Cartilaginous tumours and calcified lesions of the hand: A pictorial review

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Abstract
Cartilaginous tumours of the extremities are commonly seen in radiographs. Enchondroma is the most frequently encountered tumour. Since the vast majority of enchondromas are asymptomatic, they are typically discovered as incidental findings or along with a pathologic fracture. The authors propose a pictorial review to illustrate the imaging features of cartilaginous bone lesions of the hand and their specificities, and discuss the main differential diagnoses.

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Cartilaginous tumours of the hand are characterised by the presence of a cartilaginous matrix. They may be found in all of the anatomic compartments of the hand. They are, by far, the most common. The frequency is difficult to assess although it does not exceed 10% [1].

The authors propose a pictorial review to illustrate the imaging features of cartilaginous bone lesions of the hand as well as their specificities and discuss the main differential diagnoses. This pictorial review is based on data from the literature and personal experience.

Histology of cartilaginous bone lesions

The cartilaginous matrix is a tissue matrix consisting of chondrocytes of varying differentiation. They generally produce an extracellular substance consisting of type II collagen and proteoglycans. The production of cartilage results from the differentiation of mesenchymal stem cells that produce this extracellular matrix under the action of an internal
or external signal. Chondrocytes tend to be arranged in nodular masses. The cartilaginous tissue is then arranged in nodular masses with polycyclic outlines. The islands of hyaline cartilage organise in lobules separated by interlobular septa (Fig. 1).

**Appearance in imaging**

**Conventional radiology and CT-scan**

The cartilaginous matrix can only be recognised in conventional radiology and the CT-scan by the presence of calcifications. The calcifications have a specific appearance when arranged in compact nodules, in a ring or arc (popcorn appearance). The degree of calcification of cartilaginous matrix can vary (Figs. 2 and 3). Occasionally, the degree of calcification is very high and the typical appearance is not easy to recognise. As opposed to an infarction, there is no calcified or ossified peripheral limit. In the CT-scan, the multilobular outlines of cartilaginous tissue may be recognised when the lesion is located in a fatty medullary cavity or when it induces cortical notches (Fig. 4).

**MRI**

The cartilaginous matrix may easily be recognised in MRI (Fig. 5a–d). It presents a marked hyposignal in T1 weighting (Fig. 5a) that is highly contrasted by the intense signal of the neighbouring fatty bone marrow in case of enchondroma. The hyposignal is sometimes heterogeneous after the presence of calcium deposits (more distinct in T1 hyposignal) or fatty residues (in T1 hypersignal). In the T2 weighted sequences, lobular and well-defined contours are found. Since the septas are in hyposignal, the water-rich cartilaginous matrix is in distinct hypersignal (Fig. 5b). It should be distinguished from the intratumoral calcifications that are in hyposignal in all sequences. There is no abnormality of bone marrow signal on the T2 fat saturation sequences. After the injection of gadolinium, the contrast enhancement of the tumour is global or inexistent (Fig. 5c), rarely peripheral [2] (Fig. 5d).
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Specificities of cartilaginous tumours of the hand

Cartilaginous tumours may be found in all parts of the skeleton: medullary cavity of the bone, cortex, subperiosteal space, intrasynovial space and even in soft tissue. Cartilaginous tumours may be single or multiple, benign or malignant.

Intra-osseous cartilaginous tumours

Enchondroma

Enchondroma corresponds to an intramedullary proliferation of mature hyaline cartilage in the metaphyseal-diaphyseal regions of bones with enchondral ossification. This is a common tumour, accounting for almost 3% of all bone tumours and for 12 to 24% of all benign bone tumours. This tumour affects the young subject. The age of dis-

Figure 4. CT-scan in axial section revealing an enchondroma of the 2nd metacarpus in a 35-year-old asymptomatic patient. Note this centromedullary lesion presenting a chondroid matrix with nodular contours (arrow) and the presence of central calcification (arrowheads).

