Case Report

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Allergic Contact Dermatitis to Mastisol Adhesive Used for Skin Closure in Orthopedic Surgery: A Case Report

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Abstract

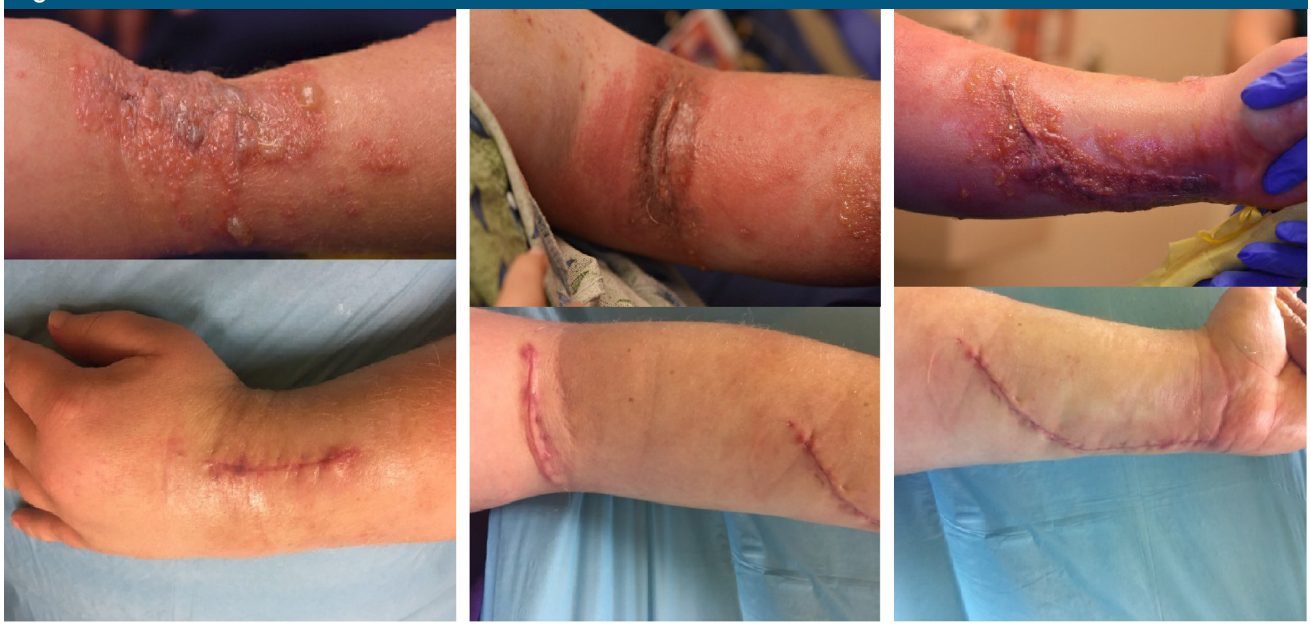
We report on a rare case of allergic contact dermatitis (ACD) from Mastisol liquid adhesive. We are aware of a few reports in the medical literature, but none describes an allergic reaction during the third exposure to the offending agent. Our patient was a 20-year-old Caucasian man with a history of cerebral palsy spastic hemiplegia who underwent single-event multilevel soft-tissue surgery to optimize function of his left upper extremity. He developed a severe cutaneous allergic reaction after his third exposure to Mastisol. He was subsequently admitted to the inpatient service and managed without further complications by a multidisciplinary team comprising orthopedics, pediatrics, and dermatology. We discuss the etiology, clinical features, diagnosis, and treatment of this entity, and we also review relevant available literature on the subject. We aim at creating further awareness of allergic reactions because of exposure to available skin-prepping and wound-dressing agents.

This case discusses a rare incidence of an allergic contact dermatitis (ACD) after exposure to Mastisol adhesive in a surgical setting. There is a dearth of reports in the medical literature describing previous instances. The process of skin preparation and wound closure are key steps in ensuring uncomplicated postoperative wound healing. Our case report describes a complication after the use of a wound adhesive to optimize the surgical incision healing. Prompt recognition and management is important to limit further complications. ACD is an underrecognized and uncommon cause of readmission in the postoperative period in orthopedic surgery.

