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Mitral Ring Extraction Due To Nickel Allergy

Short Title: Mitral ring extraction: nickel allergy

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ABSTRACT

The incidence of allergic reactions due to mechanical prosthesis or rings is not well established. We report the case of a 56-year-old male patient who presented a persistent urticarial rash and anaphylactic shock after mitral valve repair surgery. Prick skin tests were positive for nickel. After removing the nucleus from the mitral annulus, the urticarial clinic disappeared.

KEY WORDS: Nickel allergy; Mitral valve repair; Cardiac prosthesis

Ions released from metals in contact with biological fluids are able to bind proteins forming high antigenic power complexes. These antigenic complexes are capable of triggering a hypersensitivity reaction. The most frequent hypersensitivity reactions are type IV reactions, mediated by macrophages or T lymphocytes. In some cases, the presence of specific IgE antibodies to metals has also been demonstrated. The diagnosis of these reactions is often complicated due to the lack of specific laboratory tests [1].

We present a case of a 56-year-old male patient undergoing elective mitral valve surgery due to degenerative mitral regurgitation. He was in a functional class I of the New York Heart Association and had no medical or surgical history of interest- The echocardiography showed a severe mitral regurgitation with a prolapse of the posterior leaflet in P2 segment and preserved ventricular function and ventricular diameters. The coronary angiography and cardiac magnetic resonance showed no other alterations.

The patient underwent mitral valve repair with a triangular resection of P2, sliding plasty of the posterior ring, transposition of secondary cords and implantation of a complete rigid ring Carpentier Edwards Physio I of 30 mm. The immediate postoperative period was uneventful, with an episode of atrial fibrillation as the only postoperative complication. Postoperative echocardiography confirmed the success of the repair, without mitral valve obstruction (an average gradient of 3 mmHg).

During the first postoperative month, the patient had multiple emergency room admissions and up to two hospital admissions due to anaphylactic shock. The patient presented dysnea, acute glottis edema and generalized urticarial rash (Figure 1). He was treated with intravenous corticosteroids and oral antihistamines. On the basis of drug allergy clinical suspicion, acetylsalicylic acid was withdrawn from the treatment and warfarina instead of acenocumarol was started. Three months later the patient had another admission due to the same symptoms and department of Allergy performed multiple prick

tests where the nickel was the only positive result. Neither echocardiography nor cardiac magnetic resonance showed alterations. After contacting the manufacturer of the mitral annulus, it was confirmed that the ring contained a 15 % of nickel component. Given that the patient suffered new episodes of anaphylactic shock and previous prick skin tests confirmed positive reaction to nickel, we decided to reoperate the patient, considering the denudation of the annuloplasty ring during surgery, leaving the central nucleus in contact with the systemic circulation.

Surgical reintervention was performed one year after the first surgery. The mitral annulus was approached by opening the teflon coating and accessing the inner metal core, which was sheared and excised, closing the teflon ring with 6-0 polypropylene suture. It was assumed that the teflon would maintain the stability of the ring, guaranteeing appropriate reparation. The absence of residual mitral regurgitation was verified by the infusion of physiological saline under pressure and with transesophageal echocardiogram when cardiopulmonary bypass was off.

Subsequent evolution was characterized by an early exacerbation of urticarial rash symptoms that required therapy with corticosteroids and antihistamines, after the postoperative period the treatment was withdrawn. Postoperative echocardiography confirmed that mitral repair was still effective, without residual mitral regurgitation and without mitral stenosis and preserved biventricular function. Currently, after two years of follow-up, the patient remains asymptomatic.

COMMENT

Allergic reactions to metals are well described in Traumatology and Odontology practice [2,3]. In Cardiac Surgery few cases have been reported. Amplatzer extractions used in the closure of a patent foramen ovale due to allergy to nickel or nitinol have been described [4,5].

Allergies to metals, especially nickel, are a frequent cause of contact dermatitis, but the incidence of allergic reactions in cardiac valve prosthesis implantation is not well established [4]. Nickel allergy affects 10 to 15 % of the population. It is possible that in many cases, the explantation of some prosthetic material is required to nickel allergy, without the need of performing allergy tests. Nickel levels increase in serum several weeks after the implant of prosthetic material, but without a clear relation with allergic reactions [5].

A case report describing a severe urticarial rash reaction together with an anaphylactic shock is presented. Within this case study, the only possible trigger of the allergy found was the implanted mitral ring. The nucleus of this ring is made out of Elgiloy; Elgiloy is a cobalt-chromium alloy containing 15 % nickel. We contacted the manufacturer, who certified the absence of known cases of ring corrosion or nickel ion release. In addition, tests were performed to measure the release of nickel in plasma, finding less than 2 ppb after 60 days of ring immersion.

In our patient skin allergy tests were positive to nickel. However, mechanisms causing anaphylactic reaction were not demonstrated: food allergy was ruled out, viral serological tests were negative, total IgE and serum tryptase were in normal range, basophil activation measured by expression of CD63 yielded negative results and serum nickel detection was negative [6]. After removing the nickel nucleus from the mitral annulus, the urticarial rash clinic disappeared completely, demonstrating a clear temporal relationship. We can conclude that the cause of the allergic reaction was the ring implanted during the mitral valve repair.

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FIGURE LEGENDS

Figure 1. Urticaria lesions.

