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Intramuscular Chondroid Lipoma: Magnetic Resonance Imaging Diagnosis by 'Fat Ring Sign'

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Background: Chondroid lipoma is an extremely rare variant of benign lipomatous lesions that is composed of lipoblasts, mature fat, and chondroid matrix. Although benign lipomatous lesions are the most common soft tissue tumors and imaging findings are often pathognomonic, there have been few reports describing the imaging features of chondroid lipoma.

Case Report: We present magnetic resonance imaging (MRI) findings of a pelvic intramuscular chondroid lipoma in a 59 year-old man and describe a "fat ring sign" that may be useful to diagnose this rare tumor radiologically.

Conclusion: Magnetic resonance imaging findings of a chondroid lipoma may be heterogenous according to the distribution of the fatty and chondroid tissue. However, in the presence of "fat ring sign," radiologists should consider a diagnosis of chondroid lipoma preoperatively.

Keywords: Chondroid lipoma, MRI, pelvis

Chondroid lipoma is a rare type of benign lipomatous lesion that can arise from any part of the body, including proximal extremities and limb girdles, trunk, head and neck, breast, and abdominal cavity, in decreasing frequency (1-11). There are a limited number of case reports presenting the imaging findings of this rare tumor and, to the best of our knowledge, this is the second case of chondroid lipoma located in the pelvis. Preoperative diagnosis of chondroid lipoma is difficult due to heterogenous signal changes (1, 3-7, 10). In this study, we present magnetic resonance imaging (MRI) findings of a histopathologically proven chondroid lipoma with a brief review of the literature and describe a new sign that may help preoperative diagnosis of chondroid lipoma.

CASE PRESENTATION

A 59 year-old man who had suffered from left groin pain for 20 years that had increased in the last 5 months was admitted to the general surgery clinic. A computed tomography (CT) examination, which was performed at another hospital, showed a heterogenous and hypodense retroperitoneal mass with no calcification located in the left iliacus muscle region. Based on these findings, he was referred to our hospital for a pelvic MRI examination to determine the extent and nature of the lesion. The examination was performed using a 1.5 T MR scanner (Symphony, Tim Systems, Siemens Medical Systems, Erlangen, Germany) and revealed a 7x5 cm well-encapsulated, lobulated, intramuscular soft tissue mass originating from the left iliacus muscle. The lesion was composed of two parts. A central part of the lesion showed low signal intensity on T1-weighted (T1W) images (TR 450/TE 7 ms; Figure 1a) and a high signal intensity on T2-weighted (T2W) images (TR 3400/TE 150; Figure 1b). The latter was comparable to the signal intensity of the muscle, which showed early rings, an arcs enhancement pattern (Figure 1c), and delayed enhancement after intravenous gadolinium administration (not shown), thus suggesting the presence of chondroid

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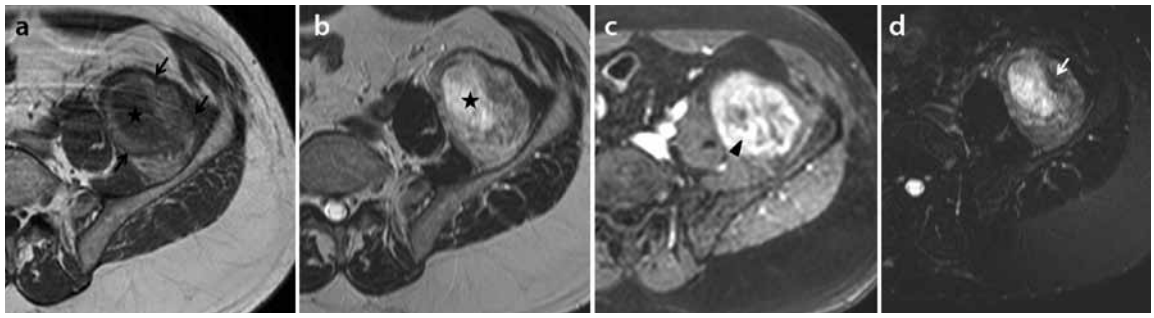

FIG. 1. a-d. Axial non-enhanced T1W (a), T2W (b), gadolinium-enhanced T1W (c), and T2W fat-saturated images (d) show a well demarcated, lobulated, soft tissue mass (black arrows) originating from the left iliacus muscle. The central part of the lesion shows a low signal intensity on T1W images (star) and a high signal intensity on T2W images (star), thus suggesting chondroid tissue. After intravenous gadolinium administration, the mass shows prominent enhancement in the peripheral region. In the central part, an early pattern of ring and arc enhancement (arrowhead) and delayed enhancement (not shown) also suggests chondroid tissue. On T2W fat-saturated images, the peripheral part of the lesion shows non-uniform fat saturation (white arrow), thus suggesting fat tissue