Case Presentation

A 20-year-old man with a history of cerebral palsy, obsessive compulsive disorder, and allergies to sulfa and gluten presented to our clinic with severe itching of his left upper extremity (Figure 1). Four days before, he underwent multilevel soft-tissue surgery at the elbow, forearm, and wrist to address myostatic contractures with a goal to optimize function. At the start of the surgery, the skin was

Figure 1



A B C

A, Left wrist dorsal—4 days post surgery (top) and 21 days post surgery (bottom). **B**, Left cubital fossa—4 days post surgery (top) and 21 days post surgery (bottom). **C**, Left wrist volar—4 days post surgery (top) and 21 days post surgery (bottom).

prepped with ChloraPrep (chlorhexidine gluconate). At the end of the surgery, a two-layer closure of the surgical incision was done using 2-0 polyglactin 910 (Vicryl) for subcutaneous approximation and 3-0 polyglecaprone 25 (Monocryl) for skin closure. The superficial wound edges were approximated with 3M-Steri-Strips after applying Mastisol liquid adhesive. The wound was covered with Xeroform petrolatum-coated gauze, sterile gauze, and a fiberglass long arm cast. Our patient had an unremarkable postoperative course and was discharged the next day to home with a follow-up appointment in two weeks for cast check. He presented 4 days later to the clinic with complaints of intense itching under the cast that started the day after discharge from hospital, with his mother noting attempts by the patient to excoriate the skin under the cast when at home. The cast and wound dressings were removed to reveal large tense fluid-filled bullae and smaller vesicles with yellow crust superimposed on red edematous plaques along and surrounding the surgical incision sites (see Figure 1). The patient was afebrile and otherwise medically stable with no concerning constitutional signs or symptoms, but he did complain of significant pruritus. A suspicion for ACD to Mastisol was made, with cellulitis and erysipelas as potential differential diagnoses. The dermatology team was promptly involved in the subsequent care for this patient. They confirmed the diagnosis of acute ACD to Mastisol given the linearity along the incision line with an acute blistering and dermatitic eruption. Inpatient hospital admission ensued for management of his symptoms and severe contact dermatitis as well as to monitor for potential signs of infection and wound dehiscence.

On admission, the wounds were dressed with clobetasol propionate 0.05% ointment and Mepilex Transfer dressing (soft silicone–faced polyurethane wound contact layer) coated in petroleum jelly, followed by a soft conform gauze overwrap and static splint, twice daily. Itching was controlled with hydroxyzine every 8 hours. Because of the severity of the eruption, once daily oral prednisone (60 mg) starting on day of admission was initiated for a 5-day course. Antimicrobial coverage was provided with oral cephalexin 500 mg every 12 hours for a total of 10 days. The postoperative orthopedic plan was modified from using a long arm cast to a removable wrist hand orthosis to allow for frequent wound inspections and dressing changes. The patient was discharged home 2 days later with instructions for wound-dressing change twice daily and subsequent follow-up in the orthopedics clinic. The patient was seen in clinic after approximately three weeks during which all signs of contact dermatitis had resolved with minor residual erythema as expected at 3 weeks post-op (see Figure 1). Regular follow-up

visits in the orthopedics clinic ensued without further complicating events.

Discussion

Allergic contact dermatitis (ACD) is a type IV delayed (cell-mediated) hypersensitivity reaction (an exception to other "allergic" reactions that are predominantly type I hypersensitivity reactions). It requires previous contact with an offending agent or a chemically similar compound. Once an individual has been sensitized, a subsequent contact with the same or chemically similar allergen can trigger a reaction at the original site of sensitization. Typically, ACD is present as erythema, edema, dermatitis, and blistering of the affected area. Certain clinical indicators such as the delineation and often geographic configuration of the skin eruption, pruritus, timing of symptoms, and lack of tenderness support the diagnosis of ACD.

The linear pattern of the bullous cutaneous eruption in our patient encompassed only the area where the liquid adhesive was applied along the wound closure sites. This observation, coupled with the experience of the dermatology team and the paucity of allergic reactions secondary to the other used products in this case such as Xeroform or Steri-Strips in the medical literature, helped to narrow down our hitherto short list of the potential offending agents. We were able to discount chlorhexidine as a potential cause because it was used beyond the site of allergic reaction.

Mastisol (Ferndale Laboratories) is a liquid adhesive for securing wound dressings and tapes. It is available in single-use vials, 15-mL and 2-oz. bottles, and a 15-mL spray bottle. It contains gum resin, styrax liquid, methyl salicylate, and alcohol (SDA 23A). Styrax is a shrub that produces the storax resin (also an ingredient in tincture of benzoin). Gum resin (also known as colophony) is a natural resin from the *Pistacia lentiscus* tree.[1] Mastisol has been reported to have about seven to eight times more adhesiveness, as well as a lower incidence of postoperative contact dermatitis, compared with the previously favored adhesive Compound Tincture of Benzoin (CTB)[2]. Colophony has been reported to have a 2% cutaneous allergen ACD reaction rate with patch testing (Hood et al[3]).

