

## CASE REPORTS

# Antral adenocarcinoma with skeletal muscle metastasis mimicking polymyositis: A case report

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## Abstract

Intramuscular metastasis from gastric carcinoma is extremely rare with the exact incidence remains unknown. It may be difficult to distinguish intramuscular metastasis clinically from inflammatory myositis. We describe here the radiological and diagnostic features of an elderly lady presented with antral adenocarcinoma, complicated further by extensive skeletal muscle metastasis that was initially diagnosed as polymyositis. Good clinical history, thorough physical examination and appropriate imaging evaluation are the mainstay in the diagnosis as it is a great challenge in differentiating between intramuscular metastasis and polymyositis through imaging. It is vital to include intramuscular metastasis as a major differential diagnosis, in view of the differences in treatment, prognosis and long-term follow up including a histopathological examination to further ascertain diagnosis.

## Keywords

Gastric carcinoma, Skeletal muscle metastasis, Polymyositis, Imaging

## 1 Introduction

Gastric carcinoma is the fifth most common cancer worldwide and remains the third leading cause of cancer death in both sexes worldwide, with adenocarcinoma accounting for 90%-95% of it<sup>[1]</sup>. Carcinoma involving antro-pyloric region are more commonly seen in high-risk regions such as Asia and Eastern Europe, with the liver, lungs, regional lymph nodes, bone, and peritoneum being the most common metastatic sites of gastric carcinoma. Although the skeletal muscle mass of the human body receives an ample supply of blood and accounts for nearly 50% of the total body weight, intramuscular metastasis from gastric carcinoma is extremely rare with the exact incidence remains unknown. Thus far, only several sporadic cases have been reported<sup>[2-5]</sup> as it may be difficult to distinguish intramuscular metastasis clinically from inflammatory myositis.

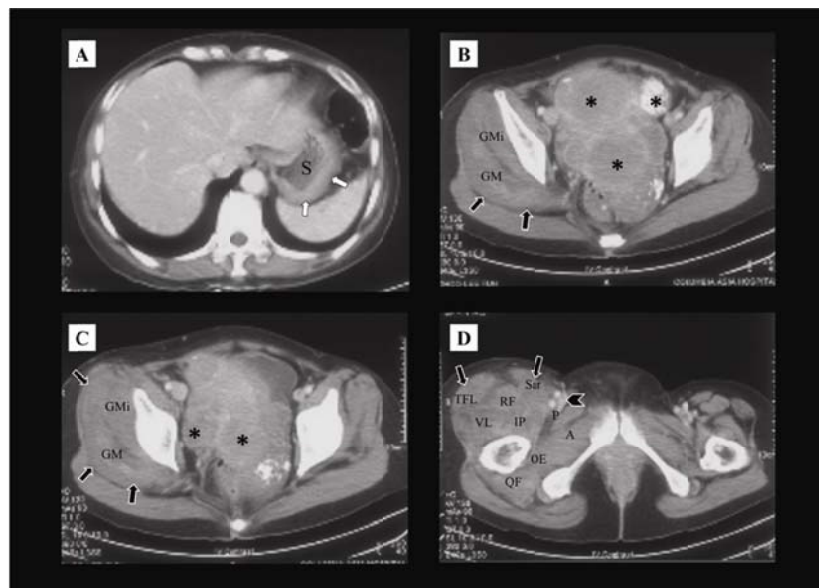
We describe here the radiological and diagnostic features of an elderly lady presented with antral adenocarcinoma, complicated further by extensive skeletal muscle metastasis that was initially diagnosed as polymyositis. As illustrated by this case, intramuscular metastasis is often a challenging diagnosis and requires a high degree of suspicion.

## 2 Case presentation

A 55-year-old Chinese lady presented to a private centre with a main complaint of progressive right gluteal and thigh swelling associated with pain for the past 2 months. She also has a history of dyspepsia and dysphagia for the past 2 years and abdominal swelling for the past 10 years. There was an associated history of passing blackish stools with no history of haematemesis or haematochezia. She denied having fever, rash, bowel or constitutional symptoms. On physical examination, there was diffuse swelling of the right gluteal and thigh with limited mobility of the right hip and knee joints. The power was preserved in all the limbs. The overlying skin was erythematous and thickened and there was no upper limb proximal myopathy seen. There was no palpable inguinal lymph nodes. However, abdominal examination revealed a palpable 16-week size mass. Her complete blood count, liver and renal profiles were within normal limits. Other biochemical tests which included calcium, phosphorus, and alkaline phosphatase showed normal values. Carcino-embryonic antigen was within normal limits (1.3 µg/L). D-dimer was positive. Doppler ultrasound of the right lower limb was negative for deep venous thrombosis. An ultrasonography of the abdomen and pelvis revealed multiple uterine fibroids.

