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Infective endocarditis in childhood: moving forward

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« Ὅκῳσα φάρμακα οὐκ ἰήται, σίδηρος ἰήται »
‘Those (diseases) that are not cured by drugs are cured by iron’
Hippocrates 5th century BC

Once again during the last 25 centuries, the above aphorism of Hippocrates is confirmed in one of the most deadly infections of childhood, the infective endocarditis (IE), since in the last 50 years the complicated endocarditis gradually has become a ‘surgical disease’ [1, 2].

Despite improvements in its treatment, IE remains with high mortality and devastating morbidity [1, 3–5]. Its incidence ranges from 0.1 to 0.8 cases per 1000 paediatric hospital admissions [1]. The reason is the improved survival rates of children with congenital heart disease, with or without surgery, and hospitalized newborn infants [1, 6]. About 8–20% of all paediatric IE cases occur in patients without underlying heart disease [1, 7].

The complexity of IE demands early diagnosis and aggressive medical and especially surgical treatment. About 20–50% of them will eventually require surgery [1, 4, 7].

In this issue of the journal, Lee *et al.* [8], demonstrate that ‘early surgery for IE could be performed safely and is indicated without delay, if corresponding to the surgical indication in children. So it may not be required to delay surgery for IE if corresponding to the surgical indication in children, because the potential benefit of early surgery could be expected and pursued in children’. Their results are similar to other studies presenting low mortality and very good overall survival rates [1, 4, 5].

Although ‘early surgery’, within 2–3 days of diagnosis, is increasingly performed worldwide, optimal timing of surgery is still debatable [1, 5, 6, 9]. The benefits of ‘early surgery’ have been demonstrated by several studies to avoid death and life-threatening complications, but it should be individualized for each patient [4, 5].

The lack of randomized controlled trials for the treatment of IE in children poses a challenge in compiling recommendations. Therefore, many of the indications are based on consensus [6, 9]. For this reason, the American Heart Association (AHA) guidelines for adults have been endorsed by the American Academy of Pediatrics. Generally, the indications for paediatric patients mirror the adult guidelines.

The European Society of Cardiology (ESC) guidelines distinguish ‘emergency surgery’ (performed within 24 h from diagnosis) and ‘urgent surgery’ (within 1 week from diagnosis) from ‘elective surgery’ (after 1–2 weeks of antibiotics); both ‘emergency’ and ‘urgent surgery’ are considered ‘early surgery’ [9]. Surgery performed after 1–2 weeks of antibiotics is ‘elective’. The AHA guidelines more vaguely define ‘early surgery’ when it is performed during initial hospitalization and before completion of a full course of antibiotics [6, 9]. In fact, there is no universally accepted definition for ‘early surgery’.

For an effective communication, we believe that the definitions of the ESC guidelines should be universally adopted with the following modifications: ‘emergency surgery’, when performed within 24 h from diagnosis; ‘urgent surgery’, when performed 2–7 days after diagnosis; ‘early surgery’ when performed after 1 week from diagnosis; and ‘elective surgery’ when performed after completion of antibiotic scheme.

The indication for ‘emergency’ surgery is mainly heart failure unresponsive to medical therapy [6–9], whereas ‘urgent’ surgery should be considered in children with IE and high risk of heart failure, uncontrolled infection, high risk of embolism, severe valvar and perivalvar lesions, prosthetic valve endocarditis, and uncontrolled infection caused by *Staphylococcus aureus* and fungi [1, 2, 4, 6, 9].

Heart failure is the most significant predictor of mortality. Early recognition and emergency surgery are mandatory for successful outcome [1, 4, 8, 9]. Many authors recommend that ‘once the surgical indication has been established, surgery needs to be performed as soon as possible’ [1, 6, 9], because ‘early surgery, as compared with conventional treatment, significantly reduced the composite end-point of death from any cause or embolic events’ [5].

The young age, the small body size and the severity of the clinical presentation are determining prognostic factors, since aortic or mitral valve replacement is not an available option most of the times; leaving the option of either valve repair or the Ross operation, which has been found to be effective in children with aortic valve endocarditis [1, 4].

Nevertheless, the decision to operate is very difficult in patients with comorbidities, such as cerebrovascular complications, renal failure, shock and high operative risk. Therefore, the

close collaboration between all the specialists has been proven to decrease the mortality [3, 4, 10].

The right-sided IE in children is associated with better clinical outcomes compared with left-sided IE [1, 9]. It is commonly complicated with valvular insufficiency, abscess formation and septic pulmonary embolism. Although surgical intervention should be considered in several situations the use of prosthetic material (i.e. valve replacement) should be avoided when possible [3, 9].

Based on the multisystem nature of IE and the need for individualized treatment, ESC, AATS and the Japanese Circulation Society recommend that a dedicated multidisciplinary team, the 'Endocarditis Team', should manage patients with IE at referral centres [7, 9, 10]. Endocarditis Team should comprise expert cardiologists, cardiac surgeons, infectious disease specialists and microbiologists. Specialists from other fields should also participate according to the needs of the patient. The 'Endocarditis Team' has proved to be beneficial for appropriate decisions about indications and timing of surgical intervention and should judge the potential benefits of 'early surgery', which must be weighed against its operative risks and long-term complications. The establishment of 'Endocarditis Team' has proved to be a prognostic factor in reducing substantially mortality and morbidity of IE and has become a key element in modern management of IE in adults [3, 10]. Accordingly, a 'Paediatric Endocarditis Team' is required.

Due to the potential relapse and recurrence of IE, close follow-up by the 'Endocarditis Team' is necessary and prompt surgical intervention is often required for residual valve lesions [3, 9]. This practice 'has been shown to reduce 1-year mortality and is arguably the single most important step forward in the management of IE in the past 20 years' [3].

In conclusion, moving forward in confronting IE in childhood requires dedicated teams and centres, close collaboration of

experts, low threshold of early surgical intervention and careful follow-up of survivors.

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