Radiographic gridding of subcutaneous soft tissue metallic foreign bodies in emergency department

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Abstract Radiographic grid for localization of soft tissue metallic foreign bodies is a modification of traditional radiography. Twenty localization procedures using simple radiographic grid was successfully performed. Its low cost and easy to perform makes it a useful tool in emergency setting.

Keywords Foreign body · Radiography

Introduction

Soft tissue foreign bodies are a common clinical problem. The commonly encountered foreign bodies include wood, glass or retained metals [1]. Detection is important because retained foreign bodies may cause inflammation and infection. Traditional radiography, ultrasonography (US), computerized tomography (CT), magnetic resonance imaging (MR) and fluoroscopy are the various diagnostic aids for localization of these foreign bodies [2]. We present a technique of radiographic gridding of subcutaneous metallic foreign bodies in the emergency department that aids easy localization and removal.

Procedure

Inclusion criteria for the study included patients with history of lodgment of metallic and impalpable subcutaneous foreign bodies presenting to the emergency department.

A detailed history was obtained and the patients were clinically examined. The affected area was palpated thoroughly. The patients were then subjected to the radiographic gridding.

A 6-inch leucoplast was used to make grids using pins (Fig. 1). These were pasted on the suspected area both in horizontal and vertical planes. The area was radio graphed in antero-posterior, lateral and oblique views. The films were developed and the grid overlying the foreign body was marked (Figs. 2, 3). After careful removal of the leucoplast the skin underlying the grid was marked with a permanent skin marker in both horizontal and vertical planes. The patient was then shifted to the operation theatre with minimal movement of the marked area. The marked area nearer to the foreign body was then explored. All patients

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Fig. 1 Grid made on leucoplast

Fig. 2 Identification of foreign body in hand

Fig. 3 Identification of foreign body in gluteal region

were explored under general anesthesia and subjected to check X-ray after removal of foreign body before reversal.

Results and analysis

The study included 20 patients who presented in the general emergency of the hospital with the history of retention of subcutaneous foreign bodies from May 2004 to December 2006. Three of these patients were referred from other hospitals after unsuccessful exploration. Fifteen patients presented acutely within 24 hours, 5 patients had delayed presentation ranging from 5 days to 2 weeks. Of the 20 patients, 14 were male and six females in the age range 20 to 56 years (mean – 30 years). The foreign bodies included pins (10), needles (4), broken blade (2) and splinters (4). Of these eight were located in the hand, four in the buttocks, five in the thigh and three in the foot. The chief presentation was pain.

Five patients presented late with discharging sinus. All the patients had a psychological feeling of having something embedded in them.

Radiographic grid could detect all the 20 foreign bodies. Of these 18 (90%) could be successfully removed. The average time of operation was 20 minutes (10–30 mins).

Two foreign bodies were difficult to localize even though they were visible on X-ray grid. These included a bomb splinter located in the thigh and a pin in the buttocks. Both were male patients, with the thigh splinter having a history of unsuccessful attempt of removal. These were removed under fluoroscopic guidance. The average time for fluoroscopy removal was 15 minutes. Of the 15 patients who presented acutely, localization and removal was successful through the visible punctured wound of entry without wound extension. In the rest 5 patients an extensive wound exploration had to be performed and in two of these patients a fluoroscopic assistance was needed for localization and removal. Check X-ray after removal did not reveal any left over foreign body. All patients are doing well after 2 months follow-up.

Discussion

Knowledge of the exact location of a foreign body relative to skin surfaces, adjacent muscles, tendons, neurovascular bundles, and other vascular structures allows more controlled surgical dissection.

Traditional radiography is still on vogue for detection of radio-opaque soft tissue foreign bodies. Metallic objects, except aluminum, and most animal bones and all glass foreign bodies are opaque on radiographs [3]. Its cheap and easy availability makes it the first line investigation in any setting. However limitations of radiography include non-visualization of radiolucent foreign bodies, radiation exposure and failure of precise localization during removal [2, 3, 4]. Advent of digital radiography has revived radiography's position among the currently available

Table 1 Comparison of radiographic grid with other diagnostic tests*

Metallic foreign body	Plain radiograph	Radiographic grid	US	CT	Fluroscopy
Visualization	Good	Good	Good	Good	Good
Localization	Poor	Superior to plain radiograph	Good	Good	Good
Guided removal	Poor	Moderate (90%)	Moderate (99%)	Good (100%)	Good (100%)

* References: [1–5]

sophisticated investigative modalities like US, fluoroscopy and MR. Though these (US, CT, MR, fluoroscopy) allow an accurate 3-D localization and guided removal of all types of foreign bodies, a major hindrance to their use includes increased cost, operator dependency and limited availability [2, 3, 5]. As such radiography still enjoys an important place in workup of patients with foreign body in emergency hospital setting. Radiographic gridding obviates much of these limitations.

One compares the different array of diagnostic tools available for detection and localization of foreign bodies [1–5]. Careful planning and meticulous scanning of the radiographic grid films fairly localizes most of the radio-opaque foreign bodies and aids easy removal as happened in our study (Table 1).

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