### 2.1 First computed tomography scan findings

A contrast-enhanced computed tomography (CT) of the abdomen and pelvis was performed and showed diffuse swelling of the right pelvic and thigh muscles with surrounding subcutaneous fat stranding (see Figure 1). No calcifications at these regions, no associated abnormality of adjacent bones and no compromise of the femoral neurovascular bundle were seen. The stomach walls were noted to be diffusely thickened. Multiple uterine fibroids were also seen.

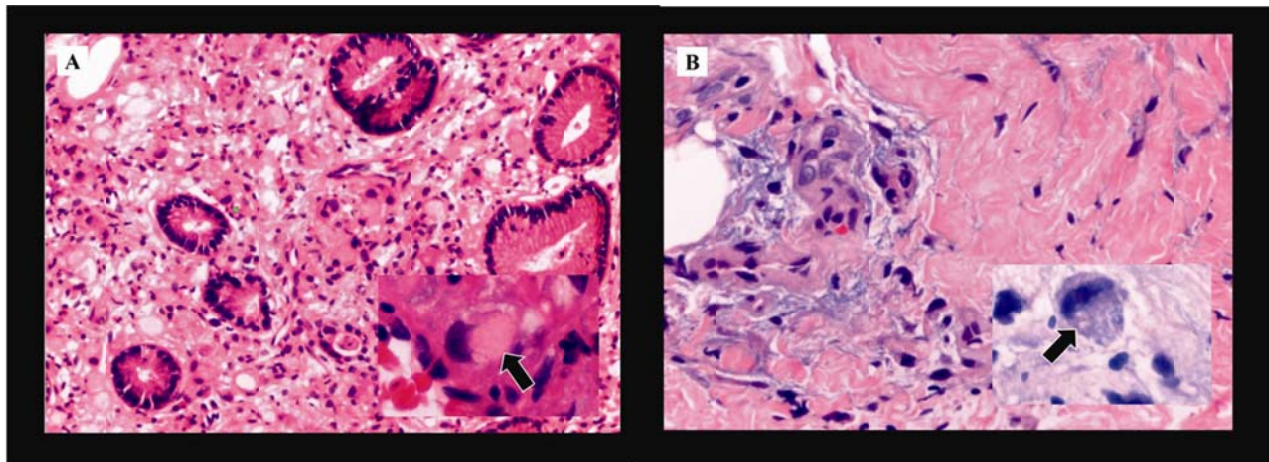


**Figure 1.** Axial contrast enhanced CT of abdomen and pelvis with rectal contrast showing diffuse thickening of stomach (S) walls (white arrows) on image A. Multiple uterine fibroids were seen on image B and C, some of which were calcified (black asterisks). There was diffuse enlargement of the right pelvic and thigh musculatures (black arrows) with surrounding subcutaneous fat stranding. No calcifications were seen at these regions. The adjacent bones were normal and the right femoral vessels (thick black arrowhead) were patent. GM, gluteus medius; Gmi, gluteus minimis

*Note.* TFL: tensor fasciae latae; RF: rectus femoris; Sar: sartorius; VL: vastus lateralis; IP: iliopsoas; P: pectineus; A: adductors; OE: obturator

externus; QF: quadratus femoris

Based on these findings, gastric tumour with associated inflammation of the right gluteal and thigh musculatures was given as a diagnosis. The patient subsequently underwent oesophago-gastric-duodenoscopy, which demonstrated malignant antral ulceration at the greater curvature. Tissue biopsies were taken and yielded atypical cells highly suggestive of carcinoma (see Figure 2A) which subsequently proved to be poorly differentiated adenocarcinoma by immunohistochemistry test.