Figure 5. a: MRI in axial section, in T1 weighting. Note T1 hyposignal of the cartilaginous matrix (arrow). This T1 hyposignal contrasts with the fatty signal from the bone marrow. The central calcifications are in asignal in all sequences (tip of arrow); b: MRI in axial section, in T2 Fat Sat weighting. Note the well-defined appearance of the cartilaginous lobules, with a very intense signal (arrows). The central calcifications are in asignal in all sequences (tip of arrow). There is no peri-lesion oedema; c: MRI in axial section, in T1 gado Fat Sat weighting. Note the enhancement of the septa (arrows). The central calcifications are in asignal in all sequences (tip of arrow); d: MRI in axial section, in T1 gado Fat Sat weighting. Note the peripheral enhancement (arrows) of this small enchondroma. The central calcifications are in asignal in all sequences (tip of arrow).
covery varies from the age of 10 to 40 years, according to Dalhin [3]. The location at the extremities is the by far most common (35 to 65%) according to the studies based on radiographic data [4,5]. The other classic locations are the proximal humeral (13%), distal femoral (7%) and proximal tibial (7%) metaphyses. Enchondroma is the most common tumour of the phalanx of the hands. In decreasing order of occurrence, it is found in the proximal phalanx, the metacarpus, the intermediate phalanx and the distal phalanx, with a preference of the ulnar edge of the hand. The natural evolution means that it is found near the zone of growth since the cells come from the physis (Fig. 6): distally from the metacarpals and proximally to the phalanx (Figs. 7 and 8). The extension of the lesion to the entire diaphysis is possible (Fig. 9).

The enchondroma, often asymptomatic, is discovered fortuitously or at the time of an X-ray, an MRI or a scintigraphy. Tumefaction may sometimes be the reason for the X-ray although the pathological fracture (Fig. 10) is most frequent in almost one third of all cases.

**Figure 6.** Natural evolution of enchondromas: near the zone of growth since these cells come from the physis (proximally from the phalanx and distally from the metacarpals).

**Figure 7.** Conventional X-ray in a 35-year-old patient. Fracture on enchondroma of the 4th metacarpus. Note the location of this enchondroma, distally from the metacarpus (arrow).

**Figure 8.** Conventional X-ray in a 60-year-old, asymptomatic patient. Chance discovery of an enchondroma of P1 of the 3rd finger. Note the location of this enchondroma proximally from the phalanx (arrow).

**Figure 9.** Conventional X-ray of the 5th finger in a 16-year-old patient presenting a fracture of the base of P1 (arrowheads) on enchondroma. Note the extension of the enchondromas to the entire diaphysis without malignancy (as opposed to the enchondromas of the long bones).
As a general rule, the destruction of more than two thirds of the thickness of the cortex is a sign of malignancy. This concept does not apply to enchondromas of the extremities in which more important endosteal erosion is not necessarily prejudicial (Fig. 11). In case of a large lesion, the bone outlines are swollen but there is neither a focal cortical rupture, nor a periosteal reaction, in the absence of a fracture. There is no extension to the soft tissue.

The enchondroma is classically recognised by the presence of chondroid calcification within the lesion (calcification in rings or arc). These calcifications may be totally absent, in particular in the fingers (Fig. 12a, b).

The CT-scan can discern the cortical anomalies and the matrix calcifications. It allows for an evaluation of the non-calcified cartilaginous areas, replacing the normal fatty medullary density by zones of tissue density corresponding to zones of residual tumoral activity (Fig. 13). It is of precious help in the search for signs of aggressivity: cortical lysis or extension to the soft tissue, highly evocative of chondrosarcoma.

Bone scintigraphy with Technetium 99m is not a very specific examination. Homogenous and moderate hyperfixation is often found, more peripherally in the childhood and adolescent forms. This hyperfixation may persist until adulthood. An increase in the hyperfixation, compared with a previous examination, should call to mind a sarcomatous transformation or a fracture. In addition, bone scintigraphy enables the search for other possible locations. Murphey et al. [6] propose comparing the tumoral fixation with that of the iliac spines. A more intense fixation than that of the iliac spines points to a possible chondrosarcoma.

From the anatomopathological point of view, an enchondroma consists of islands of hyaline cartilage organised in sometimes confluent lobules of variable size and shape (Fig. 1). These tumours may present seats of calcification and certain lesions appear extensively calcified and ossified.

