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Role of bone substituent as a void filler in the surgical management of enchondroma of the Hand: A case report

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Abstract
Enchondromas are benign lesions of hyaline cartilage usually in small bones of hand and foot. Curettage with bone grafting is the treatment of choice. We present a case of enchondroma of 5th metacarpal head treated with curettage and bone graft substitute. Clinical, radiological and histopathological findings in this case are presented with a brief discussion of literature.

Keywords: Enchondroma, bone substituent, modified hydroxyapatite

Introduction
Enchondromas are benign lesions of hyaline cartilage. They are the most common tumor of small bones of hands and feet. They usually arise in the medullary cavity [1]. They usually occur as a single lesion (solitary enchondroma) with a predilection for the short tubular bones (proximal phalanx, metacarpal/metatarsal, middle phalanx) of the hands and feet, distal femur, and proximal humerus, or as multiple/polyostotic lesions in Ollier's disease (multiple enchondromatosis), a non-heritable condition, and in Maffucci's syndrome, a combination of multiple enchondromas and hemangiomas. Malignant degeneration of monostotic enchondroma to chondrosarcoma is rare. They have a peak incidence in the fourth decade, males and females are equally affected [3]. Enchondromas are most often found incidentally when radiographic studies are performed for other reasons. They are usually asymptomatic unless associated with a pathological fracture.
Radiographs typically demonstrate a well-defined lytic lesion, central or eccentric, expansive or not, usually containing calcified chondroid matrix and noninvading into the surrounding tissue. Additional diagnostic imaging for enchondroma may include radionuclide bone scan, magnetic resonance imaging (MRI), and computed tomography scan (CT), but in the majority of cases, plain radiographs are sufficient for the diagnosis [4].
Surgical treatment of enchondroma eliminates the future risk of pathological fracture and avoids progressive deformity [2]. Curettage is the mainstay of surgical treatment for enchondroma. The bone defect is usually filled with autologous bone grafts (e.g., iliac crest, distal radius), fresh frozen or freeze-dried irradiated allografts, or bone substitutes (calcium phosphate, calcium sulphate, tricalcium phosphate, hydroxyapatite) [5].

A case report
A 20-year-old male reported with chief complaints of pain and swelling in the left hand for 2 days with a history of trauma to the left hand while punching a punching bag. There was no significant history in the past. On examination, there was tenderness over the 5th metacarpal and restriction of range of movements. The radiograph showed an osteolytic lesion in the left 5th metacarpal (Fig.1). Further MRI was done and findings were suggested of Enchondroma (Fig.2). The patient was operated on with curettage of the tumor and the resultant bone defect was filled with bone substituent and k wiring was used temporarily for fixation.

Using the dorsal approach, a straight longitudinal incision over the 5th metacarpal was taken and the lesion was exposed via a small cortical window and was removed completely by curettage, and samples were sent for histopathological examination (Fig.3). The bone defect was filled with modified hydroxyapatite blocks and k wiring was done for additional stability (Fig.4).

The histopathological examination reveals a moderately cellular tumor comprised of hyaline cartilage. The tumor is well encapsulated by perichondrium and does not infiltrate the surrounding bone and the diagnosis of enchondroma was confirmed (Fig.5).

Postoperatively splint was applied and after 6 weeks K wires were removed and physiotherapy was started. Follow up after 1 year, range of movements at the metacarpophalangeal joint was normal, and radiograph revealed signs of consolidation (Fig.6).

Fig 1: Radiograph shows lytic lesion in the left 5th metacarpal

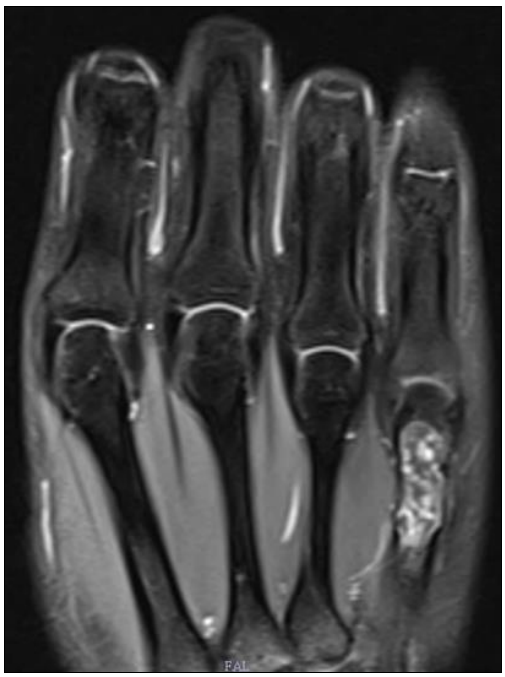

Fig 2: MRI suggestive of Enchondroma.

Fig 3: Curettage was done and bony defect filled with modified hydroxyapatite blocks

Fig 4: Post-operative radiograph

Fig 5: Histopathological examination confirming the diagnosis.

Fig 6: Radiograph showing mineralized bone after 1 Year follow up.

Discussion

Enchondromas are generally considered an asymptomatic, indolent lesion. Phalanges of hand are the most common location but in our case the lesion was in the metacarpal. When lesions are not symptomatic, serial radiographs are obtained every 3-6 months for 1-2 years and then annually to ensure that the lesions are not growing. For most enchondromas, no treatment other than observation is required. Symptomatic lesions are treated with intralesional resection by curettage [6]. Enchondroma that occurs in small bones of hand and foot are most prone to pathological fractures. Surgical intervention should be delayed until the fracture has healed [2]. Enchondromas are treated by curettage and the bone defect is then usually filled with an autologous bone graft from the iliac crest or with an allograft. Nowadays, bone substitutes, such as calcium phosphate bone cement (CPC) and hydroxyapatite, have also been used instead of autologous or allogeneic bone grafts [7]. Autologous bone graft from the iliac crest, cortical or cancellous, is the most current choice, but it is associated with an 8-39% complication rate such as infection, hematoma, urethral injury, pelvic instability, cosmetic disadvantages, donor site pain [8]. The osteoinductive potential is decreased in allogenic bone graft and there is some risk of disease transmission associated with it [9]. Due to limitations of both autologous and allogeneic graft, bone graft substitutes such as calcium phosphate ceramics, hydroxyapatite, tricalcium phosphate, calcium phosphate cement, and calcium sulfate are being used. We used modified hydroxyapatite blocks (G-bone) following curettage. Hydroxyapatite is an essential element required for bone regeneration. The essence of bone regeneration always revolves around the healthy underlying bone or it may be the surroundings that give enough strength. Hydroxyapatite is well known for bone regeneration through bone conduction or by acting as a scaffold for filling of defects. The nanostructured calcium apatite plays an important role in the construction of calcified tissues. Hydroxyapatiite has the property of osteoinductivity and thus making a good substitute for filling up bone defects [10].

Conclusion

We report a case of enchondroma of left 5th metacarpal treated by curettage with bone graft substitute (modified hydroxylapatite) which proved to be a safe and promising treatment modality for enchondroma of hand. It showed excellent functional and radiological results and there was a decrease in operating time and had no donor site morbidity. Further studies are required to demonstrate bone graft substitutes as a standard choice in enchondroma of small bones treated with curettage.

Conflict of interests

The authors do not have any conflict of interests.

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