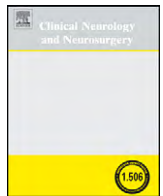




Contents lists available at ScienceDirect

Clinical Neurology and Neurosurgery

journal homepage: www.elsevier.com/locate/clineuro



Case report

Laboratory confirmed polymethyl-methacrylate (Palacos®)-hypersensitivity after cranioplasty

Oliver P. Gautschi^{a,*}, Christopher L. Schlett^b, Jean-Yves Fournier^a, Dieter Cadosch^c

^a Department of Neurosurgery, Cantonal Hospital St. Gallen, Rorschacher Strasse 95, 9000 St. Gallen, Switzerland

^b Cardiac CT MR PET Imaging Program, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

^c School of Anatomy and Human Biology, The University of Western Australia, Crawley, Western Australia, Australia

ARTICLE INFO

Article history:

Received 29 June 2009

Accepted 19 July 2010

Available online xxx

Keywords:

Bone cement

Acrylic resins

Polymethyl-methacrylate

Allergic reaction

Delayed-type hypersensitivity reaction

Cranioplasty

ABSTRACT

Polymethyl-methacrylate (PMMA) as part of bone cement is a widely used material in the context of orthopaedic implants and also in cranioplasty. Although PMMA is characterised by excellent biocompatibility with low intrinsic toxicity and inflammatory activation, a minor portion of patients develop allergic reactions. We present the case of a 39-year-old woman with an increasing headache and a corresponding erythema over the parieto-occipital cranioplasty, which was performed 42 days prior using a PMMA compound. A patch test specific for bone cement components confirmed the diagnosis of a PMMA delayed-type hypersensitivity reaction. The prevalence of allergic reactions to bone cement components are known to vary from between 0.6% and 1.6%, however no adequate, pre-interventional diagnostic tool is currently available. Therefore, physicians are required to consider this differential diagnosis even after an extremely delayed onset of symptoms. This case describes the first ever-reported case in the literature of hypersensitivity to bone cement cranioplasty.

© 2010 Elsevier B.V. All rights reserved.

1. Introduction

Different procedures and materials, including autologous bone and different types of synthetic substances may be used to reconstruct the cranial vault. Whereas autografts became popular for cranioplasty because of their high compatibleness, synthetic material is still required in several cases. Polymethyl-methacrylate (PMMA) like Palacos® was introduced in 1940 and thanks to its numerous interesting properties, particularly its high radiolucency, flexible intraoperative modelling, and stable elasticity as well consistency, it progressively replaced other synthetic materials for cranial vault replacement. Furthermore, PMMA is characterised by excellent biocompatibility with low intrinsic toxicity, inflammatory activation and immunogenicity, resulting in a good tolerance by the majority of patients. The overall infection rate is low and has dropped further in the last decades. In contrast, a minor portion of patients is showing allergic reactions to PMMA. The symptoms vary from rash and skin irritations to fatal systemic allergic shock reactions. This case describes the first ever-reported case in the literature of hypersensitivity to bone cement cranioplasty.

2. Case report

A 39-year-old Caucasian woman presented to our hospital 42 days after cranioplasty using a PMMA material. The patient reported an increasing headache over the preceding 5 days. Clinical examination showed an erythema over the parieto-occipital cranioplasty area with a tender and fluctuating pad on palpation (Fig. 1). Laboratory investigations reported 12.3% eosinophil granulocytes in the white blood cell count. With a high clinical suspicion of local implant rejection, neurosurgical intervention was deemed necessary and the PMMA implant was removed. Multiple swab samples from the superficial and deep wounds, along with repeated blood cultures, revealed no bacterial contamination. An extensive allergological investigation including a skin patch test set specific for bone cement components (HAL Allergie GmbH, Düsseldorf, Germany) exhibited a strong positive reaction to PMMA (epicutaneous lesion and distinct pruritus). The post-operative recovery was uneventful, and the remaining skull defect was closed ten months later with a computer-fabricated patient-specific bioceramic implant (PSI®, Synthes, Oberdorf, Switzerland).

3. Discussion

Polymethyl-methacrylate belongs to the class of synthetic plastics and resins, which form a large group of polymers with acrylic acid as their base. In the clinical setting, the non-polymerised

* Corresponding author. Tel.: +41 71 494 11 11; fax: +41 71 494 28 83.
E-mail address: ogautschi@datacomm.ch (O.P. Gautschi).



Fig. 1. Image of the head showing the local skin reaction.

components are the most allergenic, whereas the final products obtained after polymerisation are believed to have little allergenic

capacity. Despite this, multiple in vitro and in vivo studies have shown specific lymphocytic reactions to PMMA [1]. In addition, several case reports have been published on allergic reactions such as eczema, urticaria, persistent swelling, sterile osteomyelitis or aseptic implant loosening in the context of orthopaedic implants [2]. Interestingly, most acrylic hypersensitivity reactions have been reported as local contact responses, with few descriptions identifying any significant systemic signs or symptoms. The average time between exposure and the onset of symptoms has been reported as 24–48 h.

Recently, methods for screening acrylic resin allergies have been evaluated. The central element of these has been a skin patch test to different bone cement components, which has demonstrated an average prevalence of between 0.6% and 1.6% positive test results [3]. Given the rarity of this condition, pre-op screening would not be appropriate. Nevertheless, physicians are required to consider this differential diagnosis, and extensive examinations including an allergological investigation should be performed even if extremely delayed symptoms of an incompatibility reaction have occurred.

References

- [1] Goodman SB, Fornasier VL, Kei J. Quantitative comparison of the histological effects of particulate polymethylmethacrylate versus polyethylene in the rabbit tibia. *Arch Orthop Trauma Surg* 1991;110:123–6.
- [2] Thomas P, Schuh A, Eben R, Thomsen M. Allergy to bone cement components. *Orthopade* 2008;37:117–20.
- [3] Goon AT, Bruze M, Zimerson E, Goh CL, Soo-Quee Koh D, Isaksson M. Screening for acrylate/methacrylate allergy in the baseline series: our experience in Sweden and Singapore. *Contact Dermatitis* 2008;59:307–13.