**Figure 10.** Conventional X-rays revealing a pathological fracture on enchondroma of the 4th (left) and 3rd (right) metacarpals (arrows). The means for the detection of enchondroma in over one third of all cases.

In conventional radiography, the enchondroma may resemble a lytic osseous lesion of slow or no growth and metaphyseal or metaphyseal-diaphyseal topography. This metaphyseal-diaphyseal location is a very good sign of diagnostic orientation: the lesion is rarely epiphyseal although it may sometimes extend to the entire medullary cavity (Figs. 7–9). A small enchondroma is only detected if it induces the destruction of the endosteal side of the cortex. These endosteal cortical erosions are well-limited and do not generate a periosteal reaction.

**Figure 11.** Conventional X-ray in a 35-year-old patient. Enchondroma of P1 of the 3rd finger. Note the endosteal erosion (arrowheads) covering more than two third of the thickness of the cortex. This appearance is not a sign of malignancy (as opposed to enchondromas of the long bones).
Figure 12. a: X-ray of the hand in a 40-year-old, asymptomatic patient. Note the presence of a partially calcified enchondroma on the base of the 1st metacarpus (arrow) and a non-calcified enchondroma of the base of P1 (arrowheads); b: MRI in T1 weighting and T1 gado FS. Note the location of the enchondroma (arrows) at the base of the 1st metacarpus (the area of the physa) versus in distally from the metacarpals for the other fingers.

Figure 13. CT-scan with sagittal and coronal reconstruction in a 45-year-old patient. Pathological fracture on partially calcified enchondroma of the 3rd metacarpus (arrow). Note the replacement of the fatty bone marrow by zones of tissue density corresponding to zones of residual tumoral activity (arrowhead). Absence of cortical lysis or extension to the soft tissue.

(Fig. 14). The cortex is often thin and slightly repressed by the tumour, especially in chondroma of the fingers. The chondrocytes are small cells, usually with single, small round and even nuclei and are similar to the chondrocytes observed in non-tumoral cartilage. Mitoses are rare or absent. The histological and cytological characteristics of chondrocytes are of basic importance in the diagnosis of the type of cartilaginous tumour. All fragments obtained should be studied because the histology (cellularity, appearance of the cells) may vary considerably from one area to another. The histological analysis of the chondrocytes should be carried out in variable, non-rearranged and non-necrotic territories.

The degree of cellularity may vary considerably according to the topography of the tumour and the age of the patient, but also within the same tumour. The enchondromas
of the long bones of the hands and feet often present hypercellularity with a cellular pleiomorphism, chondrocytes of irregular size and shape that are sometimes floppy and degenerative, often binucleate. These histological signs do not necessarily attest to the malignant nature of these lesions in this location. However, the presence, within the hypercellular non-degenerative territories, of multinucleate chondrocytes and/or presenting nuclear atypies with an increase in the size of the nucleus and hyperchromatism, are unusual in a chondroma of the long bones, of the pelvis and the shoulder and point to a possible malignancy.

In spite of this, a differential histological diagnosis between a benign or malignant cartilaginous tumour is often difficult. This is why anatomopathologists recommend the confrontation with the clinical and radiographic data and rely more on the topography of the lesion than its histological appearance. With similar histology, certain cartilaginous lesions are benign or malignant depending on whether they are found in the hands or pelvis.

Therapeutic abstention is the rule in the absence of symptomatology of the enchondroma of the hands. If this is not the case (pain, non-aesthetic deformation or pathological fracture), surgery will consist of curettage, and then the filling of the residual cavity by a spongy autograft or by bone substitutes (Fig. 15a, b). The rate of recurrence from the periphery of the initial lesion is low and depends on the quality of the treatment of the walls of the chondroma during the primary curettage.

The prognosis for solitary chondromas, outside of the orthopaedic problems raised by the pathological fractures and the problem of the possible recurrence after treatment, is above all related to the risk of sarcomatous transformation of the lesion. However, this malignant transformation is exceptional in the solitary forms of the extremities.

