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Christina A. Fleming, Shane C. O'Neill, Prasad Ellanti, Paul Moroney

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Case Report: We discuss a case of a 65-year-old male who following a scaphoid fracture, developed a severe acute allergic contact dermatitis to fiberglass orthopedic cast. He had no previous history of atopy and had orthopedic casting previously, 20 years ago. He was treated symptomatically initially without cast removal but deteriorated. His condition was successfully managed conservatively with a combination of cast removal and use of a canvas splint, intravenous antibiotics, oral antihistamine and topical steroids. He achieved full fracture healing clinically and radiologically.

Conclusion: A high index of suspicion should be kept when patients with an orthopedic cast present with any symptoms to the emergency department. Any symptoms beneath a cast should prompt cast removal and full examination.

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CASE REPORT

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Keywords: Cast dermatitis, Contact allergic dermatitis, Orthopedic casting, Scaphoid fracture

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INTRODUCTION

Orthopedic casting is a fundamental technique in orthopedic practice. It is used for the immobilization of fractures both as definitive or postoperative management. While orthopedic casting principles date back several centuries, the use of modern casting techniques was first described in 1851 by Mathijsen culminating in the introduction of synthetic casting tapes (45% polyurethane resin and 55% fiberglass) in the 1970s [1]. While orthopedic casting is effective it is not without complications including stiffness, pressure sores and compartment syndrome [2]. All of these complications may be avoided with correct casting technique and regular cast review. We describe a case of a rare orthopedic cast complication in which a previously well patient with no atopic background developed a severe acute allergic contact dermatitis to fiberglass cast application.

CASE REPORT

A 65-year-old male presented to the emergency department with a painful right wrist, subsequent to a fall ten days earlier on to his outstretched hand. On clinical assessment he had a painful wrist and tenderness over his anatomical snuffbox that was suspicious for a scaphoid fracture. An undisplaced scaphoid waist fracture was confirmed on plain film radiographs (Figure 1). He was placed in a Plaster of Paris (POP) back slab and an orthopedic follow-up was arranged. At the orthopedic

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review, it was decided that non-operative treatment in a below elbow “Colles” cast was the treatment of choice. A standard 3M (TM) fiberglass cast was applied with a further clinical and radiographic review scheduled. Over the following two days the patient began to develop pain, pruritus and felt the cast getting tighter. He presented to the emergency department where a further radiograph demonstrated no fracture displacement and it was felt that the symptoms would resolve with elevation as the arm was not too swollen. The following day he noted progressive edema of his hand and fingers and pustular lesions on his right arm, spreading to his left arm (Figure 2). There were similar lesions on his right trunk and abdomen where he had rested the cast in direct contact with skin (Figure 3). The pain and irritation became so unbearable that the patient removed the cast with a saw himself before re-attending the emergency department. On arrival he was afebrile, normotensive and without any symptoms or signs of systemic infection or overt anaphylaxis. There was no past medical history of atopy or dermatological conditions. His right forearm was edematous with erythema and numerous bullous eruptions. Many lesions were impetiginized and cellitic. He had a similar rash on his trunk and left forearm. Routine bloods showed normal white cell count of $8 \times 10^9/L$, normal eosinophils $0.15 \times 10^9/L$ and a normal C-reactive protein of 4 mg/L.

The patient was admitted to hospital with a working diagnosis of acute allergic contact dermatitis (ACD) secondary to fiberglass cast application. Swabs were taken from pustular lesions and sent for microscopy, culture and sensitivity analysis to rule out infection. He was commenced on empirical flucloxacillin (500 mg six hourly) by mouth and subsequent microbiological results returned negative for the presence of any micro-organisms. He was urgently reviewed by the dermatology team who concurred with a diagnosis of acute ACD and further commenced on oral prednisolone 10 mg once daily by mouth, cetirizine 4 mg three times daily by mouth and topical agents including Fucibet® (betamethasone and fusidic acid) and Jelonet dressings. The patient was nursed with his arm elevated in a sling support and showed signs of improvement within twenty four hours. On day-3 he was switched from oral steroids to topical steroid cream (dermovate). The antibiotics and antihistamines were continued for a total of ten days.

He was discharged home on day-5 with the wrist in a canvas splint with thumb extension for management of the scaphoid fracture. By six weeks the skin had greatly improved and the scaphoid fracture had healed by eight weeks (Figure 4). The patient's skin had normalized by three months and he has been discharged from follow-up. He remains pain free and without any functional limitation.

DISCUSSION

This case report describes acute allergic contact dermatitis (ACD) secondary to fiberglass orthopedic cast

Figure 1: Radiograph demonstrating an undisplaced scaphoid waist fracture (white arrow).

Figure 2: Clinical photographs of the right forearm demonstrating the extensive skin involvement and pustular lesions.

Figure 3: Clinical photograph demonstrating the allergic contact dermatitis involvement of the forearm, arm and abdomen.

Figure 4: (A) Clinical photograph demonstrating resolution of allergic contact dermatitis, (B) Radiograph demonstration healed scaphoid fracture.

application. While previous case reports have reported allergic skin reactions to POP, the development of ACD to newer fiberglass cast agents have not been reported in the literature to date. Allergic contact dermatitis is the result of a T cell mediated, delayed-type hypersensitivity response to an exogenous agent on direct contact [3]. Hapten-binding is the initial step in the development of ACD and after initial sensitization CD 4+ and CD 8+ T cells as well as natural killer T cells and T regulatory cells are critical participants in the immunogenic response [4]. Clinically, it presents as erythematous, indurated skin often with edema and bullae formation [5]. Secondary skin changes may be seen in the form of excoriation or

impetiginization as was seen in this case also [6]. While lesions are typically seen in areas in direct contact with the irritant, diffuse distributions may also occur depending on the nature of the allergen or transfer of the allergen from the primary site of contact to distant skin areas [7]. Steroids and anti-histamine therapies provide the foundation of management along with treatment of superimposed infection.

3M(TM) Scotch cast (TM) tape currently is the most commonly used orthopedic casting agent and was used in this case. It contains a resin embedded in woven fiberglass and can be molded to the required shape for immobilization. Chemical constituents include fibrous glass, 4,4'-diphenylmethane diisocyanate-polypropylene glycol polymers and dimorpholino diethyl ether [8]. Patch testing for these agents may identify atopy and confirm diagnosis but clinical diagnosis is sufficient to recommend future avoidance of this material in patients showing sensitivity to this material. We must make note of the clinical difficulty in this case between fracture management and skin management. The scaphoid, due to its retrograde blood supply is vulnerable for non-union if not appropriately managed. However, due to the extent of the patient distress from the significant cutaneous involvement, skin management was prioritized. Splint immobilization was sufficient to manage the fracture.

CONCLUSION

A high index of suspicion should be kept when patients with an orthopedic cast present to the emergency department with persistent pain or other unexplained symptoms under an orthopedic cast. It is often due to the underlying fracture itself or the subsequent edema of the affected limb but occasionally may be more sinister. While radiographic assessment is important, cast removal must be performed as a matter of urgency in any patient who presents with unexplainable pain, persistent burning or neurovascular symptoms to allow for full examination and ensure there is no evidence of compartment syndrome. An urgent orthopedic opinion must be sought on these patients.

Author Contributions

Christina A. Fleming – Substantial contributions to conception and design, Acquisition of data, Analysis and interpretation of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published

Shane C. O'Neill – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Prasad Ellanti – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Paul Moroney – Analysis and interpretation of data, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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