PENCIL-CORE GRANULOMA OF THE DISTAL RADIO-ULNAR JOINT:
AN UNUSUAL PRESENTATION AS SOFT-TISSUE SARCOMA AFTER 45 YEARS

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A case of pencil-gore granuloma occurring 45 years after the initial injury is described. The clinical and radiological presentation was suggestive of a soft-tissue sarcoma. The diagnosis was confirmed by biopsy, which also revealed foreign body fragments which, on spectrometric analysis, had high concentrations of carbon and aluminium.

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Injuries caused by pencils are common and usually trivial. We present a case of a pencil-core granuloma arising from the distal radio-ulnar joint 45 years after the initial injury and which resembled a soft-tissue sarcoma. There are seven previous case reports1-7 in the literature of pencil-core granuloma presenting to dermatologists, plastic surgeons, ophthalmologists and neurosurgeons as a suspected melanoma, haemangioma or abscess.

Case report

A 60-year-old right-handed bus driver who had a rapidly growing lump on his right wrist, was referred to our tumour unit. He gave a history of being stabbed in the right wrist by a pencil at the age of 15 years after which he had undergone surgical removal of the pencil lead the same evening under local anaesthetic. There were no further problems from this until the rapid onset of swelling 45 years later. He correlated the onset of pain and swelling in his wrist to an injury at work. There were no other musculoskeletal symptoms and no significant family or personal history.

On examination there was a tender, multilobulated, firm swelling 4 x 4 cm in size on the volar and medial aspect of the right wrist which appeared to envelope the head of the ulna. It was deep to the deep fascia. There was a normal range of movement of the wrist and forearm.

Radiographs showed erosion of the cortices of the distal radius and ulna (Fig. 1). MRI showed a large lobulated soft-tissue mass arising from the distal radio-ulnar joint (Fig. 2). The differential diagnosis was between a synovial proliferative disorder, neoplasm and tuberculosis. The chest radiograph was normal. The ESR was 2 mm at 1 hour and the level of C-reactive protein 3 mg/l. A biopsy was performed which showed multiple fragments of dense collagenous tissue, synovium and fibrin with embedded metal-like particles. In view of the history, these were thought to be foreign-body fragments of graphite from the pencil core. There was also deposition of haemosiderin indicating previous local haemorrhage. There was no evidence of infection (Figs 3 and 4).

A small piece of the biopsy sample was cut and examined in a Philips XL-30 scanning electron microscope operating at 15 kV. Using signals of secondary electrons, the surface morphology of the sample was revealed. Chemical analysis was also performed through an ultra-thin window energy-dispersive x-ray (EDX) spectrometer, which can detect light elements down to boron. A few spectra were collected in which peaks for carbon, oxygen and aluminium were seen (Fig. 5). The patient declined further surgery and when last reviewed the lump was still present although not causing symptoms.

Discussion

Pencil lead is made up of graphite (elementary carbon), clay (aluminium silicate), various waxes and lacquers. Graphite and clay are the main components.1,2,4 As seen from the spectrometric analysis the fragments of foreign body showed a high percentage of carbon and aluminium. Each component of a pencil core can induce a tissue reaction. Silica, a component in clay, can incite an epithelioid granulomatous reaction. Graphite particles may cause a chronic granulomatous reaction in the lung called graphite pneumoconiosis.1,8

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There have been three case reports of pencil-core granuloma in a limb reported in the literature in two of which it clinically resembled a melanoma \(^1\), \(^4\) and in one a haemangioma. \(^2\) In addition, there have been three ophthalmic injuries described in other case reports which clinically resembled a melanoma \(^3\), \(^5\), \(^7\) and one intracerebral injury which was initially reported as a brain abscess. \(^6\) All presented many years after the initial injury.

MRI can identify the presence of pencil lead. \(^9\) In our patient, MRI did show signal voids indicative of a metal foreign body (Fig. 2).

The clinical presentation was highly suggestive of a soft-tissue sarcoma with the rapid appearance of a painless mass deep to the fascia. Any patient with such symptoms and signs requires further investigation to exclude a malignant tumour. \(^10\)

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Coronal T1-weighted MR scans of the right wrist before (a) and after enhancement with gadolinium (b) showing a large soft-tissue mass arising from the distal radio-ulnar joint. There is heterogeneous enhancement indicating the partially solid nature of the lesion. A central signal void is indicative of a metal artefact from a fragment of pencil lead.

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Photomicrograph showing synovium with intrasynoviocyte deposition of haemosiderin and subsynoviocyte graphite fragments (haematoxylin and eosin x50).

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Photomicrograph showing synovium with intrasynoviocyte deposition of haemosiderin (blue) and subsynoviocyte graphite fragments (black) (Perl’s stain x50).
Pencil is believed to be a harmless stationery article. This report, and others, indicates that caution must be exercised when treating stab injuries caused by pencils. All penetrating injuries caused by a pencil should be carefully assessed and treated in order to remove all pieces of lead from the wound.

Our case also emphasises the importance of investigating any soft-tissue mass by biopsy before embarking on definitive treatment.

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References


Graph showing EDX spectrometric chemical analysis of a sample showing peaks of carbon, oxygen and aluminium.