Diffuse enchondromatosis
Diffuse enchondromatosis or Ollier disease is among the osteo-chondro-dysplasias. This non-hereditary osseous dysplasia is characterised by an alteration in the enchondral ossification with heterotopic proliferation of chondroblasts either from fertile metaphysal cartilage, or the deep layer of the peristium. It is characterised by the multiplicity and asymmetric distribution of chondromas (Fig. 16) (enchondromas and subperiosteal chondromas). The symptomatology is early and constant involving deformation and shortening. There is an increased risk of sarcomatous transformation compared with the single forms.

Maffucci syndrome is also a non-hereditary disease that associates a unilateral or asymmetrical enchondromatosis predominantly at the extremities with vascular lesions such as capillary or cavernous haemangiomas of the soft tissue (Fig. 17). Their distribution does not coincide. Phleboliths are highly evocative of this.

Diffuse enchondromatosis is much more rare than the solitary forms with a slight predominance in men. The age of discovery is early, most often during childhood, but classically during the first three decades. The distribution of the diseased bones corresponds to that of the solitary chondromas with preferential impairment of the bones of the hands and feet. The bones of the axial skeleton may also be affected, as may the craniofacial bones.

The positive diagnosis is based on the conventional radiological assessment. The other examinations (bone scintigraphy, MRI) are only used to assess whether or not there is a sarcomatous transformation of the lesions. The X-rays objectify both the central forms and the periosteal forms. The isolated forms of medullary and periosteal lesions do not differ from the isolated forms except that the size is larger. The bones have abnormal outlines with shortening, angulation and asymmetrical expansion. The cortex

Figure 15. a: conventional X-ray in a 30-year-old patient. Pathological fracture on partially calcified enchondroma of the 3rd metacarpus (arrow); b: same patient after treatment by curettage and filling (arrow).

Figure 16. Conventional X-ray of the hand in a 6-year-old child presenting diffuse enchondromatosis (Ollier disease). Note the multiplicity of the chondromas with association of enchondromas (arrows) and periosteal chondromas (arrowheads). Their distribution is asymmetric.
may, at this point, be thinner so that it may completely break off without the lesion being malignant.

In Ollier disease, the risk of deterioration into chondrosarcoma varies from 5 to 30% of the cases, depending on the series. In Maffucci syndrome, this risk involves the enchondromas (15 to 20% of the patients) and the angiomas (3 to 5% of the patients).

The treatment of chondromatosis involves two steps: the care of the enchondromas and that of the deviations and shortenings engendered by the disease.

Periosteal chondroma or ecchondroma

The periosteal chondroma corresponds to a proliferation of mature hyaline cartilage between the periostium and the osseous cortex, from the para osteal connective tissue, thereby accounting for its higher frequency in tendinous or ligamentous insertions. It accounts for about 15% of all chondromas [3]. It is generally detected before the age of 20 years, due to tumefaction of the soft tissue. It is predominant in men with a sex ratio of 2:1. All of the bones may be involved with, nevertheless, a predilection for the long bones (70%) versus only 25% for the hand and foot [5].

Radiologically, the periosteal chondroma destroys the subperiosteal side of the cortex. The inner limits are emphasised by a thin osteosclerotic strip. The medullary cavity of the bone is rarely impaired and, in general, the chondroma remains separated from the latter by a “sign of the partition” cortical residue (Fig. 18). The presence of intra-lesional calcification seems less frequent than in the endodermal form. Nevertheless, radiopaque microgranulations such as microcalcifications may be found, even to the extent of full calcification of the lesion.

A CT-scan or MRI, although not indispensable, enables a better analysis of the extension of the periosteal chondroma in the soft tissue, as well as quantification of the depth of the cortical nature, thereby helping determine the fragility of the bone involved.

Histologically, it has a lobular cartilaginous appearance with several small seats of irregularly interspersed calcifications, and sometimes areas of enchondral ossification arising from the underlying cortical bone.

Therapeutic abstention, provided that there is regular monitoring, is legitimate in case of asymptomatic periosteal chondromas of small diameter and stable size. In other cases, or as a principle for certain professionals, in view of the difficulty in the differential diagnosis with a low grade periosteal chondrosarcoma, it is necessary to carry out an excisional biopsy for cancer.

Osteocartilaginous exostosis or osteochondroma

The exostoses account for about 10% of all primary bone tumours. It is the most common benign bone tumour. It is a metaphyseal or metaphyseo-diaphyseal lesion located near the growth cartilage. It affects the extremities in 10% of the cases.

