

Is gentamicin-loaded bone cement a risk for developing systemic allergic dermatitis?

Contact Dermatitis 2009; 60: 176–177

Michael Haeberle¹ and Bernd Wittner²

¹Dermatological Office, and ²Department of Traumatology and Orthopaedic Surgery, County Hospital, 74653 Kuenzelsau, Germany

Key words: bone cement; gentamicin; joint replacement; orthopaedic surgery; systemic allergic dermatitis.

Biomaterial-associated infections are a serious complication following orthopaedic surgery. The biofilm mode of growth on the surface of implanted materials protects bacteria against host defences and systemic antibiotic therapy (1). Since 1970, antibiotics have, therefore, been incorporated in polymethacrylate-based bone cements to provide a continuous local release of the antibiotic (2). The efficacy of their prophylactic use has been shown in clinical trials (3). Systemic allergic dermatitis after a joint replacement caused by sensitization to metal alloys (4) and to methyl methacrylate (5) is well known. A sensitization rate of 4.6% to gentamicin in the Finnish population ($n = 7814$) was found in a retrospective study (6). Comparing the sensitization rate of bone cement components in orthopaedic patients (19/113, i.e. 16.8%), gentamicin proved to be the most frequent allergen (Thomas P, unpublished data). Approximately 280 000 hip and knee replacements were performed in Germany in 2007 (Thomas P, unpublished data). In contrast to these data, to our knowledge, the clinical picture of a gentamicin-induced rash in orthopaedic patients has not previously been described.

Case Report

A 74-year-old woman who had suffered from venous leg ulcers and stasis

dermatitis for more than 20 years developed a pruritic eczematous rash 3 days after a left knee replacement (Fig. 1). Clinically, an infective cause for the rash was excluded. The patient had a normal blood count. The dermatitis initially involved the left lower leg, but within 2 days, it had extended over the whole left leg, the left hip, the right lower leg, and both arms. The dermatitis was more prominent on the left side of the body. The rash cleared over the next 2 weeks without the need for any therapy. She reported that she had developed a similar rash 2 years previously when she had received a total right knee prosthesis. This postoperative dermatitis had not been examined by a dermatologist as the rash was mild and resolved within a few days.

Two months after the knee replacement, patch tests were carried out on normal skin: the European baseline series, cosmetics, drugs (antibiotics and benzoyl peroxide), preservatives, fragrances (Almirall Hermal GmbH, Reinbek, Germany), and components of the Palacos® bone cement provided by the manufacturer (Biomet Deutschland GmbH, Darmstadt, Germany). Application was 2 days. Readings were on D3 and D5. The following substances showed a ++ or +++ reaction after D3 and D5: lanolin alcohol, thiuram mix, myroxylon pereirae, myroxylon toluiferum, fragrance mix II, cetearyl alcohol, methyl dibromo glutaronitrile, methylchloroisothiazolinone, sesquiterpene lactone mix, *Evernia prunastri*, isoeugenol, cinnamal, sorbitan sesquioleate, framycetin sulfate, and gentamicin sulfate. There was no reaction to metals.

Discussion

Our patient's rash showed a pattern that was typical of a systemically induced allergic dermatitis. During and after the operation, her skin had not been exposed to any of the contact allergens above. The clinical picture and the course of the dermatitis supported the hypothesis that an allergen released from bone cement might have caused the rash. We suggest that the observed allergy was elicited by gentamicin released from the bone cement. The pharmacokinetic properties of gentamicin-loaded bone cement have been extensively investigated (7): maximum release is within the first 24 hrs after implantation, and then, a steady release of gentamicin occurs during the next 190 days.

The positive patch test reactions reflect the patient's long history of stasis dermatitis and venous leg ulcers. Topical treatments with various ointments containing fragrances, preservatives, antimicrobial drugs, and other sensitizers had caused polyvalent delayed-type hypersensitivity. In a cohort of leg ulcer patients ($n = 811$), the sensitization rate for gentamicin was found to be 4.5% (8) and framycetin 17.6%. In the 1980s and 1990s, the topical application of a framycetin-containing fleece to treat leg ulcers was popular in Germany. The majority of sensitizations to gentamicin might be due to its cross-reactivity to the aminoglycoside framycetin. A recent study from Portugal showed a sensitization rate of 8.8% for gentamicin in 57 leg ulcer patients (9).

The clinical picture of this probable gentamicin-induced allergic dermatitis

was characterized by minor symptoms, which did not need specific treatment; the release of gentamicin from bone cement is a self-limiting process.

Systemically induced allergic dermatitis due to gentamicin is a rare phenomenon, but a positive history of leg ulcers or stasis dermatitis should be considered as a risk factor for the development of the problem after orthopaedic surgery. However, gentamicin-induced allergic dermatitis is not relevant for the surgical outcome of a joint replacement.

References

1. van de Belt H, Neut D, Uges D R, Schenk W, van Horn J R, van der Mei H C, Busscher H J. Surface roughness, porosity and wettability of gentamicin-loaded bone cements and their antibiotic release. *Biomaterials* 2000; 21: 1981–1987.
2. Hendriks J G, van Horn J R, van der Mei H C, Busscher H J. Background of antibiotic-loaded bone cement and prosthesis-related infection. *Biomaterials* 2004; 25: 545–556.
3. van de Belt H et al. Infection of orthopaedic implants and the use of antibiotic-loaded bone cements. *Acta Orthop Scand* 2001; 72: 557–571.
4. Thomas P, Schuh A, Ring J, Thomsen M. Orthopädisch-chirurgische Implantate und Allergien. *Hautarzt* 2008; 59: 220–229.
5. Richter-Hintz D, Rieker J, Rauch L, Homey B. Prothesenunverträglichkeit bei Typ-IV-Sensibilisierung gegen Knochenzement. *Hautarzt* 2004; 55: 987–989.
6. Liippo J, Lammintausta K. Gentamicin allergy – different sources of sensitization (Abstract FC2.5). *Contact Dermatitis* 2008; 58 (Suppl. 1): 34–35.
7. Gonçalo M, Ribeiro F, Figueiredo A. Contact sensitization in leg ulcer patients: a five-year-review (Abstract PB30). *Contact Dermatitis* 2008; 58 (Suppl. 1): 66.
8. Lange-Ionescu S. Kontaktallergien bei Patienten mit Stauungsdermatitis oder Ekzem der Beine – Alte und Neue Allergene. *Vasomed* 1995; 7: 260–266.
9. Frommelt L, Renzing-Köhler K, Fenner T. Gentamicin-haltige Knochenzemente. *Krankenhauspharmazie* 2003; 24: 320–324.

Address:

Michael Haeberle, MD
Private Office
Dermatology/Allergology
Stuttgarter Straße 5
D-74653 Kuenzelsau
Germany
Tel: +497940985100
Fax: +497940985101
e-mail: drhaeberlem@aol.com



Fig. 1. Rash on the left lower leg.