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Isolated primary bone tumours of the lesser trochanter: Demographics, diagnosis and management

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ABSTRACT

Primary bone tumours arising from the lesser trochanter (LT) are rare and the literature describing them is sparse. In this paper, we describe the largest series of LT tumours describing the demographics, diagnosis and management.

Methods: A retrospective search of prospectively maintained radiology and oncology databases was performed to identify bone tumours of the LT diagnosed between 2007 and 2018. Metastatic lesions were excluded. All cases were re-reviewed by a senior Radiologist and all case of isolated tumours of the LT were included.

Results: 23 cases of isolated LT tumours were identified. There were 15 males and 8 females. Mean age of our cohort was 32 (14–63) years. Most (n = 19, 82.6%) cases had classic radiological (Radiographic, MR Imaging and CT) features and therefore did not undergo biopsy. 4 patients had equivocal radiological investigations that required biopsy to confirm the diagnosis. MR imaging was the most commonly used imaging modality for diagnosis (n = 17, 73.9%)

There was a broad range of tumour subtypes, and osteochondroma (n = 17, 73.9%) the most frequently diagnosed. Surgical excision was performed in 4 patients (all osteochondromas) and 4 patients underwent therapeutic radiological guided hip injections for symptomatic relief. The remaining cases were managed conservatively and where they were identified incidentally, no intervention was required.

Conclusion: We report the largest case series of isolated primary bone tumours of the LT. All isolated primary bone tumours of LT are benign. Osteochondroma is the most common. The diagnosis can be made with on radiological investigations in most patients.

1. Introduction

Primary bone tumours are a group of neoplasms that can arise from any part of the skeletal system. These are most frequently seen in children and young adults and encompass a range of pathologies both benign and malignant.[1]

Primary bone tumours of the lesser trochanter (LT) are considered rare. We have only been able to identify a single case series of 6 patients from our review of the literature.[2] Imaging features of tumours of the LT are key for diagnosis and biopsy is performed in some indeterminate cases. Treatment is only necessary when mandated by the severity of symptoms, the risk of impending fractures or malignant transformation.[3–5] Surgical management of tumours of the LT is quite challenging due to the anatomical location, insertion of iliopsoas tendon and proximity of the neurovascular bundle. We present the largest series of primary bone tumours isolated to the LT.

2. Methods

A retrospective search of our tertiary orthopaedic oncology institute's oncology and radiology databases was performed to identify tumours of the LT over an 11-year period (2007–2018). We utilised the WHO classification of bone tumours, published in 2013, to describe our bone lesions.[6] Imaging features were reviewed by a senior Radiologist, with a special interest in bone and soft tissue oncology. Only primary bone tumours isolated to the LT were

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included in the study. Metastatic lesions were excluded. The databases were reviewed for demographic data, diagnosis, imaging features and histology (where available).

3. Results

We identified 797 cases of tumours involving the LT, from a review of our oncology and radiology databases, between 2007 and 2018. Of these, 23 patients (2.9%) were reported to have an isolated primary tumour of the LT and these were included in our study. The mean age of the patients was 32 (14–63) years.

There was a male predominance of 1.9:1 (15 males and 8 females). 17 patients (73.9%) of patients presented with groin pain. Of them 4 patients (17.4%) had restriction in hip flexion and abduction, with symptoms mimicking impingement.

Three different imaging modalities were used to interpret and diagnose isolated LT tumours (Magnetic Resonance (MR) imaging, Computed Tomography (CT) and Plain Radiographs (XR)). The majority of diagnoses were made using MRI (n = 17, 73.9%). This was followed by CT (n = 4, 17.4%) and XR (n = 2, 8.7%). Imaging modalities used for individual diagnoses are summarised in Table 1, Figs. 1–4. Most (n = 19, 82.6%) cases had classic radiological (Radiographic, MR Imaging and CT) features and therefore did not undergo biopsy. 4 patients had equivocal radiological investigations that required biopsy to confirm the diagnosis.

With respect to management, 6 (26.1%) tumours were found incidentally and did not require intervention. Nine (39.1%) cases were managed conservatively. Eight (34.7%) patients required invasive management. Of these, radiologically guided injections (Levobupivacaine and Kenalog) were performed in 4 cases - 3 osteochondromas and one fibrous dysplasia. Surgical excision was undertaken in four patients (all osteochondromas).