The exostosis may be sessile or pedunculated. There is always a cortical and spongy continuity between the latter and the bearing bone (Fig. 19).

The main complication of degeneration into chondrosarcoma is low (< 1%), although higher for the proximal or axial topographies.
Cartilaginous tumours of the soft tissue or pseudotumours

Nora’s disease
This is an osteochondromatous para osteal proliferation that mainly affects the phalanx (middle and proximal) of the hands and feet. This lesion evolves over time, initially with tumefaction of the soft tissue and then a fast-developing periosteal pluri lamellar reaction called “florid reactive periostitis”. There is no bone anomaly. The cortex opposite the tumefaction is well individualised. At the end of the evolution, a sessile or pedunculated osteocartilaginous mass appears, without any continuity between the lesion and the adjacent spongy bone (as opposed to exostosis) (Fig. 20).

Synovial and tenosynovial chondromatosis
Synovial chondromatosis is a mono-arthropathy characterised by the formation of probably metaplastic cartilaginous seats in the synovia. This disorder affects the young adult (20–40 years), most often men. It is preferentially found in the large articulations. The location in the extremities is not frequent [7] and malignant degeneration is rare.

Tenosynovial chondromatosis is similar to synovial chondromatosis as regards the histogenesis. However, the origin is in the tenosynovial sheath. No cases of malignant transformation have been observed, even if, in the histological examination, nuclear hyperactivity of the cartilaginous cells (large nucleus, bi-nuclear nucleus) may be observed. The rapid multiplication only attests to a specific activity of growing cartilaginous cells. However, recurrences are not exceptional.

Chondroma of soft tissue
Chondroma of soft tissue is a rare lesion that, by definition, arises in soft tissue without any connection with the bone. It mainly develops at the extremities (96%): 72% in the upper limb and 24% in the lower limb. The reason for consultation is generally painless tumefaction that has asymptptomatically evolved for a long time. The origin is a subject of debate. Dahlin and Salvador [7] think that the starting point is synovial, whereas Uehara and Becker [8] and Rosenfeld and Kurzer [9] find its origin in the production of connective tissue by metaplasia or activation of heterotopic cartilaginous islands. The latter hypothesis seems most likely. It accounts for the development of chondromas within the viscera (liver, kidney, testes, fallopian tubes, tongue) where no synovial structures exist. In the hand, repeated microtraumas have been incriminated in the development of these tumours.

Above all, this lesion affects the 30 to 60-year-old adult. It corresponds to a slow growing nodule. The radiological assessment does not reveal bone damage, but frequently arc-shaped or ring-shaped calcifications.

The reliable diagnosis is anatomopathological. This lesion is benign even if it comprises atypies. However, the recurrence after resection is not rare (15–20%) and sometimes multiple.

Chondrosarcoma
Chondrosarcoma is a very rare cartilaginous malignant tumour of the hand. It accounts for less than 5% of all malignant tumours and less than 1% of the chondrosarcomas in the entire skeleton [10–12]. The chondrosarcoma is primary in almost 80% of all cases. In 20% of the cases, it is secondary to the degeneration of pre-existing chondromas: Ollier disease, Maffucci syndrome, and in less than 1% of the cases to a solitary chondroma.

The age of discovery of the chondrosarcoma of the hand is between the fifth and seventh decade. The impairment to the phalanx is predominant (68%) compared with that
of the metacarpals (32%) and the location often neighbours
the metacarpophalangeal joint, especially affecting the first
phalanx.

Tumefaction is the usual inaugural symptom and pain
occurs as soon as there is a rupture in the cortex. The rapid
increase in size should draw the clinician’s attention, espe-
cially after the age of 40. Certain clinical elements help
differentiate chondroma from chondrosarcoma.

The conventional X-ray enables a search for the criteria
of malignancy: progressive erosion of the cortex, periosteal
reaction without fracture and extension to the soft tissue
(Figs. 21 and 22a–d).