The incidence of Mastisol-induced ACD is unknown because of paucity of previous studies in the medical literature. A literature search carried out in September 2017 on MEDLINE, CINAHL, Web of Science, EMBASE, and Scopus databases using keywords "mastisol," "gum mastic," and "dermatitis" as combined search criteria resulted in a limited set of previously published cases. The summary of our findings is presented in Table 1.

Our patient had two previous exposures (2 and 7 years earlier) to Mastisol with no documented history of adverse reactions. Antigenic-induced primary sensitization is an unusual event predominantly expressed 7 to 10 days after exposure in a previously unsensitized individual and 12 to 48 hours after exposure in a patient with a history of previous sensitization.[4] In this case, it is unlikely that our patient was sensitized to Mastisol during his first encounter with it because he had no reaction during the second encounter. It is important for patients and caregivers to recognize that ACD can also occur at any time, even after many exposures to an allergen over many months to years.

Table 1

Summary of Literature Review

Lead Author (Year)	Highlight of Case Reports
Mabrie et al[8]	Mastisol-induced contact dermatitis after a rhinoplasty procedure.
Kline[6]	A patient with ACD at the incision site one day after a foot surgery that involved skin prep using DuraPrep and skin closure using Steri-Strips and Mastisol. The patch test compared Steri-Strips, Mastisol, and DuraPrep and showed significant reaction to Mastisol skin adhesive.
Caldwell et al[9]	ACD in a patient exposed to Mastisol for intrathecal pump placement, which resolved within a week on topical steroids.

Diagnosis

Diagnosis of ACD is clinical. A typical case could present as a peri-incisional erythema along with signs of dermatitis and blistering seen 5 to 14 days after surgery during which a wound adhesive was used for incision closure.[5] The co-presentation of systemic symptoms such as fever, chills, and incision site pain or purulent drainage should prompt a comprehensive workup for an infectious etiology. Some reports (Kline[6]) have suggested patch testing before actual surgery to identify high-risk patients. This suggestion presents its own set of challenges with cost implications and time commitment for testing and interpretation, before surgery date. In addition, a similar case as ours may have posed difficult to prevent, considering that our patient was exposed to the causative substance during the last two surgeries without any adverse reactions and would not have been considered a high-risk patient.

Treatment

A multidisciplinary treatment approach that encompasses the knowledge and expertise of orthopedics, dermatology subspecialties, and wound care specialists is needed to manage the patient. Treatment plans should include diligent wound care, anti-inflammatory agents including topical corticosteroids and oral steroids when indicated, and oral antihistamines for pruritus relief. Careful monitoring for potential secondary wound infection and dehiscence should be undertaken, and superficial wound cultures should be done if there is concern for infection.

This case is unique because ACD is a rare complication of orthopedic surgery and has not been reported previously as a cause of readmission within 30 days of surgery. This becomes even more relevant because the 30-day postoperative readmission rate is being used as a quality health outcomes indicator. Thibaudeau et al[7] in their retrospective analysis of the 2013 National Surgery Quality Improvement Program pediatric database identified surgical site infection, fracture, pneumonia, and cellulitis as some of the leading causes of readmission within 30 days of upper extremity surgery, with no mention made of allergic reaction to wound dressings or other topical preparations used in the perioperative period (Thibaudeau et al[7]).

In this case, the ACD also necessitated a change in the postoperative orthopedic protocol to allow for its appropriate treatment without compromising the goals of surgery. We changed our original plan from a long arm cast to a static splint and nighttime elbow extension splint to allow for twice daily wound-dressing changes which eventually worked well for the care team and the family on discharge.

Conclusions

Incidences of ACD to Mastisol are rare or possibly underreported. Our case portrays a moderate-to-severe instance of this localized reaction. Early recognition and treatment with a multidisciplinary approach is key to managing patients effectively without adversely jeopardizing wound healing and functional outcomes.

Keypoints

1. ACD as a result of wound-dressing material may be rare, but can occur. A high index of suspicion is needed for prompt diagnosis.
2. ACD can be recognized based on its geographic pattern that tends to correspond to the location of the placement of the offending agent, as well as the typical clinical appearance of vesicles, bullae, and acute dermatitis. Early recognition is important to prevent further complications and misdiagnosis.
3. The successful management of ACD often requires a multidisciplinary approach including surgery, dermatology, and medicine specialties.

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