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Hypersensitivity to Polymethylmethacrylate Following Shoulder Hemiarthroplasty

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Thorofare: [Jul 2008](#). Vol. 31, Iss. 7; pg. 1, 5 pgs

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Full Text (1582 words)

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Acrylic resins have been used for many years in several health-related applications due to their ease of use, favorable material properties, and relative cost. Cements containing polymethylmethacrylate (PMMA), in particular, have been widely accepted for use in orthopedic surgery, as well as in other fields of medicine. Although relatively rare, the potential for acrylic resins such as PMMA to induce hypersensitivity reactions via cutaneous or mucosal exposures has been reported¹; however, comparatively few cases have been described of patients reacting adversely to acrylic resins used as permanent cements during surgical procedures.

This article reports a hypersensitivity reaction to PMMA cement applied in a right shoulder hemiarthroplasty, which initially presented as a possible postoperative infection. It is believed to

be the first case in the literature of such a reaction occurring in an upper extremity prosthesis.

Case Report

A 56-year-old woman sustained a closed fracture dislocation of the right proximal humerus following a fall onto an outstretched hand. Her injuries included a 1 cm displaced greater tuberosity fracture and a nondisplaced surgical neck fracture (Figure 1). Following reduction under anesthesia, magnetic resonance imaging (MRI) confirmed the greater and lesser tuberosity fractures, a reduced glenohumeral joint, and small supraspinatus and subscapularis tears. Surgical stabilization was elected, and surgery was performed 5 days following her injury. Using a standard deltopectoral approach for exposure, several small articular fragments were noted in addition to her tuberosity and neck fracture, and thus a shoulder hemiarthroplasty was performed. A shoulder prosthesis (head, 43×16 mm; stem, 135°×6.5 mm; length, 115 mm; Tornier, Stafford, Texas) was used for the reconstruction (Figure 2). Polymethylmethacrylate (Surgical Simplex P radioopaque bone cement; Howmedica, Inc., Rutherford, New Jersey) was placed using a syringe and simple finger packing cementing technique. The prosthesis was left slightly proud due to the amount of comminution, and the tuberosities were secured to the prosthesis through drill holes and Ethibond sutures (Eticon, Inc., Sommerville, New Jersey). The rotator cuff tears were also repaired with Ethibond, the deep layer closed with Vicryl (Eticon, Inc.), and the skin closed with Monocryl (Eticon, Inc.). No drain was used. The patient tolerated the procedure well without any complications and was subsequently discharged on postoperative day 3.

At initial follow-up 9 days after surgery, the patient was healing well with resolving shoulder pain, movement of all major muscle groups, and no evidence of infection. During the 4 to 12 weeks after the procedure, the patient complained of a nonspecific shoulder pain, but continued to improve overall.

Four months postoperatively, the patient was noted to have weakness and pain, primarily with shoulder abduction and also at rest. She developed a new onset of a 6×7-cm area of erythema and tenderness over the anterolateral shoulder. She was afebrile without a leukocytosis, with an elevated erythrocyte sedimentation rates (50-60) and a C-reactive protein level of 7.02 (normal, 0-0.79). Due to a possible infection, a shoulder joint aspiration was performed in clinic with confirmation using fluoroscopy. Gram stain of the minimal fluid obtained was negative for any organism, and no growth occurred on aerobic, anaerobic, and fungal cultures. With ongoing pain and suspicion of an infected joint, an arthroscopy of the shoulder (with possible conversion to an open approach, if required) was performed, which showed fibrosis throughout the glenohumeral joint; when probed, however, the prosthesis was well seated and stable. Although no signs of infection were evident, repeat gram stains and cultures, including mycology and tuberculosis, were negative. Multiple synovial samples collected during the arthroscopy showed increased polymorphonuclear neutrophil

cells and granulation without any evidence of infectious organisms. At no point were antibiotics administered to the patient.

Due to persistent erythema and inflammation overlying the lateral shoulder, a dermatology consult was obtained. A punch biopsy from the affected skin showed marked interstitial edema, numerous eosinophils, and vascular ectasia. Patch testing for metals and glues showed delayed contact hypersensitivity to multiple acrylics, including methylmethacrylate; no response to multiple metals was observed, despite lack of any pertinent medical history or previous sensitivity history.

The patient continued to have right shoulder pain and a limited range of motion, with improved but persistent erythema over the lateral arm for approximately 2 years following the procedure. She progressed through various treatment modalities, including physical therapy, multiple pain medications, and acupuncture. Under the guidance of her primary care physician and the allergy service, a course of oral steroids was prescribed, but this, too, resulted in little improvement. Ultimately, at nearly 3 years after her surgery, complete removal of the hardware and cement was performed (Figure 3). This significantly reduced her pain and yielded complete resolution of her erythema. Again, intraoperative cultures showed no evidence of infection. Although a staged reimplantation and revision was entertained, due to ongoing medical concerns, including progressive amyotrophic lateral sclerosis (Lou Gehrig's disease), further surgery has been avoided.

