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An unusual bone reaction to a retained organic foreign body in the hand

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Abstract
Penetrating wounds of the hand with an embedded foreign body are common in active children and manual workers. Organic material, particularly thorns, can cause an inflammatory tissue reaction, ranging from a localized foreign body granuloma to a severe soft tissue and osseous reaction.
We report the case of a 57-year-old man presented to our emergency department with a painful swelling of his fourth right finger. He had fallen into bushes 4 month prior to his presentation. Plain radiographs showed a solid periosteal new-bone formation along the second phalanx, interrupted by a rounded well-limited radiolucent area at the mid-phalangeal level that we described like a "crab claw periosteal reaction".
The osteoblastic reaction to an organic foreign body is very rare, we report an exceptional case of an unusual osteoblastic reaction to a retained organic foreign body in the hand that has been to our knowledge only once reported in the literature.

Keywords: Organic, foreign body, thorn, crab claw, periosteal reaction, hand

Introduction
Penetrating wounds of the hand are common especially in rural areas. Many are caused by thorns or by wood splinters. When the diagnosis is missed, an untreated retained organic foreign body in the hand usually creates a foreign-body granuloma and may cause late soft tissue and osseous complications.

Case report
A 57-year-old man presented to our emergency department with a painful swelling of his fourth right finger. He had fallen into bushes 4 month prior to his presentation, but without any complaints at that time and he continued with his daily activities. Then, he noticed a progressive swelling that became painful with erythema only in the last few days.
Physical examination showed that the patient had moderate fever with swelling and erythema of the ulnar aspect of his fourth right finger. There was a firm sub-cutaneous mass of 1 cm painful to palpation with a central sting area or entry point (Fig.1).

Fig 1: Clinical images of the right hand showing firm sub-cutaneous mass of 1 cm painful to palpation with a central sting area or entry point

He had an elevated white-blood-cell count (WBC= 13200) and an elevated C-reactive protein level (CRP= 48 mg/dl).
Plain radiographs of the right hand (Fig. 2) showed swelling of the soft-tissues along the ulnar aspect of the fourth right finger at the level of the second phalanx. A solid periosteal new-bone formation was observed along the second phalanx, interrupted by a rounded well-limited radiolucent area at the mid-phalangeal level that we described like a "crab claw periosteal reaction". There was no associated osteolytic lesions or intra-medullary abnormalities.

Fig 2: Plain radiographs of the right hand showing a solid periosteal new-bone formation along the second phalanx, interrupted by a rounded well-limited radiolucent area at the mid-phalangeal level, that we described like a "crab claw periosteal reaction"

The patient was operated under general anesthesia. A surgical excisional biopsy was performed revealing a retained thorn measuring 9 mm (Fig. 3, 4).

Fig 3: Per-operative images of the right hand after surgical excision of the granuloma and retrieval of the thorn

Fig 4: Excision of the soft tissue around the entry point of a 9 mm thorn

Histological study on the biopsy specimen revealed an epithelioid giganto-cellulary granuloma without caseous necrosis consistent with a foreign body granuloma.
At 3 months of follow-up the wound was healed and the patient was completely painless with a full grip strength (Fig.5). Plain radiographs of the hand showed complete disappearance of the crab claw periosteal reaction (Fig. 6).

Fig 5: the patient was completely painless with a full grip strength at 3 months of follow-up

Fig 6: Plain radiographs of the hand showed complete disappearance of the crab claw periosteal reaction at 3 months of follow-up

Discussion

Penetrating wounds of the hand with an embedded foreign body are common in active children and manual workers. Foreign-body reactions can result from different types of agents such as cactus bristles, wooden splinters, nylon fibers, silicone, tattoo pigments, sea urchin spines and thorns [1].
Foreign bodies in the hand are often composed of wooden splinters and thorns. If the foreign body goes unrecognized or cannot be removed and is not phagocytized during the acute inflammatory reaction, the end stage will be encapsulation with fibrous tissue and the formation of a foreign body granuloma [2].
The diagnosis of thorn injury can be difficult especially when the patient has forgotten the traumatic incident. The presentation may take several months or even years [3].
In such cases the patient usually presents with delayed manifestations of the initially forgotten thorn injury such as a low grade chronic inflammatory reaction due to intense local

inflammatory response, mimicking a tumour of the soft tissue or a bone tumour. Foreign body granulomas may mimic a variety of tumoural and pseudotumoural lesions [4].

Organic material, particularly thorns, can cause an inflammatory tissue reaction, ranging from a localized foreign body granuloma to a severe soft tissue reaction including a significant synovitis with a painful joint and an osseous lesion with a lytic reaction or exceptionally an osteoblastic reaction as in our case or a combination of both [5].

The differential diagnosis for an osseous pathologic reaction to an unrecognized organic foreign body includes acute and chronic osteomyelitis, osteoid osteoma, tuberculosis granuloma, cortical fibrous defect, aneurysmal bone cyst, bone cyst, and neoplasm [6].

To the best of our knowledge, only 5 cases of osteoblastic reactions secondary to the long presence of organic foreign body have been previously reported, and only 1 case had a similar shape of bone formation that we described for the first time as a "crab claw periosteal reaction" [5, 7].

Organic foreign bodies are radiolucent so they are difficult to identify on plain radiographs in contrast to glass and metallic objects [8]. Ultrasound has been proven to be a highly sensitive and specific tool for the diagnosis of such retained foreign bodies [9].

MRI (Magnetic Resonance Images) can also detect foreign body and guide the surgical approach for its retrieval. The usual appearance of a foreign body on MRI is a low-signal intensity on T1-weighted images. The most typical sign for identification on MRI is the presence of a surrounding rim of fluid rich in granulation tissue or a fluid-filled cyst [10].

Once the organic foreign body is detected, it should be immediately surgically removed. The surrounding tissues and the foreign body granuloma should be excised and sent for histopathology and culture [3].

Conclusion

Retained organic foreign bodies in the hand may mimic a variety of soft tissue and bone lesions delaying the diagnosis. A neglected organic foreign body should be included in the differential diagnosis when the radiological findings are nonspecific, even in the absence of a definite history of trauma.

Surgical retrieval of the foreign body with excision of the granuloma is necessary to obtain good functional outcome and radiological disappearance of the new bone formation.

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