The average follow-up period of all cases was approximately ten months. There were 12 cases followed up between a period of 1–12 months and then discharged with no recurrences. Of them 3 cases (osteochondromas) underwent surgical intervention, 3 patients had a hip injection (2 osteochondromas, 1 fibrous dysplasia) with good alleviation of symptoms, 4 cases (2 osteochondromas, 2 fibrous dysplasia) were managed conservatively until symptoms improved or resolved, and the remaining 2 cases (osteochondromas) were asymptomatic incidental findings.

Five cases (all osteochondromas) were followed up between a period of 24–36 months, 2 of which were symptomatic patients treated conservatively, one patient underwent surgical intervention, and one, an incidental finding.

Four patients did not require any follow-up, 3 of which were incidental findings (of osteochondromas) and one bony island.

One patient (case of fibrous dysplasia) failed to attend for follow up. We were unable to retrieve the follow-up details regarding the patient presenting with Haemangioma.

4. Discussion

Primary bone tumours are relatively rare and constitute <1% of all cancers worldwide.[7–9] The most common benign subtype is an osteochondroma (approximately 30% of all cases worldwide).[10] The literature shows that benign tumours of the bone commonly involve the proximal femur and usually arise from the femoral head, neck and greater trochanter.[11] The LT, however, is frequently involved in metastatic lesions and usually presents sporadically as atraumatic avulsion fractures, which are pathognomic.[12]

To the best of our knowledge, there are only a few studies discussing the management of tumours isolated to the LT [2,13–16]and therefore, ours is currently the largest case series. From our institutional experience, 2.9% is the incidence of benign LT tumours (23 out of 797 cases in total).

From a radiological perspective, a plain radiograph is usually the first line imaging modality used to identify bone tumours; however, they can lack the ability to evaluate detailed features within tumours such as cartilage, vascular tissue, liquid or fat. This is why MR imaging has become the gold standard imaging tool to aid in the diagnosis and classification of the different bone tumours.[17] This was also noted in our study where 74% (n = 17) of bone tumours were identified on MR imaging.

With respect to diagnosis, most of our cases were diagnosed based on classical imaging features (n = 19, 82.6%). Osteochondromas constituted the majority of our cases (n = 17) and classically appear as pedunculated or sessile osseous lesions with a continuation of the medullary cavity into the involved bone. MRI helps to ascertain the complications of these lesions; a thickened cartilage cap (malignant transformation) fractures, adventitious bursa and impingement on adjacent structures. Fibrous dysplasia appear as well-defined, ground glass lesions on plain radiographic imaging with a varied appearance on MRI. In regards to bone island, these classically appear as radiodense lesions on radiographs, with high attenuation on CT and low signal on all MRI sequences. Haemangiomas have more distinct features, seen as thickened trabeculae with intervening fat (corduroy appearance) or as Polka dots on CT. On MR imaging, these lesions demonstrate fat interspersed with vessels and thickened trabecula.

There were 4 (17.4%) cases in our study that required abiopsy, all of which were osteochondromas. This was primarily due to the detection of a thickened cartilaginous cap, raising the suspicion of a malignant transformation.

Benign bone lesions can be managed in a variety of ways depending on the level of symptoms and underlying diagnosis. Recommended intervention for benign neoplastic lesions of the bone includes primary resection.[18–20] In our cohort, four patients (all with an osteochondroma) underwent surgical excision. Operative intervention involving excision of the LT can damage the iliopsoas tendon (IPT). The LT serves as an attachment for the iliopsoas muscle, regarded as the most powerful hip flexor in the body.[21] The iliopsoas muscle functions as a major hip and lumbar

Table 1
Demographics, Diagnosis and Management modalities used in our Cohort of isolated Tumours of the LT.