**Figure 2.** A. Histopathology of section of the gastric tumour showing diffuse infiltration of the lamina propria by malignant cells. (Haematoxylin-eosin stain, magnification  $\times 200$ ). Inset shows a magnified image of a signet ring cell (black arrow); B. Photomicrograph showing malignant cells with pleomorphic hyperchromatic nuclei and eosinophilic cytoplasm, arranged singly and in clusters invading the fibrous stroma of the skeletal muscles (Haematoxylin-eosin stain, magnification  $\times 200$ ). Inset shows a magnified image of a signet ring cell (black arrow) as seen on image A

Following the diagnosis of gastric carcinoma, the patient noticed right gluteal and thigh swelling associated with pain for 2 months duration which progressively increased in size. She described the pain as insidious in onset with significant worsening over the preceding one month. The swelling became more painful whenever she walked for long distance or sat with direct pressure on it. However, no numbness or muscle weakness noted. She denied any weight loss, night sweats or malaise and has no prior history of connective tissue disease as well as trauma, infection and surgery. There was also no family history of soft tissue masses or malignancy.

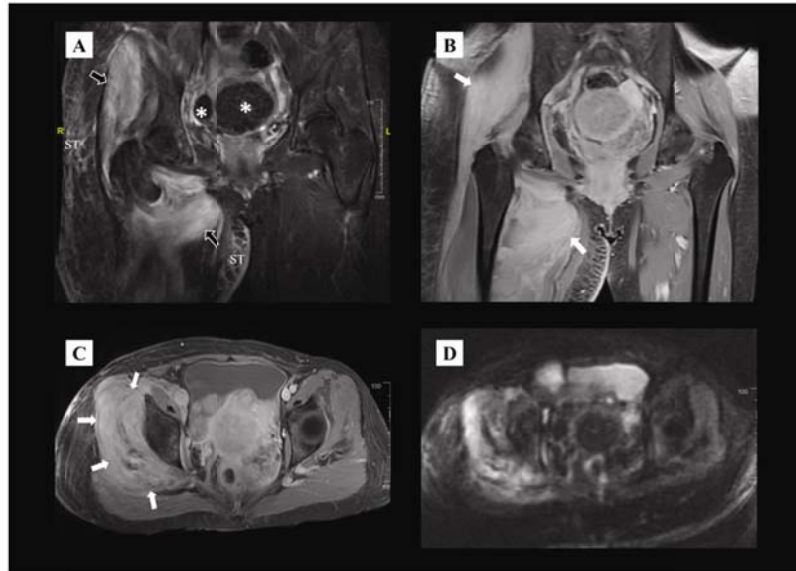
## 2.2 Magnetic resonance imaging findings

She was later referred to University Malaya Medical Centre and magnetic resonance imaging (MRI) of pelvis was then performed using 1.5 Tesla MRI machine (Signa HDx; General Electric Healthcare; Wisconsin, United States of America) revealing diffuse enlargement of the right pelvic and thigh muscles involving right gluteus medius, gluteus minimis, tensor fasciae latae, sartorius, rectus femoris, iliopsoas, pectineus, adductor magnus, adductor longus, adductor brevis, obturator externus, biceps femoris, quadratus femoris, gracilis, vastus medialis, vastus intermedius and vastus lateralis muscles, which demonstrate high signal intensity on short inversion time inversion recovery (STIR) sequence and diffusion weighted imaging (DWI), and homogenous enhancement on post gadolinium images (see Figure 3). There was also subcutaneous tissue oedema at the right pelvic and thigh regions with no evidence of bony erosion. The neurovascular bundle was preserved. A diagnosis of right hip polymyositis was given based on these MRI findings.

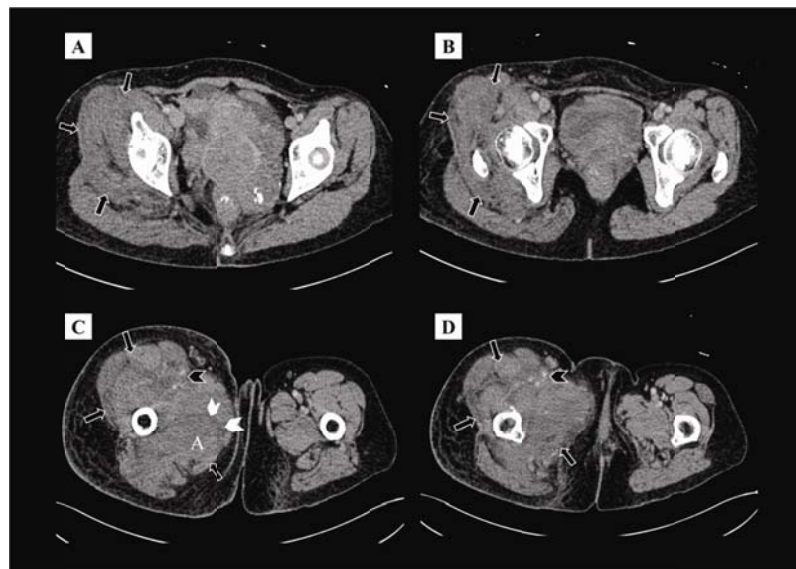
## 2.3 Second computed tomography scan findings