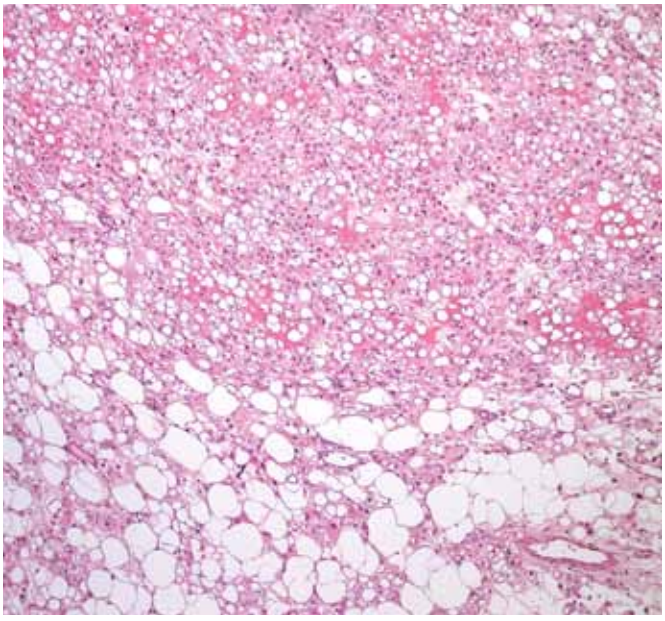

FIG. 2. A photomicrograph of the specimen shows mature lipoid cells surrounding lipoblast-like cells with clear, vacuolated cytoplasm, and central nuclei, and oval or round cells with eosinophilic cytoplasm in a myxoid and hyalinised matrix consisting of chondroid lipoma (H&E, original magnification x40)

tissue. The peripheral part of the mass showed high signal intensity on T1W and T2W images when compared to the signal intensity of the muscle and showed non-uniform fat saturation on T2W fat-saturated images (TR 3400/TE 150), thus suggesting the presence of fat-tissue (Figure 1d). There was an intense enhancement at the peripheral part on post-contrast images (Figure 1c). The mass was resected surgically and histopathologic examination showed well limited, encapsulated neoplastic tissue consisting of mature lipoid cells at the periphery with scattered chondroid cells consistent with chondroid lipoma (Figure 2). There were no mitoses, and the Ki-67 proliferation index was low. On follow-up, no recurrence was noted. Patient's informed consent was obtained for the release of relevant information.

DISCUSSION

Chondroid lipoma is a rare variant of benign lipomatous tumors that was first described by Meis and Enzinger in a series of 20 cases as a rare fatty tumor simulating liposarcoma and myxoid chondrosarcoma in 1993. Although benign lipomatous lesions often have pathognomonic imaging findings, chondroid lipomas have an unusual radiologic appearance, which makes the diagnosis difficult, particularly in differentiating them from malignant tumors (1, 3-7, 10, 11). However, the nonaggressive behaviour of this rare tumor makes the accurate diagnosis essential to avoid unnecessary radical treatment (1, 2, 4, 7, 10).

Chondroid lipoma is usually diagnosed in middle-aged adults with a significant female predominance. In general, the mass presents with a slow-growing, painless lump. Most lesions originate from the subcutaneous tissue, superficial muscle fascia, or skeletal muscle. Although the patients with chondroid lipoma usually show a limb girdle predominance, chondroid lipomas arising from head and neck, trunk, breast, and the abdominal cavity have also been reported (2, 7-12).

Meis and Enzinger (2) described the histopathologic findings as clusters, strands, and sheets of eosinophilic and vacuolated cells containing glycogen and fat droplets. They reported that cells of chondroid lipoma resemble brown fat cells, lipoblasts, and chondroblasts in a varied background of mature adipose tissue associated with a marked myxoid matrix, which is partially fibrinous to hyalinised. The amount of mature fat and chondroid components with the myxoid matrix can be in a variable mixture, which results in heterogenous and nonspecific signal changes on an MRI. This heterogeneity of MRI

TABLE 1. Magnetic resonance, computed tomography, and radiographic imaging findings of chondroid lipomas reported in the literature

Article (reference [#])	T1-W (signal)	T2-W (signal)	T2-W with FS or STIR (signal)	T1W C+ (enhancement)	CT[µ]	Radiography (Ca^{++})
Logan et al. (3)	Low*/high	High	High* /Low	N/A	N/A	N/A
Yang et al. (11)	Low*/high	High	High* /Low	N/A	N/A	N/A
Green et al. (4)	High*/low	N/A	High* /Low	Mild	N/A	+
Boets et al. (8)	High[α]	N/A	High*/Low	Marked	Isodense	N/A
Murphey et al. (1)	Low*/high	High	N/A	N/A	N/A	+
Hyzy et al. (5)	High*/low	N/A	Low*/high	Moderate	N/A	+
Hoch et al. (6)	High*/low	High*/low	High*/low	N/A	Isodense w curvilinear Ca^{++}	+
Hwang et al. (10)	High*/intermediate/low	High*/intermediate/low	N/A	Moderate	Hypodense w marked Ca^{++}	N/A

