Sonographic Detection of Subcutaneous Foreign Bodies in 3 Cases

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ABSTRACT Subcutaneous masses caused by foreign bodies are frequently encountered in daily practice. Although the majority of foreign bodies such as metals can be detected by radiography, substances such as vegetative materials or wood are difficult to detect. To our knowledge, only a few studies have described the sonographic characteristics of foreign bodies. Herein, we report 3 cases where we studied the sonographic characteristics of the foreign bodies in the dermis and subcutaneous tissue. Our results revealed the following 3 foreign bodies: (1) glass, (2) vegetative material, and (3) a pencil core. Thus, sonographic examination is useful for the detection of foreign bodies.

KEY WORDS: foreign body, sonography, diagnosis

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CASE DESCRIPTIONS

Case 1 was a 16-year-old boy, who presented with a painful nodule on his right index finger. On examination of history, it was found that a splinter of glass had pierced his finger 2 months ago. Physical examination revealed a skin-colored, firm, subcutaneous nodule on the ventral side of his right index finger, which measured 4 × 3 mm in size with a 2 mm bulge. The center of the nodule was covered with a crust measuring 1 mm in diameter, resulting in a clavus-like appearance (Figure 1).

Case 2 was a 39-year-old man who noticed a painless nodule on the inner part of his right forearm 3 months ago, which had not changed in size. Physical examination revealed a skin-colored, firm, subcutaneous nodule measuring 15 × 4 mm in size on the inner part of his right forearm. The upper part of the nodule was well-demarcated from the surrounding tissues, whereas the base of nodule had unclear margins.

Case 3 was a 38-year-old woman who complained of a firm nodule on her right sole. On examination of history, it was found that she was struck with a pencil-tip 3 years ago. Physical examination revealed a blue-colored, firm, subcutaneous nodule measuring 7 mm in diameter on her right sole. The nodule had a callus-like appearance (Figure 2).

Sonographic findings

Sonographic examinations were performed with a 6.0-14.0 MHz linear probe (Prosound α 10 real-time apparatus; Hitachi Aloka Medical, Ltd., Tokyo, Japan). Color Doppler imaging was also performed on the lesions.

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Figure 1. Clinical findings in case 1. A skin-colored, firm, subcutaneous nodule on the ventral side of his right index finger.

Figure 2. Clinical findings in case 3. A firm nodule on the right sole.

A grayscale sonogram of the subcutaneous regions in case 1 showed a 3.2 × 0.8 mm well-defined linear hyperechoic lesion (Figure 3, a and, b). Some Doppler signals were detected in the areas surrounding these lesions (Figure 3, c). In case 2, the grayscale sonogram revealed a 5.0 × 2.0 × 18.0 mm linear hyperechoic lesion in the well-defined hypoechoic mass on the right forearm (Figure 4, a and b). No obvious Doppler signal was detected. In case 3, the grayscale sonogram revealed a linear hyperechoic lesion with a hypoechoic margin. A hypoechoic area was detected within the subcutaneous tissue (Figure 5, a and b). Some Doppler signals were detected in these hypoechoic lesions (Figure 5, c).

Histologic findings

The final diagnoses of the foreign bodies in these 3 patients were based on the histological findings of the surgical specimens. In case 1, a fragment of the glass was removed from the region when the biopsy examination was performed. In case 2, histological examination revealed a vegetative foreign body surrounded by multinucleated giant cells and lymphocytes in the dermis (Figure 6, a and b). In case 3, the pencil-core material was observed in the dermis and subcutaneous tissue (Figure 7, a). The nodule showed granulomatous changes, characterized by foreign body giant cells, lymphocytes, and histiocytes including black particles in the cytoplasm (Figure 7, b).

