Percutaneous ultrasound guided extraction of non-palpable soft tissue foreign bodies

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SUMMARY

Ultrasound is being increasingly used in the diagnosis of the soft tissue foreign body (FB), in particular for the nonradio-opaque materials which may not be visualized with conventional radiography (Fornage & Schemberg 1986). A simple technique for ultrasound guided FB extraction under local anaesthesia is described, and comment is made upon our preliminary experience and pitfalls.

INTRODUCTION

Low Kv radiography has been the traditional method for diagnosing the soft tissue FB. Recent ultrasound reports indicate a sensitivity of 95% for detecting nonradio-opaque FBs with a specificity of 89% (Gilbert et al., 1990). Banerjee et al, (1989) went on to describe the use of ultrasound in the accurate localization of the FB for surgical guidance. It is also possible to accurately localize the FB by placing a localizing wire adjacent to the FB, similar to tumour localization in the breast. The aim of this study was to assess the feasibility of a percutaneous ultrasound guided extraction technique for the impalpable FB which would require a difficult invasive surgical procedure even with accurate localization.

METHODS AND RESULTS

Initially an Aloka 650 ultrasound machine with a 5MHz curvilinear probe was used with stand-off medium. The stand-off medium is a solid gel material which
is placed between the ultrasound probe and the patient to enhance the resolution of the near field ultrasound vision. This system gave excellent diagnostic results but the stand-off made the extraction procedure impractical. Thus, subsequently a 7.5 MHz probe with a built-in water bath was used, replacing the need for a separate stand-off, and the increased frequency also gave better resolution.

Using this technique, 11 non-palpable FBs were diagnosed by plain X-rays and ultrasound in five patients (eight radio-opaque, three non-opaque) ranging from 0.3 to 8 cm in length and 1–6 cm deep to the skin surface. Extraction was performed using local anaesthetic injections of Lignocaine 1% at the proposed incision site or with a Biers block for the forearm. A small incision was made at the most suitable point to be able to extract the FB in its longitudinal plane (Fig. 1). Whilst scanning in the longitudinal plane of the FB, forceps were directed to the target with continuous ultrasound imaging and the FB was grabbed and removed using the minimal amount of dissection required to advance the instrument. (Fig. 2). This was successful with five FBs (45%) whilst the remainder required formal surgical exploration.

**DISCUSSION**

The advantages of this technique are that it does not use any ionizing radiation and it may be used for either non-opaque or opaque FB’s. The avoidance of general anaesthesia shortens the patients stay in hospital and the small incision causes less scarring and patient discomfort, making it a very cost effective procedure in comparison to surgical exploration. Our main anxiety was whether we could only accomplish partial removal of the FB if it broke during removal, but this is probably the same risk as the surgeon in these difficult cases.

The true longitudinal plane of irregular shaped FB’s was a little difficult to identify in all cases and this is obviously important because one end has to be grabbed to necessitate successful removal. Careful scanning should get round this problem. The choice of ultrasound probe is also important but this is probably best decided by the operator, but we would advocate a system that did not rely on

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**Fig. 1.** Illustration to show the technique of continuous ultrasound scanning to direct the forceps to the target.
Fig. 2. (a) Ultrasound scan through the longitudinal plane of the foreign body showing as an echo-bright line surrounded by a dark ‘halo’. (b) The foreign body is grabbed by the forceps (fb = foreign body, i = instrument).
a separate stand-off medium. Initially our incisions were too large which caused artifact due to blood and air in the wound making scanning difficult. Latterly our incisions were as small as possible to allow passage of the FB and forceps. The degraded image in a fat patient or in an area of scarring from previous trauma made scanning more awkward and may lead to failure of the technique. We believe that this is a potentially very beneficial technique for extracting impalpable FB’s, whether opaque or non-opaque, which would otherwise need an invasive surgical procedure in these difficult cases. After allowance for the pitfalls described, we should anticipate more reliable results.

REFERENCES