FS: fat-saturation; N/A: not available
[µ]Lesion density compared with muscle density
*Indicates the dominant signal intensity
[α]Slightly high signal when compared to adjacent muscle

imaging findings has been reported in a few case reports in English literature (1, 3-7, 10, 11) (Table 1). Logan et al. (3) were the first to describe the MRI findings of this rare tumor in 1996 as low signal intensity on T1W images and high signal intensity on T2W images. This suggested a chondroid tumor, while reticulated strands of high signal intensity on the T1W images that were suppressed on short-tau inversion recovery (STIR) images suggested fat.

Boets et al. (8) described a soft tissue mass located in the trunk using MRI results. They showed a heterogeneous high, but central low signal intensity on STIR images, as well as slightly increased signal intensity when compared to adjacent muscle on T1W images with pronounced enhancement after gadolinium administration. They stated that these findings were different from those described by Logan et al. (3) and explained the difference by the prominent chondromyxoid matrix with a low number of mature fat cells. On the other hand, they also emphasised that myxoid liposarcoma and extraskeletal chondrosarcoma can also give similar MRI findings and cause a diagnostic problem.

Green et al. (4) reported a case of a chondroid lipoma located on the medial aspect of the foot that had radiographic calcification. MRI findings from T1W, T2W, and STIR images suggested the presence of fat and chondroid tissue. With the MRI and radiographic findings of the lesion, the authors included an atypical lipoma or a liposarcoma, extraskeletal chondroma, chondrosarcoma, synovial sarcoma in their differential diagnosis list. Hyzy et al. (5) and Hoch et al. (6) also presented cases of chondroid lipomas with calcification seen on the radiography.

Hwang et al. (10) described the first case of pelvic chondroid lipoma originating from the left gluteus medius muscle using CT and MRI results. On the CT images, they found a fatty pelvic mass with peripheral calcifications that showed a linear and rosary pattern. MRI findings on T1W, T2W, and T1W post-contrast images also revealed the presence of fat and chondroid tissue, and showed delayed enhancement after IV Gd administration related to chondroid tissue. They concluded that despite the very limited number of reported cases, the rosary calcification pattern could be a characteristic finding of chondroid lipomas, and this was the first the delayed enhancement feature for was described.

In our case, the mass originated from the left iliacus muscle with a well demarcated, lobulated shape and a central enhancement pattern of rings and arcs, suggesting a cartilage tumor. The central part of the lesion was consistent with a predominantly chondroid component, and the peripheral part of the lesion was consistent with a predominantly fatty component. The content of the lesion was similar to that of the cases reported by Murphey et al. (1), Logan et al. (3), and Yang et al. (11). The chondroid tissue component was prominent when compared to the fatty tissue component. After gadolinium administration, the lesion showed a marked diffuse peripheral enhancement, with arcs and rings enhancement patterns in the central part. Additionally, there was delayed enhancement at the central part, which was first described by Hwang et al. (10), and which was attributed to the presence of fibrous tissue within the chondroid tissue.

The composition of the current lesion was very similar to the chondroid lipomas described by Murphey et al. (1) and Yang et al. (11). Although not described in these reports, we noted the presence of a "fat ring sign" in the MR images in these articles. Therefore, we decided that the presence of a "fat ring sign" on MR images may help the radiologist diagnose a chondroid lipoma.

Despite the findings of the described imaging suggesting chondroid lipoma, fatty tumors with chondro-osseous differentiation, such as lipoma or liposarcoma, tumors including myxoid component, such as myxoid liposarcoma and extraskeletal myxoid chondrosarcoma, should also be included in the differential diagnosis. Both lesions may show heterogeneous signal changes on MRI related to a variable amount of fat and chondroid tissue. A reticulated or linear pattern in the small amount

of mature fat and a cyst-like appearance in myxoid liposarcomas may help to differentiate it from chondroid lipomas. The invasive nature may also help extraskeletal myxoid chondrosarcoma be differentiated from chondroid lipomas (13, 14).

In conclusion, radiologists should consider chondroid lipoma in the presence of "fat ring sign". Although MRI findings may be heterogenous according to the distribution of the fatty and chondroid tissue, a "fat ring sign" could enable the diagnosis preoperatively.

Ethics Committee Approval: N/A.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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