Histological criteria of malignancy have been estab-
lished: cell immaturity or nuclear anomalies, hypercellu-
larinity in the entire specimen or in seats with defect of the
matrix tissue and invasion of the marrow or soft tissue. There
are three histological grades of increasing malignancy: grade
I (very differentiated tumour, histologically very close to a
benign cartilaginous tumour), grade II (presence of 10% cell
anomalies), grade III (non-differentiated cells with nuclear
anomalies and mitoses). In spite of these criteria, the histo-
logical difference between the grade I chondrosarcoma and
the chondroma is sometimes difficult to determine. In fact,
the chondromas of the hand and foot (especially in case of
chondromatosis and in the young subject) present a high cel-
ularity and more nuclear atypies than the other locations
[11]. The histological appearance alone does not confirm the
diagnosis, but all of the clinical, radiological and evolutive
aspects confirm the histological diagnosis of malignancy.

The treatment is surgical and involves the segment ampu-
tation, the choice solution, enabling eradication of the
disease and avoidance of the appearance of especially pul-
monary metastases. The prognosis is good and malignant
tumours of the hand are reputed to be tumours of local
malignancy.

Differential diagnoses: calcified lesions of
the hand

Gout

Chronic tophaceous gout corresponds to the deposit of
sodium urate crystals at the surface of the cartilage, in
the synovial membrane, the capsulo-ligamentary structures
and the soft cutaneous tissue. The distribution is often polyartic-
ular and asymmetrical (Fig. 23a). The tophi are cutaneous
and attest to the presence of more or less dense masses.
However, the density does not exceed 300 UH (average of
170 UH) (Fig. 23c, d). The well-limited osseous erosions
are secondary to the tophaceous gout. They are often sur-
rrounded by an osteosclerotic fringe.

These tophi may be intra-osseous. They then attest to
the presence of a well-limited osseous gaps sometimes sur-
rrounded by an osteosclerosis (Fig. 24).

Pseudo-tumoral calcinosis

It corresponds to the deposit of calcium masses in the soft
periarticular tissue, occurring in patients suffering from
untreated kidney failure. These masses are often large in
haemodialysed patients and in transplant patients. These
calcifications are mainly found in the hips, shoulders, knees
and elbows. They are more often found at the extremi-
ties. The X-rays then find dense calcifications presenting
multilobular outlines (Fig. 25). These deposits of calcium
hydroxyapatite are well individualised in the CT-scan with,
for the largest, the detection of levels of sedimentation.

Pseudo-tumoral chondrocalcinosis

It corresponds to deposits of calcium pyrophosphate crystals
in the form of a solitary calcified mass with poorly defined
contours that may resemble tophaceous gout or a tumoral
disease (Fig. 26a, b). These deposits rarely take the form of
a pseudotumour. It has mainly been described in the fingers,
feet, elbows, acromioclavicular joint and hip [13].

Secondary osteochondromatosis

This disorder is secondary to an underlying chondropathy.
Differing from synovial or tenosynovial chondromatosis, the
size and shape of the osteochondromatous nodules are vari-
able (Fig. 27a, b).

Apatite deposition disease

This is an idiopathic disorder (certain authors have
incriminated repeated microtraumas) that corresponds to
periarticular and articular deposits of calcium hydroxyapa-
tite. These calcifications are often asymptomatic. Their
clinical manifestation (intense pain settling in 48 hours) cor-
responds to the resorption phase of the calcification and
therefore the cure. The most typical example is that of the

Figure 21. 72-year-old patient, presenting evolutive tumefaction
with the appearance of pain. Conventional X-ray revealing chon-
drosarcoma of P1 of the 2nd finger. Noted the periosteal appositions
in grassfire and extension of the tumour to the soft tissue (arrow-
heads).
Figure 22.  a: 65-year-old patient, pain at the 2nd finger. Conventional X-ray revealing a condensing chondrosarcoma of P1. Note the extension to the soft tissue (arrowheads); b: CT-scan in coronal sections. Note the cortical rupture (arrow) and the extension to the soft tissue (arrowheads); c, d, e: MRI in T1 coronal sections (c), T1 axial (d) and T1 axial after gadolinium (e). The MRI helps better assess the extension to the soft tissue (arrowheads). Note the marked enhancement of the lesion (arrow); f: bone scintigraphy with Technetium 99m. Note the intense hyperfixation of P1 of the 2nd finger related to the chondrosarcoma.
Figure 23.  a: conventional X-ray of a 65-year-old patient presenting a carpal canal syndrome. Note the polyarticular and asymmetrical distribution of the tophaceous gout represented by 65 in the form of pseudo-tumoral formations with a dense appearance (arrowheads); b: CT-scan in axial section passing by the carpal canal. Soft tissue window. Note the density of the tophi that do not exceed 300 UH (arrow); c: open surgery of the carpal canal. Large tophaceous gout (arrow) of chalky appearance compressing the median nerve (arrowhead) in the carpal canal.

