Painful swollen thumb

A 20-year-old woman with a painful swollen left thumb

S K Tiwary, M K Singh, R C Shukla, M Pandey, V K Shukla

A 20-year-old woman presented with pain and swelling in her left thumb for 3 months. She had noticed a gradual enlargement of her left thumb for 3 months and did not seek medical attention until it became painful. She had no history of trauma or any systemic symptoms.

Physical examination of the left hand showed a localised swelling of variegated consistency over the left first metacarpal (fig 1). The overlying skin was normal and the movements of the metacarpophalangeal and trapeziometacarpal joints were painful and restricted. No neurovascular or cutaneous abnormalities were observed. The patient had pain in the clenched-fist position. No joint effusion was noticed. The laboratory investigations were unremarkable.

Radiographs of the left hand showed an expansile osteolytic lesion of the first metacarpal (fig 2). The margins of the lesion were well defined. The patient underwent fine-needle aspiration cytology (FNAC), which showed osteoclast-type multinucleate giant cells interspersed with stromal cells. The nuclei of stromal cells were morphologically similar to those of multinucleated giant cells, and mitotic figures were absent.

The treatment plan constituted local resection with reconstruction, considering the young age of the patient, intact phalanges and unwillingness for amputation. The tumour was resected with a cuff of surrounding normal tissue and protecting neurovascular bundle. An autograft of the tricortical iliac crest was taken to bridge the defect after

resection of the tumour. K wires were used to fix the tricortical iliac crest graft placed between the trapezium and proximal phalanx. A thumb spica was applied to immobilise the thumb. Movement of the thumb was started after 3 months. The patient was doing well during a follow-up of 6 months.

QUESTIONS

1. What is the differential diagnosis on the basis of clinical presentation and radiological findings?
2. How will the diagnosis be confirmed?
3. What is the management?

SELF-ASSESSMENT ANSWERS

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1. What is the differential diagnosis on the basis of clinical presentation and radiological findings?

The differential diagnoses for metacarpal bone tumour affecting young people

under 20 years of age are giant-cell tumour (GCT), reparative giant-cell granuloma, enchondroma, aneurysmal bone cyst, chondroblastoma and metastatic tumours of the bone.¹ Metastatic tumours of the bone are often multiple, with the primary tumour commonly found in the lungs, breast, kidney, prostate and thyroid. The involvement of the bones of the hand and foot is rare, and phalanges are more commonly affected than metacarpals. The plain radiograph in this case showed a solitary expansile lytic lesion, which was consistent with GCT, enchondroma, aneurysmal bone cyst and chondroblastoma. Eccentric, expansile osteolytic lesions situated at the juxta-articular region in young patients are likely to be GCT, chondroblastoma, aneurysmal bone cyst or reparative giant-cell granuloma.

How will the diagnosis be confirmed?

Fine needle aspiration cytology (FNAC) supplemented over a plain radiograph is the minimum essential investigation for confirming the diagnosis. At times, histopathological examination may be required for final diagnosis. GCTs are characterised by uniformly distributed giant cells and nuclear similarity to mononuclear stromal cells. Spindle cells replace stromal cells and giant cells are distributed unevenly in giant-cell reparative granuloma. Pericellular calcification as well as giant cells are present in chondroblastoma. Cystic degeneration and haemorrhagic areas with blood-filled lacunae and septa are found in aneurysmal bone cysts. These also show increased signal on T1-weighted

Figure 1 Swelling in the left thumb.

Figure 2 Plain radiograph of the left hand with osteolytic lesion of the first metacarpal.

image in magnetic resonance imaging (MRI). MRI is also essential to assess joint involvement. Correlation of clinical, radiological and pathological findings clinches the diagnosis.

What is the management?