Discussion

Hypersensitivity reactions to acrylates have been implicated as the cause for multiple adverse outcomes, including aseptic loosening and death.²⁻⁴ Although relatively rare, cutaneous exposures resulting in confirmed sensitization via patch testing may occur through dental, occupational, and acrylic nail routes.⁵ A multiyear study of 13,833 patients with suspected contact dermatitis published in 2001 reported that only 54 patients had been diagnosed with a contact allergy to methacrylates via patch testing.¹ Information supporting the incidence and clinical presentation of hypersensitivity reactions to surgically implanted acrylates is less prevalent. A cohort study of 42 patients undergoing hip prosthesis using acrylate cement reported that 21.4% of those tested showed a positive patch test to PMMA 6 months after the operation.⁶ A statistically significant relationship between hypersensitivity to other bone cement components, such as the accelerator N,N-dimethylparatoluidine and subsequent aseptic loosening, has also been demonstrated in a small retrospective study of total hip prosthesis patients.⁷ Other factors that have been implicated as contributing to the biological response include cement consistency, surface area in contact with the bone, exothermic chemical reactions, degree of trauma associated with implantation of the prosthesis, and leaching of monomers.⁸

In the case presented, the patient was thought to have

experienced an intense localized reaction to the PMMA. Hypersensitivity to acrylates was confirmed following placement of the prosthesis through patch testing. The patient had an extensive history of repeated cutaneous exposures to acrylates via cosmetic nail products. While prior sensitization cannot be confirmed, her history of acrylic nail use suggests this etiology rather than a primary reaction to the cement used with the prosthesis. Aseptic loosening appears in the literature as the most commonly reported clinical manifestation of a surgical implant hypersensitivity reaction. To date, no studies have investigated the incidence of hypersensitivity in patients with loosened prostheses. A well-seated prosthesis was verified via arthroscopy, and multiple serial radiographs in the case were presented. Although multiple etiologies of her postoperative localized pain and decreased range of motion (traction injury, iatrogenic injury, cement leakage, possible size mismatch, and resorption of the greater tuberosity) exist, her erythema, continued cutaneous findings, and elevated erythrocyte sedimentation rate represent an unusual presentation of a hypersensitivity reaction.

This case highlights the importance of identifying latent sensitivities in patients considering surgical implantation of prostheses using acrylates. While not cost effective to test all patients, an approach centered on a thorough preoperative history and physical examination with a subsequent focused record review and patch testing for patients with a possible allergy has been described in the literature.⁹ Future studies clarifying the incidence of hypersensitivity to acrylates in patients exhibiting aseptic loosening or other manifestations of a reaction would be beneficial. Identifying new techniques and refining current practices could reduce the likelihood of adverse outcomes by decreasing exposure to the monomeric form of PMMA both during implantation and by leaching afterwards.

[Reference]

References:

1. Geukens S, Goossens A. Occupational contact allergy to (meth)acrylates. *Contact Dermatitis*. 2001; 44 (3):153-159.
2. Jones LC, Hungerford DS. Cement disease. *Clin Orthop Relat Res*. 1987; (225):192-206.
3. Kepes ER, Undersood PS, Becsey L. Intraoperative death associated with acrylic bone cement: report of two cases. *JAMA*. 1972; 222(5):576-577.
4. Haddad FS, Levell NJ, Dowd PM, Cobb AG, Bentley G. Cement hypersensitivity: a cause of aseptic loosening? *J Bone Joint Surg Br*. 1995; 77(2):329-330.
5. Sood A, Taylor JS. Acrylic reactions: a review of 56 cases. *Contact Dermatitis*. 2003; 48(6):346-347.
6. Clementi D, Surace A, Celestini M, Pietrogrande V. Clinical investigations of tolerance to materials and acrylic cement in patients with hip prostheses. *Ital J Orthop Traumatol*. 1980; 6(1):97-104.
7. Haddad FS, Cobb AG, Bentley G, Levell NJ, Dowd PM. Hypersensitivity in aseptic loosening of total hip replacements. *J Bone Joint Surg Br*. 1996; 78(4):546-549.
8. Bullough PG et al: Pathologic studies of total joint replacement. *Orthop Clin North Am*. 1988; 19(3):611-25
9. Kaplan K, Della Valle CJ, Haines K, Zuckerman JD. Preoperative identification of a bone-cement allergy in a patient undergoing total knee arthroplasty. *J Arthroplasty*. 2002; 17(6):788-791.

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ORTHOPEDICS 2008; 31:708
July 2008

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Indexing (document details)

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July 2008

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Document types: General Information

Publication title: [Orthopedics \(Online\)](#). Thorofare: [Jul 2008](#). Vol. 31, Iss. 7; pg. 1, 5 pgs

Source type: Periodical

ProQuest document ID: 1658016681

Text Word Count 1582

Document URL:

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