Case report

Tricuspid insufficiency after blunt chest trauma
in a nine-year-old child

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Abstract

The case of a traumatic tricuspid insufficiency in a child, due to an anterior and septal leafllet rupture at the annulus level is reported for the first time. The early diagnosis 2 months after the trauma enabled a rapid and simple tricuspid valvuloplasty by leafllet reinsertion on the annulus associated with annuloplasty with a good result 6 months after the repair. © 1999 Elsevier Science B.V. All rights reserved.

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1. Introduction

If the rupture of cardiac valves following blunt chest trauma is rare, the involvement of the tricuspid valve is even more rare. Until now, the majority of cases reported in the literature occurred in adults.

The authors report a case of traumatic rupture of the anterior and septal tricuspid leafllets in a 9-year-old child, following a horse riding accident.

2. Case report

A 9-year-old child without any past medical history, was admitted to hospital in July 1998 for a skull trauma with transient loss of consciousness and abdominal contusion following a horse riding accident. During his fall, he had received a blow from a hoof on the anterior wall of his chest. After 48 h of monitoring, he was discharged with a normal clinical examination.

In September 1998, while an unusual tiredness was noted during exercise, an unexpected cardiac murmur was discovered, corresponding to a grade 2/4 pansystolic murmur at the lower left sternal border, increasing during inspiration. In addition, the liver was enlarged 3 cm below the right costal margin.

The electrocardiogram was normal. Chest radiography evidenced an enlargement of the right atrium. Two-dimensional echocardiography revealed a situs solitus, normal pulmonary and systemic venous returns as well as atrioventricular and ventriculo-arterial concordance. Both the atrial and ventricular septum were intact. No abnormality was observed at the level of the insertion of the tricuspid valve on the annulus, such as can be seen in Ebstein disease, although the annulus was slightly enlarged (30 mm for an upper normal value for the age of 25 mm). There was an ectasia of the right atrium and a dilatation of the right ventricle, with a paradoxical septal movement. Left heart chambers, aortic and mitral valves, and the aortic arch were normal. Doppler examination found a severe tricuspid regurgitation at the level of the anterior leafllet, originating near the insertion of the leafllet on the annulus (Fig. 1A). The velocity of the tricuspid regurgitation flow was low (2 m/s). A significant regurgitation in the sub-hepatic veins was also noted.

The decision to perform surgery was taken, in December 1998, with cardio-pulmonary bypass, aortic cross-clamping for 45 min and mild hypothermia. The opening of the right atrium revealed an important enlargement of the tricuspid annulus. The internal half of the anterior tricuspid leafllet and the septal leafllets were desinserted: the desinsertion was well-defined, following laceration of the leafllets close to the annulus (Fig. 1A’). The chordae and the papillary muscles were intact. The repair consisted of reinserting the leafllets on the annulus by a simple suture line followed by a semi-circular annuloplasty calibrated on a 25-mm Hagger dilator and an antero-septal commissuroplasty.
with pledget-suture (Fig. 1B'). The injection of saline solution into the right ventricle evidenced the persistence of a small central regurgitation.

The postoperative course was uneventful, allowing rapid extubation. The echocardiogram performed 4 months later showed a residual grade 1/4 tricuspid regurgitation with a low velocity and a mean transvalvular gradient of 3 mm Hg (Fig. 1B).

3. Discussion

The tricuspid valve is a rare location of intra-cardiac lesions induced by blunt chest trauma (3%) [1]. Although it was described for the first time by Williams [2] in 1829, it has been the subject of an increasing number of publications in the last 10 years, mainly because of the augmentation of road accidents and of the rapid development of reliable diagnostic techniques, especially Doppler-echocardiography [3].

The most common mechanisms involved associate an antero-posterior compression of the chest with a sudden increase in the right ventricular pressure during the end-diastolic phase, when the main pulmonary vessels are compressed. This generates a marked traction on both the valvular and subvalvular apparatus [4]. Sub-valvular lesions are responsible for the incompetence in 75% of cases, the leading cause being the rupture of one of the two papillar muscles, most often the anterior one [5]. Usually, lesions caused by these mechanisms become rapidly symptomatic.

Conversely, although it is much less frequent, the leaflets themselves can be damaged either by laceration [6] or by an abrupt rupture near the annulus, as was the case for this child. This mechanism leads to well-defined lesions, which can easily be repaired if the delay between the trauma and the surgical intervention is short. Indeed, in the mid...
1980s, it was common practice to postpone the intervention until the patient became really symptomatic. Delays could sometimes be very long, with an average of 16 years according to Van Son et al. [5], causing deterioration of the valve, necrosis of the papillary muscles and retraction of the chordae, making valvuloplasty an illusive treatment option. However, tricuspid valve replacement by a bioprosthesis cannot be proposed in children because of the rapid structural failure of this type of prosthetic valves at that age. In addition, the risk of thrombo-embolic events with mechanical devices located in a low pressure flow is extremely high, requiring strict anticoagulation, which imposes unbearable restrictions in children. Therefore, we strongly believe that tricuspid valvuloplasty is the treatment of choice for traumatic tricuspid insufficiency in childhood. In order to be feasible, such a procedure must be performed as soon as possible after the trauma. Indeed, the benefit will be even greater, since the cardiac chambers will not have time to become dilated.

Four cases of traumatic tricuspid incompetence have been reported in children in the literature (Table 1). In fact, these children were older, aged between 9 and 15 years, most of them being male. The types of accident were similar to those reported in adults as were the valvular lesions. Overall, including our own observation, four lesions out of five were located at the level of the sub-valvular apparatus (80%), and one lesion was caused by the laceration of a leaflet (20%). Valvuloplasty was performed in three cases, with a prolonged delay of 3 years following the initial trauma in one case. In the other two cases, tricuspid valve replacement was required: one valvuloplasty failure, probably caused by old lesions (8 years) and one case of severe lesions despite early discovery after the initial trauma (1 month).

4. Conclusion

The authors report the first case of traumatic tricuspid insufficiency in a child due to an anterior and septal leaflet rupture at the annulus level. Early diagnosis 2 months after the trauma enabled rapid and simple tricuspid valvuloplasty by leaflet reinsertion on the annulus associated with annuloplasty.

By contrast with traumatic tricuspid insufficiency in adults, tricuspid valvuloplasty is mandatory in children because of the poor long-term results with valvular prostheses. Therefore, surgical intervention must be performed as soon as possible, when valvular lesions can still be repaired easily.

References