Tumour Subtype	Number Of Patients (n)	Sex (n)		Imaging Modality Used to establish final Diagnosis			Biopsy (n)	Management			Incidental (n)
		M	F	MR Imaging (n)	CT Imaging (n)	XRAY Imaging (n)		Conservative (n)	Surgical Excision (n)	Radiologically Guided Injection (n)	
Osteochondroma	17	11	6	13	3	1	4	5	4	3	5
Fibrous dysplasia	4	3	1	2	1	1	0	2	0	1	1
Haemangioma	1	1	0	1	0	0	0	1	0	0	0
Bone island	1	0	1	1	0	0	0	1	0	0	0
Total	23	15	8	17	4	2	4	9	4	4	6

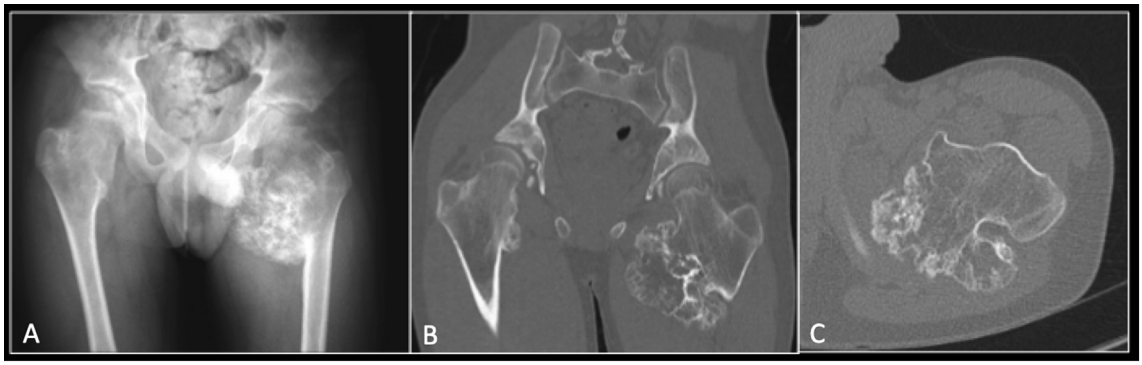

Fig. 1. AP x ray of pelvis (A), coronal CT(B) and axial CT(C) shows a large osteochondroma involving the lesser trochanter and hereditary multiple exostosis.

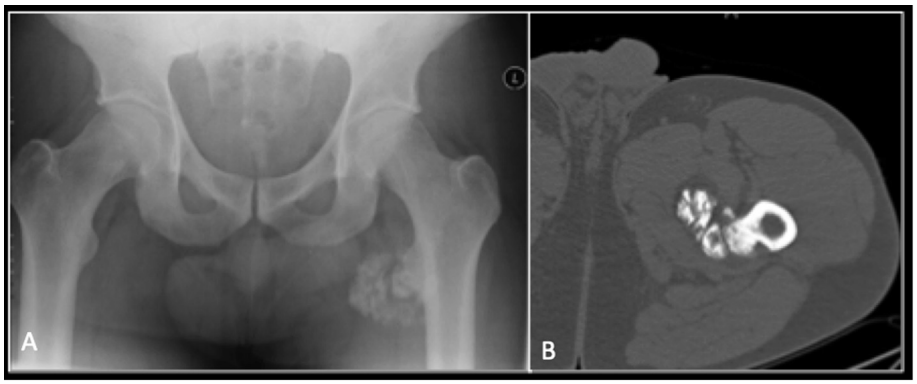

Fig. 2. AP x ray of pelvis(A), and axial CT(B) shows a large osteochondroma involving the left lesser trochanter.