A second staging CT scan of thorax, abdomen and pelvis was done using a 64 slice scanner (Somatom Sensation; Siemens; Germany) with 80 ml of intravenous (Ultravist 300 mgI/ml, Schering, Berlin, Germany), 100 ml oral and 40 ml rectal

contrast media (diluted Gastrografin 370 mgI/ml, Bayer, Spain), showing no evidence of thoracic or abdominal organ metastases. Abnormal enhancement of the right pelvic and thigh muscles affecting predominantly the anterior compartment of the thigh was seen with some hypodensities present through the adductor muscles, which is likely to represent central necrosis or abscess formation (see Figure 4). There was no evidence of bony erosions or significant lymphadenopathy. Given these new findings, possibility of skeletal muscle metastasis from her initial gastric carcinoma with differential diagnosis of polymyositis and primary muscle lymphoma was made.



**Figure 3.** Axial MRI, showing intramuscular metastasis in the right pelvic and thigh muscles mimicking polymyositis. MRI revealed high signal intensity (black arrows) on the STIR coronal image A compared with surrounding muscles and homogenous enhancement (white arrows) on T1-weighted post gadolinium coronal image B and axial image C. There is associated subcutaneous tissue (ST) oedema at the right pelvic and thigh regions with no evidence of bony erosion. Multiple uterine fibroids (white asterisks) were seen as noted in previous CT. D. DWI sequence showing high signal intensity within these lesions



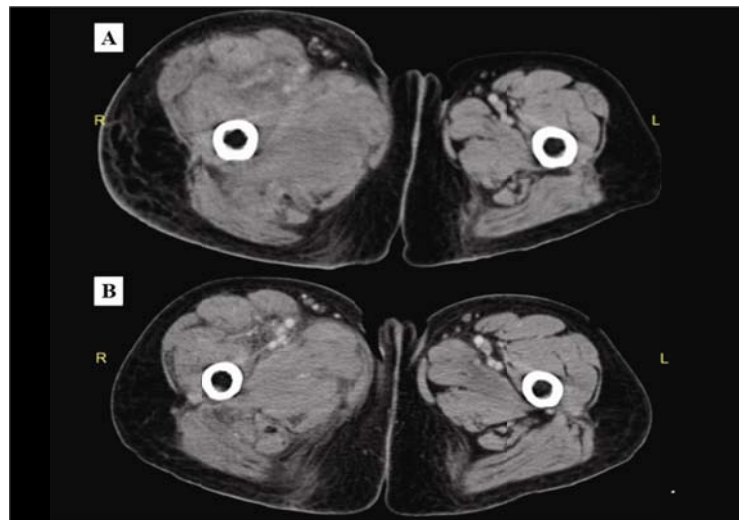
**Figure 4.** Axial contrast enhanced CT of thorax, abdomen and pelvis for staging showing abnormal heterogeneous enhancement of the intramuscular metastasis (black arrows) with some hypodensities (thick white arrowheads) present through the adductor muscles (A), likely to represent necrotic tissues on image C. The right femoral vessels (thick black arrowhead) were preserved

## 2.4 Histopathological examination findings

Based on the imaging characteristics which raised the possibility of metastasis, a trucut biopsy of the right thigh swelling was performed. The culture swab test was found to be negative for growth. The histopathological findings showed muscle fibres infiltrated by small malignant cells which invaded the muscle and intermysial fibres in small groups of 2-3 cells and as single cells (see Figure 2B). There was marked degeneration of muscle fibres characterised by cytoplasmic eosinophilia, loss of cross striations and multinucleated giant cell formation typical of repair. A diagnosis of metastatic poorly differentiated adenocarcinoma, consistent with spread from gastric primary was subsequently made. Subsequent laparoscopy for staging was done revealing right ovarian soft tissue mass which turned out to be poorly differentiated adenocarcinoma in keeping with metastatic Krukenberg tumour. The patient eventually underwent chemotherapy with further follow-up in our centre.