DISCUSSION

A sonographic examination is often performed in dermatology (1) and is considered a useful diagnostic tool, especially for radiolucent foreign bodies in the dermis and subcutaneous tissue. However, to our knowledge, only a few studies have reported the sonographic characteristics of radiolucent foreign bod-

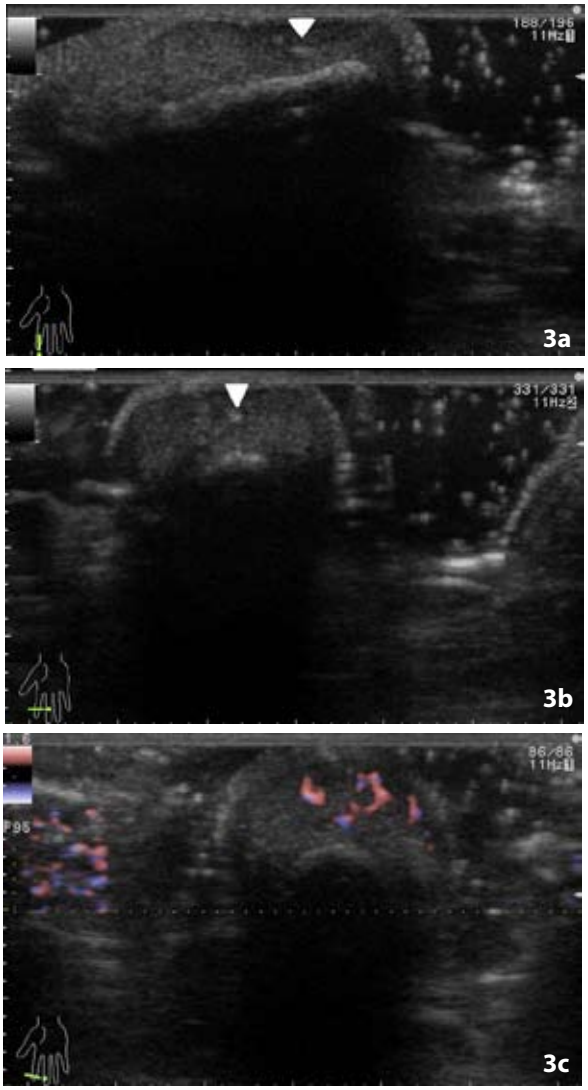

Figure 3. Ultrasonograms of the foreign body in case 1. (a) Longitudinal grayscale sonogram of a linear hyperechoic lesion (arrowhead). (b) Transverse grayscale sonogram showing a defined linear hyperechoic lesion (arrowhead). **(c)** Doppler sonogram showing some signals.

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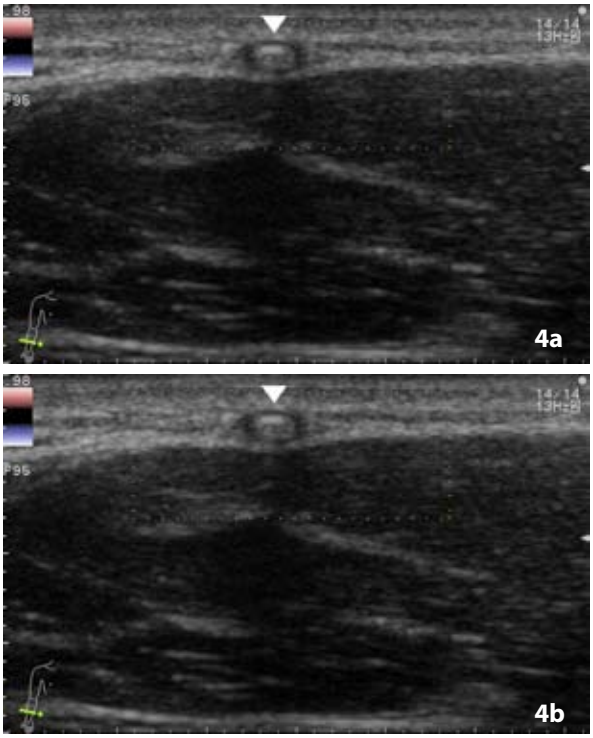

Figure 4. Ultrasonograms of the foreign body in case 2. (a) Longitudinal grayscale sonogram showing a linear hyperechoic lesion in the well-defined hypoechoic mass (arrowheads). (b) Transverse grayscale sonogram showing a linear hyperechoic lesion in the well-defined hypoechoic mass (arrowhead).

ies. Herein, we report the sonographic characteristics of 3 foreign bodies (a fragment of glass, a vegetative foreign body, and a pencil core).