Treatment modality is determined after a detailed clinical and radiological evaluation to assess the exact site, size, involvement of adjacent surrounding structures and presence of effusion or involvement of the joint. Age of the patient, involvement of joints, site and size of the tumour, relationship with surrounding structures, aggressiveness of the tumour and possibility of local recurrence are deciding factors for mode and extent of intervention. Surgery is the main treatment modality in the form of curettage, curettage combined with cryosurgery, bone cementing or bone grafting. However, resection of the tumour with primary reconstruction is the best treatment. Irradiation or amputation is another option in cases where successful resection and reconstruction is not possible. GCT is no more considered as radio-resistant. Megavoltage radiation is considered to be an alternative to complex and difficult surgery, with local control achieved in 75–85% of the cases. Local recurrence is higher if only curettage is carried out, but it is decreased when curettage is combined with cryosurgery, bone cementing or bone grafting.

DISCUSSION

GCTs of the bone are rare (4% of all bone tumours). They mainly affect the long bones (75–90% cases), with the femur (30%) being most commonly affected, followed by the tibia (25%), radius (10%) and humerus (6%).² The spine and innominate bone are occasionally affected. The bones of the hand are rarely affected—in only 2% of the cases—with the phalanges being more commonly affected than the metacarpals.² Multicentric foci are present in 18% of GCTs of the hand; hence, a bone scan should be part of the routine investigation.³ Young age at occurrence and early age of recurrence are more common in GCTs of the hand.³ Growth pattern is usually aggressive; diagnosis is made in 6 months because of the location and distressing symptoms of the tumour.³

Expansile osteolytic lesions detected on plain radiographs are usually suggestive of enchondroma, GCT, aneurysmal bone cyst, chondroblastoma or metastatic tumours. The most common cause of expansile and lytic bone lesions of the hand is enchondroma (60–80%), followed by aneurysmal bone cysts (10%). Metastatic tumours are extremely rare

(0.1% of all metastases), with metastasis commonly arising from the lung (45%) and affecting the distal phalanges (35%).⁴

The mean age of patients with GCTs is 32 years (versus 20 years in the present case), whereas GCT of the hand occurs in younger patients (aged only 22 years).⁵ GCTs generally extend to the articular cartilage and are eccentrically located when present in the hand.⁶

Histopathological examination is essential to settle the diagnosis for expansile and lytic bone lesions of the hand. The giant cells are abundant, uniformly distributed and share nuclear similarity with the mononuclear stromal cells in GCTs. The picture is similar, but the stromal component is made up of spindle cells with unevenly distributed giant cells in giant-cell reparative granuloma. Apart from giant cells, pericellular calcification known as chicken-wire appearance is present in chondroblastomas.

Treatment modalities for GCT of the hand comprise curettage, curettage and bone grafting, irradiation, amputation, and resection with reconstruction.^{2,3} Surgery is the recommended treatment for GCT of the hand. Local resection of the affected metacarpal with autograft or allograft replacement is the preferred surgical treatment. All GCTs of the hand should be considered locally aggressive, as no correlation has been found between the grade of GCT and recurrence rate. Curettage is more extensively used nowadays for the treatment of GCT than before, with a decreased local recurrence of 15–25%.⁷ Recurrence rate is $\leq 15\%$ if curettage is combined with cryosurgery.⁸ Adjuvant therapy with curettage in the form of cryosurgery, phenol, bone cement and bone graft helps to achieve good results and limits the indications of resection and amputation. Bone cement, compared with bone grafts, provides immediate support and allows for intensive curettage even for larger tumours.⁹ A definite procedure should be carried out initially, as multiple surgical procedures may predispose benign tumours to malignant transformation.¹⁰ Amputation prevents recurrence but it is functionally limiting and cosmetically deforming.^{2,3}

Joint reconstruction can be carried out by using metatarsal substitution, a combined iliac crest and metatarsal head graft,¹¹ and prosthetic replacement.¹² Patients should undergo surveillance for local and systemic recurrence after surgery.¹³

Radiation as adjuvant therapy has pitfalls and it is not used routinely because of lack of evidence on its efficacy and fear of sarcomatous changes that may occur after exposure to radiation.¹⁴ Radiotherapy, however, can be used as an

alternative to surgery when surgery is not possible or fear of severe disfigurement prevents surgery.^{15,16}

In summary, GCTs of the hand affect metacarpals uncommonly and are more prevalent in the younger population. All expansile and lytic lesions on radiographs should be supplemented essentially with FNAC or needle biopsy for establishing the diagnosis.

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