## 2.5 Follow up (1 year) computed tomography scan findings

Follow up CT scan of the thorax, abdomen and pelvis was performed 1 year later at the end of chemotherapy treatment using the same CT scanner as above (see Figure 5). There was significant improvement of the right thigh muscle infiltration with clearer definition of muscles and reduction of neurovascular bundle impingement. Stable appearance of the antral wall thickening was noted.



**Figure 5.** Axial contrast enhanced CT of thorax, abdomen and pelvis. A. Before chemotherapy; B. After chemotherapy. Image B shows significant improvement in the right thigh muscle infiltration post chemotherapy

## 3 Discussion

In this case report, we illustrated a case of an elderly female patient who presented with progressive right gluteal and thigh swelling mimicking inflammatory myositis which was further complicated when the patient was subsequently diagnosed with gastric carcinoma and metastatic Krukenberg tumour. Further imaging and investigations were made to evaluate the right gluteal and thigh swelling and a diagnosis of skeletal muscle metastasis was finally made based on histopathological examination.

Skeletal muscle is an uncommon site of haematogenous metastases from any malignancy despite its ample blood supply. In 2010, Surov *et al.* reported 80 skeletal muscle metastases originating from different primaries in 61 out of 5,170 oncological patients, with genital tumours found to be commonest site of primary malignancies [4]. In a study conducted by Arpaci *et al.*, lung carcinoma was found to be the commonest primary site for skeletal muscle metastasis [5]. The resistance of skeletal muscle to metastatic disease has been attributed by various factors such as the muscle motion and mechanical tumour destruction, high tissue pressure, the accumulation of lactic acid, changes in muscle pH, and oxygenation [3, 5]. Gastric carcinoma usually remains locoregional and normally produces distant metastasis only in the first organ



the circulation reaches, which normally is either the liver or lungs. However in our case, the intramuscular metastasis developed without having metastasis in these organs. There are several papers previously reporting skeletal muscle metastasis arising from gastric carcinoma [2, 3].

Based on the history and clinical features of gluteal and proximal lower limb swelling associated with pain, along with CT and MRI findings as mentioned above in the elderly patient per se, it is common to initially consider polymyositis as the provisional diagnosis. Polymyositis is an autoimmune disorder of skeletal muscle frequently manifests during the 4th decade of life. It is characterised by pain and gradual onset of muscle weakness in the thighs and pelvic girdle involving mainly the large proximal muscles, generally in a symmetric pattern. However, the involvement of muscle may be unevenly distributed and not all are affected at the same time in the same patient. Nevertheless, it was vital to consider other differential diagnosis of proximal intramuscular lesions which include intramuscular metastasis with background history of primary carcinoma as in this case, primary soft tissue sarcoma and even primary muscle lymphoma.

In terms of intramuscular metastasis, they are commonly encountered in elderly patients in the fifth to seventh decades [4, 5]. Most patients may experience local pain or occasionally paraesthesia due to compressive mass effect. In some patients, intramuscular metastasis can be the presenting symptom as in our case or present synchronously with primary carcinoma. The skeletal muscle metastasis may occur as a solitary mass with or without any other clinically detectable metastases, or present with multiple skeletal muscles metastases as in the patient in question. Along with this, the patient also presented with metastatic deposit in the right ovary. In previous reported cases of intramuscular metastasis from gastric carcinoma, the commonest site of muscle metastasis is in the lower limb with the skeletal muscle of the thigh and the calf becoming the most common anatomical sites whereas the skeletal muscle of the upper limb and other sites were less involved [3]. In this particular case, the intramuscular metastasis was located in the right pelvic and thigh regions.