Radiological examination is not always useful to detect foreign bodies, because organic substances such as vegetative materials and wood are radiolucent. Borgohain et al. have reported that vegetative foreign bodies in the soft tissues are not detected in an X-ray, but are detected by a sonographic examination (2). Retained wooden foreign bodies are shown as linear echographic structures with a pronounced acoustic shadowing (3), similar to our findings. Horton et al. (4) evaluated the appearances of soft-tissue foreign bodies by size, shape, and composition such as glass, toothpicks, pencil-cores, metal, and plastic, and compared them in sonographic and radiographic findings. In their study, sonographic characteristics of glass appeared hyperechoic with posterior shadowing from the edge (4). Although a wooden toothpick was not visualized on the radiograph, the sonographic examination could detect it as a hyperechoic mass with complete posterior shadowing. In our case, the vegetative foreign body was revealed as a linear hyperechoic lesion in the well-defined hypoechoic

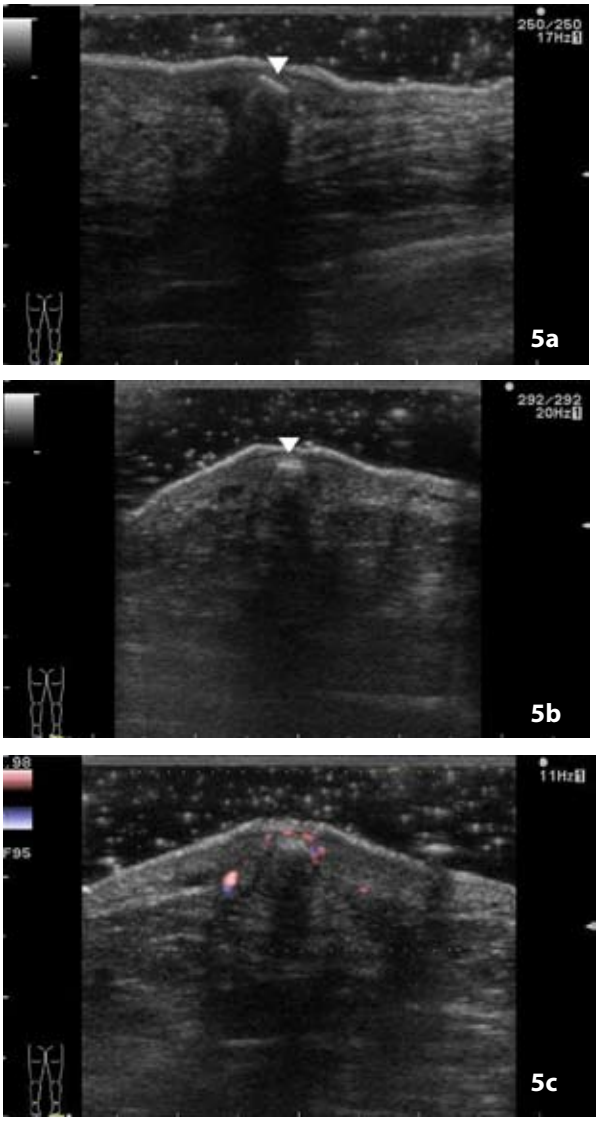

Figure 5. Ultrasonograms of the foreign body in case 3. (a) Longitudinal grayscale sonogram showing a linear hyperechoic lesion (arrowhead) with a hypoechoic margin. Hypoechoic area was consistent with the thickening of the subcutaneous tissue. (b) Transverse grayscale sonogram showing a linear hyperechoic lesion (arrowhead) with a hypoechoic margin. Hypoechoic area was consistent with thickening of the subcutaneous tissue. (c) Doppler sonogram showing some signals.

mass. Jacobson *et al.* (5) reported that sonography can reveal wooden foreign bodies, as small as 2.5 mm in length, with 87% sensitivity and 97% specificity. The sonographic finding of a pencil fragment was a hyperechoic lesion with complete posterior shadowing, similar to our findings. Since several investigators have reported that many foreign bodies are radiographically undetectable, sonography shows an

