

Allergic Reaction to Polyether Ether Ketone Following Cross-Reactivity to Epoxy Resin

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1–2

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Abstract

Polyether ether ketone (PEEK) is a thermoplastic polymer frequently used in engineering but also in medical devices. Only 1 case of allergic reaction to PEEK used as an implanted medical device has been reported so far; however, the route of sensitization remained unclear. Here we report on a 62-year-old male patient with a preknown, severe type IV allergy to epoxy resin. He reported strong pain in his shoulder after implantation of a PEEK-containing device after a rotator cuff injury. For testing, the device was implanted in a small pouch subcutaneously on the abdomen. The patient reported massive pain starting 8 hours after the implantation, strictly limited to the procedural area and showing perifocal erythema. A possible explanation of the sensitization mode is the source material for PEEK and epoxy resin, as both are mainly based on bisphenols. An allergic reaction to PEEK with preknown epoxy resin sensitization has not been reported so far. As epoxy resins are a frequent cause of occupational contact dermatitis and PEEK is widely used for medical and nonmedical devices, we believe that this is of great clinical relevance.

Keywords

allergy, epoxy resin, cross-reactivity

Polyether ether ketone (PEEK) is a thermoplastic polymer, frequently used in engineering but also in medical devices such as dental prostheses but also orthopaedic and neurosurgical implants. Only 1 case of allergic reaction to PEEK used as an implanted medical device has been reported so far.¹ However, the route of sensitization remained unclear.

Here we report on a 62-year-old male patient with a pre-known, severe type IV allergy to epoxy resin presenting to the outpatient department with strong pain after a rotator cuff injury and subsequent surgical procedure. To reattach the rotator cuff, a minimal invasive procedure with a self-anchoring device head (Healix Transtend DePuy, New Brunswick, NJ, USA) was implanted. After the procedure, the patient reported constant, severe pain in the shoulder area. As all smear tests and cultures remained negative for bacterial or fungal infection and the patient never showed any systemic signs of inflammation, he was referred to the allergy department for further investigation.

Epicutaneous testing with metals, latex, bone cement, as well as samples from the implanted device remained without pathological findings. We were not able to perform further testing as no commercial testing substances for PEEK are available. Production of a testing substance by dilution of the solid material was not possible because of technical difficulties and patient safety considerations.

The material of the device head used was investigated to be PEEK. To increase the sensibility of testing, a sterile Healix Transtend device head was implanted in a small pouch subcutaneously on the abdomen after obtaining informed consent by the patient. The patient reported massive pain, starting 8 hours after the implantation, strictly limited to the procedural area and showing perifocal erythema. After 24 hours, the device was explanted and several microbiological samples as well as a histologic sample were taken. Microbiologic investigation showed no bacterial or fungal infection; histology revealed a panniculitis with leucocytic infiltration. After consulting the treating surgeon, the rotator cuff device was removed and a wire cerclage was used to fix the tendons. After the revision surgery, the patient has fully recovered and is still symptom free 8 months after the procedure.

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PEEK synthesis is based on dialkylation of bisphenolate salts. This fact could serve as a possible explanation of the sensitization mode, as epoxy resin is mainly based on bisphenols. The same source structure of both materials might be responsible for the reaction to the PEEK device in this patient with a preknown sensitization to epoxy resin. Several cases of allergic contact dermatitis to epoxy resin and sensitization to bisphenol have been published.²⁻⁴ We observed local inflammatory reaction after implantation of the device, although epicutaneous testing remained negative. This could be explained by the increased exposure of the PEEK device to mediator cells in the subcutaneous tissue. Also, the large size of PEEK polymers might have affected sufficient penetration through the skin in epicutaneous testing.

However, an allergic reaction to PEEK with preknown epoxy resin sensitization has not been reported so far. As epoxy resins are a frequent cause of occupational contact dermatitis and PEEK is widely used for medical and non-medical devices, we believe that this possible cross-reaction could be of great clinical relevance.⁵⁻⁷ We recommend that any case of suspected PEEK allergy should be tested with epoxy resin too as these substances are commercially available.

Declaration of Conflicting Interests

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