Figure 24.  57-year-old patient presenting painless tumefaction of the 4th finger. X-ray of an intra-osseous tophaceous gout of P1 (arrowhead) represented by a well-limited osseous gap surrounded by a osteosclerotic ridge. Note the distal location of the phalange (contrary to the enchondroma located in proximity). Note very dense tumefaction of the soft tissue around the proximal inter phalangeal (arrow).

Figure 25.  43-year-old patient, without specific antecedents, presenting painless tumefaction of the 1st finger. The conventional X-ray reveals a pseudotumour characterised by the presence of periarticular amorphous deposits presenting multilobular outlines (arrowheads). The diagnosis of pseudo-tumoral calcinosis was confirmed in the anatomopathological examination of the surgical excision.
Figure 26. a: 62-year-old patient presenting painless tumefaction of the 2nd finger evolving for several years. The conventional X-ray reveals a pseudo-tumoral lesion in the form of a solitary, calcified and poorly limited mass (arrows), resembling a tophaceous gout (but more calcified). This lesion is found at the metacarpal-phalangeal joint and seems to erode the head of the metacarpus (arrowheads); b: CT-scan with axial and sagittal reconstructions enables better visualisation of the pseudotumour eroding the cortical bone of the head of the metacarpus (arrows). The anatomopathological examination of the surgical excision concluded as to pseudo-tumoral chondrocalcinosis.

Figure 27. a: 65-year-old patient, with a past history of chondrosarcoma of the 2nd toe of the right foot that was amputated 10 years ago. Painless tumefaction of the base of the thumb. The conventional X-ray centred on the base of the thumb, reveals secondary osteochondromatous nodules (arrowhead) in a context of trapezo metacarpal osteoarthritis (arrow); b: the MRI with coronal sequences in T1, STIR and T1 gado FS weightings, reveals the appearance in hyposignal in all of the osteochondromatous nodules (arrowheads). Note the presence of effusion in the trapezo metacarpal joint (arrow) in relation to the osteoarthritis.
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Figure 28. 56-year-old patient, with a past history of calcifying tendinopathy of the supra spinatus. Intense, inflammatory and rapidly appearing pain in the wrist on the ulnar side: a: conventional X-ray revealing an oval calcification near the pisiform (arrow); b: the CT-scan confirms the amorphous appearance of these calcifications and specifies their topography near the flexi carpi ulnaris tendon (arrows); c: MRI coronal sequence in STIR weighting revealing the appearance in hyposignal of the calcification (arrow) with considerable oedematous signal of the neighbouring tissue; d: the control X-ray reveals the full disappearance of the calcification after 2 months (arrows) confirming the diagnosis of apatite deposition.

shoulder. In the X-ray, the calcifications are dense, amorphous, rounded or oval. They are found at the insertion of the tendons but may also be found in the articular capsule, tendon sheaths or synovial bursa. In the hand, the calcifications are often found on the tendon of the flexi carpi ulnaris or near its insertion on the pisiform (Fig. 28a–d).

Conclusion

Cartilaginous tumours of the extremities are often found in X-rays. They are often found incidentally or in the case of a fracture. The enchondroma, by far the most common lesion, assumes the appearance of centromedullar osteolysis associated with endosteal cortical gaps, without a peripheral edge of sclerosis or periosteal apposition. It is found in the metaphyseal region, near zones of growth (proximal topography for a metacarpal and distal in the first and second phalanx). The vast majority of cartilaginous lesions of the fingers are benign, in spite of the sometimes disturbing, histological appearance. Chondrosarcoma is an exceptional lesion of the extremities and there is a well-defined clinical context and radiological criteria.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.
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