Imaging modality such as plain radiograph, CT and MRI often provides valuable information and can be used to distinguish intramuscular metastasis from other conditions. Radiographs are the best initial method to assess any co-existing bony involvement and reveal soft-tissue calcifications present in certain conditions such as in primary soft tissue sarcoma. In 2004, Tuoheti *et al.* found that in a radiographic bone survey of those with intramuscular metastasis, there was no osseous metastasis and only one patient presented with calcification within the lesion [6], which is not seen in our patient.

The CT features are often non-specific in all of these conditions, as the lesion may be homogenous and of low or similar attenuation to muscle [4, 5]. On contrast enhanced CT, these lesions may have similar attenuation to the adjacent skeletal muscle or demonstrate homogenous contrast enhancement. Additionally, CT is particularly useful in detecting destruction of cortical bone and calcification of lesions. Pretorius *et al.* described the CT findings in 15 patients with skeletal muscle metastases and the most common appearance of metastatic disease to muscle on contrast-enhanced CT was that of a rim-enhancing intramuscular mass with central hypoattenuation [7]. In this case, there was heterogenous enhancement of the right pelvic and thigh musculatures seen with some hypodensities present within. However, radiographs and CT were of little value with regard to the character of the mass when compared with MRI.

Although MRI is not specific for skeletal muscle metastasis, nonetheless it provides superior soft-tissue contrast and far greater definition of muscle involvement [5, 8]. Intramuscular metastasis normally appear more infiltrative with ill-defined margins and often violates fascial planes as well as anatomic compartments. This pattern of growth is quite different from that seen in most primary soft tissue tumours. Intramuscular metastasis have been described as showing low or iso-signal intensity on T1-weighted images and high signal intensity on T2-weighted images compared with surrounding muscles. Other features include muscle enlargement, reticulated texture, peritumoral oedema, and intratumoral patterns such as haemorrhage [5, 8]. On gadolinium-enhanced imaging, intramuscular metastasis usually demonstrate extensive peritumoral enhancement associated with central necrosis. As with polymyositis cases, high signal intensity is seen in the active phase on STIR and fat-saturated gadolinium-enhanced T1-weighted images. Occasionally, the inflammation may extend along

or around individual muscles and muscle groups. It normally exhibits diffuse homogeneous enhancement on post gadolinium images. Primary soft tissue sarcomas and lymphoma have similar appearance on T1-weighted images to intramuscular metastasis. On T2-weighted images, sarcomas have the same appearances as well, but may demonstrate more areas of haemorrhage, necrosis, calcification and peritumoral oedema, especially in larger tumours [3, 8]. In lymphoma, the tumours demonstrate intermediate signal intensity compared with fat on T2-weighted images.

In our case, there was diffuse enlargement and infiltration of the right pelvic and thigh musculatures with signal characteristics and post gadolinium homogeneous enhancement which appeared more consistent with a diagnosis of polymyositis. However, with an underlying primary carcinoma and infiltrative appearance of these lesions, intramuscular metastasis was considered as a possibility. Thus, it poses a challenge in diagnosing intramuscular metastasis and differentiating it from the rest of the conditions as there is significant overlap in their range of appearances. Furthermore, because of differences in treatment and prognosis, it is important to distinguish each and every condition mentioned above. A biopsy is mandatory and should be performed to confirm the final diagnosis. Gadolinium-enhanced imaging may be beneficial in evaluating the vascularity and perfusion of the tumour in planning the biopsy of these lesions.

Skeletal muscle metastasis is possibly a sign of partial systemic haematogenous metastasis and a terminal stage in the progress of gastric carcinoma. The optimal treatment of intramuscular metastasis is yet to be known. Although there are reports on various treatment for intramuscular metastasis from primary gastric cancer which include surgical excision, radiation therapy, or systemic chemotherapy, however, ineffective for prolonging the survival of the patients [2, 3]. Therefore, further research and clinical studies are still needed to establish an appropriate treatment and therapy.

## 4 Conclusion

In conclusion, although skeletal muscle metastasis is uncommon, it poses a diagnostic and therapeutic challenge to clinicians. Good clinical history, thorough physical examination and appropriate imaging evaluation are the mainstay in the diagnosis as it is a great challenge in differentiating between intramuscular metastasis and polymyositis through imaging. Thus, it is vital for the radiologist to include intramuscular metastasis as a major differential diagnosis as in this case, in view of the differences in treatment, prognosis and long-term follow up including a mandatory needle biopsy to further ascertain diagnosis.

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## Conflict of interests

None.

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