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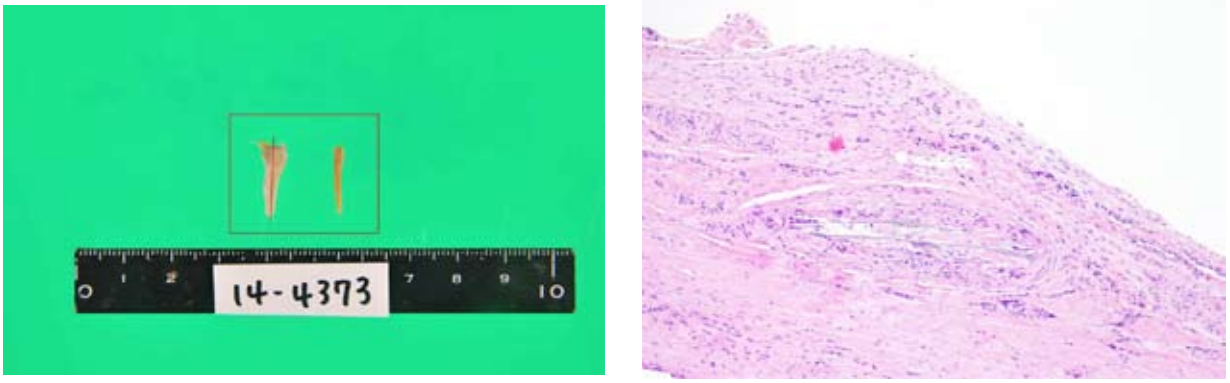

Figure 6. Histologic findings in case 2. (a) A vegetative foreign body in the dermis. (b) A vegetative foreign body surrounded by multinucleated giant cells and lymphocytes (hematoxylin-eosin stain, original magnification ×100).

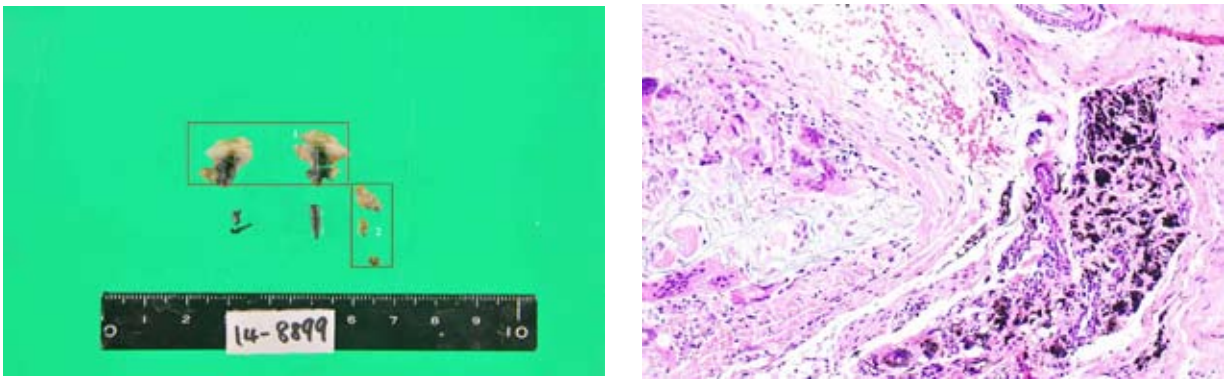

Figure 7. Histologic findings in case 3. (a) A pencil-core material was observed in the dermis and subcutaneous tissue. (b) The granulomatous changes by the foreign body, giant cells, lymphocytes, and histiocytes containing black particles (hematoxylin-eosin stain, original magnification ×200).

excellent modality for the evaluation of radiolucent foreign bodies (5,6).

CONCLUSION

Our sonographic study revealed 3 characteristic features of the different foreign bodies: 1) the fragment of glass showed a well-defined linear hyperechoic lesion, 2) the vegetative foreign body revealed a linear hyperechoic lesion in a well-defined hypoechoic mass, 3) the pencil-core revealed a linear hyperechoic lesion with a hypoechoic margin. High-resolution ultrasound equipment is useful for the detection of small foreign bodies that are difficult to detect in sonography and other diagnostic imaging. In addition, as a sonography is a noninvasive method, it can be a useful tool for the diagnosis of subcutaneous masses and lesions.

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