Mitral annuloplasty with biodegradable ring for infective endocarditis: a new tool for the surgeon for valve repair in childhood

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Abstract

The incidence of bacterial endocarditis and valvular involvement is rare in the childhood period. If the patient is unresponsive to medical treatment and some complications occur, early surgical treatment is indicated. Debridement of vegetation combined with valve repair techniques sparing the native valve is the ideal surgical procedure instead of replacement, especially for children. Annuloplasty is the key step during valve repair procedures. On the other hand, absence of appropriate sized annuloplasty rings on the market for this group of patients is the main problem. Nondegradable annuloplasty rings might lead to stenosis as the child grows. Thus, biodegradable tissue engineered materials are new solutions for such patients since the fibrous tissue induced by implanted ring grows with time. We describe a pediatric patient with Brucella endocarditis at the mitral position who was treated successfully with valve repair using a biodegradable annuloplasty ring (Kalangos® Biodegradable Ring).

Keywords: Brucella; Endocarditis; Mitral; Bioring

1. Introduction

The incidence of bacterial endocarditis for pediatric population is rare (0.5%) [1]. Surgical treatment is indicated for the patients who have persistent infection, progressive cardiac failure, recurrent and/or major embolic accident with a mobile vegetation larger than 10 mm in the left cardiac chambers despite adequate medical therapy [2]. Although repair of the valve is the most favorable surgical procedure for all age groups, the importance of this treatment is foremost for pediatric patients [3].

In this report, we describe a 10-year-old girl who had mitral valve regurgitation secondary to Brucella endocarditis. Vegetectomy and mitral annuloplasty with a new biodegradable ring (Kalangos® Biodegradable Ring, Bioring, Lonay, Switzerland) were used as the surgical procedures.

2. Case report

A 10-year-old girl had been previously admitted to another medical center with complaints of arthralgia, myalgia, headache and weakness. She received medical treatment for 8 weeks with the diagnosis of Brucellosis following a Wright test with 1/1280 titration. Later, the patient was referred to our Department of Pediatric Cardiology with suspected infective endocarditis.

She did not have previous rheumatic heart disease in her past medical history. Her physical examination revealed 3/6 systolic murmur on the apical region. Her echocardiography detected 3–4° mitral valve regurgitation and three mobile vegetations of 1 cm diameter adherent to the mitral valve. Wright agglutination test was repeated, revealing a value of 1/1280 (1/200 is positive). A treatment regimen of streptomycin 16 mg/kg/day, doxycyclin 4–5 mg/kg/day, rifampicin 10 mg/kg/day was started. Her blood cultures were repeated three times but none of them were positive. However, on the 4th day of treatment, the patient became unconscious, and developed left hemiparalysis with right facial paralysis of central type. Magnetic resonance imaging showed acute ischemic infarct in the vicinities of the right parietal region and centrum semiovale. Therefore, early surgical treatment was planned due to mobile vegetations and hemodynamic instability.

Surgery was performed using extracorporeal circulation under mild hypothermia. During surgical exploration, subvalvular apparatus was normal. No abscess formation was seen. Mitral leaflets were mildly thickened but they were intact with annular dilatation. Vegetations were resected and mitral valve annuloplasty was performed with a biodegradable ring (Kalangos® Biodegradable Ring, Bioring,
3. Discussion

Infective endocarditis is a rare pathology in childhood. The predisposing factors are congenital heart disease, endocarditis, congenital heart disease, and previous cardiac surgery [2]. The most common isolated microorganisms are streptococcus viridans and staphylococcus aureus [4]. Cardiac involvement with Brucellosis in childhood is rare and, when present, it usually follows acute rheumatic fever [5].

Despite adequate medical therapy, Brucella endocarditis generally requires early surgical intervention [6]. Indications for early surgical treatment are as follows: persistent infection or cardiac failure, recurrent and/or major embolic accident with a mobile vegetation larger than 10 mm in the left cardiac chambers despite adequate medical therapy. Although our patient was hemodynamically stable, we decided on early surgical intervention after she had an embolic cerebrovascular event.

Mitral valve repair is the most favorable surgical approach for patients with valve pathology secondary to endocarditis especially in the pediatric age group. The main disadvantage of nondegradable annuloplasty rings is the lack of an appropriate size for the pediatric population since they may cause iatrogenic stenosis secondary to the ring itself as the child grows. A biodegradable ring (Kalangos® Biodegradable Ring, Bioring, Lonay, Switzerland) has been designed to reinforce the mitral annulus allowing normal growth of the valve, thus avoiding stenosis secondary to ring. Once implanted, the material is degraded by hydrolysis and replaced by fibrous scar tissue which maintains the valvular orifice at the desired dimension. Since no foreign material is left after degradation, theoretically there is less predisposition to infection when compared to other ring materials. Cikirikcioglu and Kalangos have reported their series of 20 patients operated on between 1994 and 2003 who had mitral valve repair by use of biodegradable annuloplasty ring. The size of all rings was smaller than commercial ring sizes (<26 mm). The mean follow-up time was 62±11 months and only one patient was reported to have had re-operation because of short chordae syndrome [7,8].

4. Conclusion

Pediatric patients with infective endocarditis who necessitate surgical intervention might benefit most from valve repair especially with biodegradable materials that have significant advantages in their age group.

References


Appendix A. ICVTS on-line discussion: Invited Editorial eComment

Author: Carlos-A. Mestres (University of Barcelona, Spain)
eComment: This is a brief report on a successfully operated case of Brucella endocarditis in a 10-year-old girl [A1]. The case as such is interesting as it refers to Brucella endocarditis, a rare condition which is usually seen in Mediterranean countries. Some previous reports are available in the literature. However, a mention is made to valve repair using a biodegradable annuloplasty ring and this is, perhaps, the most interesting aspect of this report.

A number of methods to perform mitral valve repair have been published since the very first attempts of Wooler who tried annuloplasty as early as 1962 [A2]. After the contributions of Carpenter [A3] and Duran [A4] a number of rings have been used in clinical practice. Rigid, flexible and semirigid rings and bands have been commercialized and all have shown to be reliable for annuloplasty alone or in association with some other methods of valve repair. The case of Kazaz et al. seems to be the first formal case report of mitral annuloplasty using a biodegradable ring in English language [A1]. Kalangos et al. [A5] have been working in the experimental laboratory and have some clinical experience extending back to 1994. Their series of 20 cases has not been published yet but it was partially presented at the EACTS/ESTS meeting in Vienna a couple of years ago [A6]. So far we have no additional information in this regard.

However, it is of interest to know that some experience is available for study. There have been a number of previous attempts with ‘vanishing’ annuloplasties using bovine fibrin and polydioxanone by Duran et al. [A7,A8], who coined this attractive term, and Chachques et al. [A9], but no consistent clinical series have been published. As with previous rings tested in the laboratory, the Kalangos® biodegradable ring (Bioring, Lonay, Switzerland) is expected to help in the normal growth of the mitral valve in children after attempted repair thus avoiding stenosis. This ring was initially described for use in children. Therefore this concept, albeit not new, should be welcome especially in the setting of pediatric population.

Resorbable polyesters are of high-molecular weight that may have a future based on compatibility and safety [A10]. The point will be useful for implantation on a temporary basis, to provide a scaffold for growing structures like pediatric valves [A11]. Mitral and tricuspid valve repair may be good examples both in the pediatric and adult populations and this type of resorbable scaffold may eventually be used for other applications [A12]. This case by Kazaz et al. [A1] may not be important as an isolated example, however, it may help to renew the interest in a somewhat old concept.
References


