision of all infected tissues. Many surgeons accept, as true, that aortic homografts are the best valve for treating aortic root endocarditis because of ease of operating and the adeptness of the anterior mitral leaflet of the homograft to patch defects left behind from resecting all infected tissues [13–17]. However, although homograft human aortic valves have also been used for replacement of the aortic root for decades, their superiority to other protheses remain unconfirmed.

Delaying surgical treatment often increases the probability of complications and operative mortality and morbidity rates. The notion that less virulent microorganism such as *Streptococcus viridan*s always respond to antibiotics alone is erroneous because this bacterial species can cause extensive paravalvular abscess [18].

Elgalad et al.'s single-centre study in 168 patients with surgically treated extensive aortic valve active IE has demonstrated that accurate preoperative accurate diagnosis, aggressive follow-up for proper operative timing, and appropriate surgical strategy are the cornerstones for improving both early and long-term outcome in these patients. Long-term survival was excellent, with good functional capacity.

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