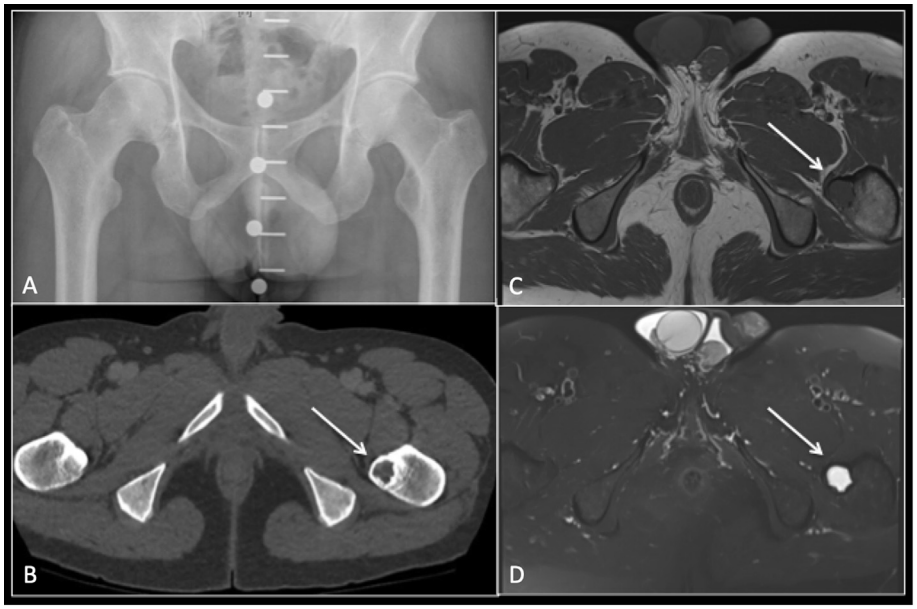

Fig. 3. AP x ray of pelvis(A), axial CT(B), axial T1C) and STIR(B) shows a cystic lesion in the left lesser trochanter in keeping with cystic fibrous dysplasia.

spine stabiliser allowing flexion of the lumbar spine through the pelvis. Failure of the IPT may manifest as anterior hip pain with anterior hip instability, weak hip flexion and persistent lower back pain.[22]

The anatomical position and the proximity of major neurovascular structures poses a surgical challenge to orthopaedic oncology surgeons when operative intervention is planned for a tumour located at the LT. Orthopaedic oncologists are very familiar with reconstructions of the proximal femur following resection of malignant tumours affecting the proximal femur. This involves a combination of a posterior and anterolateral approach to the hip to mobilise and resect the desired amount of proximal femur. A

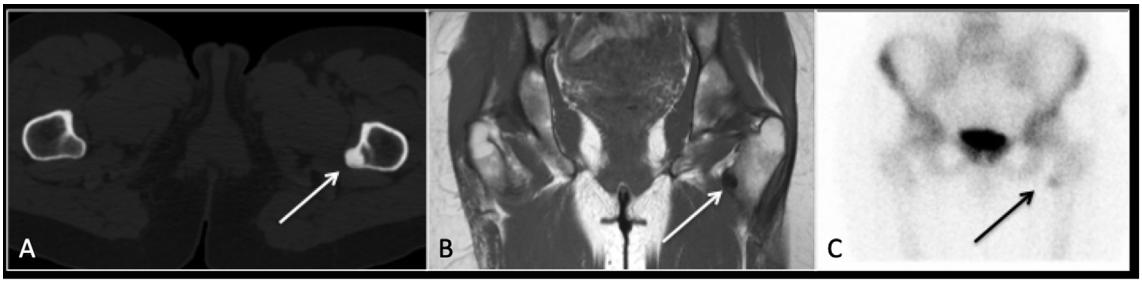

Fig. 4. Axial CT(A), coronal T1(B) and bone scan (C) shows a bone island in the left lesser trochanter with increased uptake on bone scan.

modified posterior approach to the hip can be utilised to access the LT. Patients are positioned in the conventional lateral position however the deeper dissection is modified to remain extracapsular. Once the deep fascia is incised the leg is internally rotated to bring the LT into the surgical field. The quadratus femoris muscle may need to be partially released to better visualise the LT whilst protecting the sciatic nerve. Curettage or resection of any benign tumour can then be performed. This is the familiar and preferred approach utilised in our unit.

However, various medial approaches have been documented in the literature and are often described as being a more direct approach. The Ludloff approach was first described in 1913 as an approach to congenital dislocations of the hip[23]. This adopts an internervous plane between the adductor brevis and adductor magnus and places the medial femoral circumflex artery, obturator artery (anterior and/or posterior division) and the deep external pudendal artery at risk. Numerous modifications of Ludloff's original approach have been described utilising different medial planes of dissection often via the femoral triangle.[2,24] We have little experience of these approaches and would recommend that any surgeon undertaking procedures in the region of the LT utilises an approach that they feel comfortable performing safely. The ischium is also located in close proximity and any abnormalities that lead to the decrease in this interval can result in ischiofemoral impingement.[25]

Our study is limited in that it describes the experience from a single institute over a period of 11 years. However, this is mitigated by the fact that isolated tumours of the LT are rare and that this is the largest case series to date.

5. Conclusion

All isolated primary bone tumours of LT are benign. Osteochondroma is the most common. The diagnosis can be made with on radiological investigations in most patients. We present the largest series in literature of 23 patients.

Conflicts of interest

No conflicts of interest.

Financial disclosures

No financial disclosures.

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