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RESEARCH ARTICLE

RADIOFREQUENCY ABLATION FOR RARE OSTEOID OSTEOMA OF THE LESSER TROCHANTER IN AN ADOLESCENT: A CASE REPORT

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Abstract

Osteoid osteoma is a benign but painful bone tumor, predominantly affecting young individuals [13]. Although it frequently occurs in the long bones of the lower limbs, involvement of the lesser trochanter is rare and poses diagnostic and therapeutic challenges due to its deep location and proximity to vital neurovascular structures [6]. This report presents a case of a young adult with persistent hip pain, ultimately diagnosed with osteoid osteoma of the lesser trochanter using computed tomography [12]. The patient underwent CT-guided percutaneous radiofrequency ablation (RFA), resulting in immediate symptom relief and full recovery without recurrence during follow-up [4]. This case highlights the utility of minimally invasive RFA as a safe, effective alternative to surgical excision, especially in anatomically challenging sites.

Introduction:-

Osteoid osteoma is a small, benign, osteoblastic tumor typically seen in adolescents and young adults, with a higher prevalence in males [13]. It accounts for approximately 10–12% of all benign bone tumors [13,7]. The majority of these lesions are found in the diaphyseal or metaphyseal regions of long bones, particularly the femur and tibia [1]. When located in atypical sites, such as the lesser trochanter of the femur, diagnosis can be delayed due to its unusual presentation and deeper anatomical location [3,12]. Patients commonly present with localized pain that intensifies at night and is remarkably relieved by nonsteroidal anti-inflammatory drugs (NSAIDs) [2]. However, in less common locations like the lesser trochanter, symptoms may mimic other conditions, such as stress fractures, soft tissue injuries, or referred pain, making clinical identification difficult [12]. Imaging plays a crucial role in establishing the diagnosis, with computed tomography (CT) being particularly effective in identifying the nidus [12]. Traditional treatment methods included surgical excision, which, while effective, often required extensive dissection and longer recovery times, particularly in deep-seated or atypical locations [14,11,6]. Radiofrequency ablation (RFA), a percutaneous technique performed under image guidance, has emerged as a minimally invasive and efficient alternative to open surgery [11,14]. It offers excellent outcomes with reduced morbidity, faster recovery, and minimal risk of complications [4]. In this report, we discuss the successful application of CT-guided RFA in a patient with osteoid osteoma of the lesser trochanter, emphasizing the clinical benefits of this approach in managing deep-seated lesions.

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Literature Review:

Osteoid osteoma was first described by Jaffe in 1935 as a distinct benign bone-forming tumor. The tumor is histologically characterized by a central nidus of osteoid tissue surrounded by reactive sclerosis [13]. Although benign, the tumor is notorious for causing significant pain, often disproportionate to its size [2]. Lesions located in deep or atypical regions, such as the lesser trochanter, pose diagnostic difficulties [3,12]. In such scenarios, plain radiographs may not always reveal the nidus, making advanced imaging crucial [12]. While magnetic resonance imaging (MRI) can detect associated bone marrow and soft tissue edema, computed tomography (CT) remains the most definitive modality for visualizing the nidus with precision [12]. Historically, open surgical excision was the standard treatment, involving resection of the nidus along with surrounding sclerotic bone [11]. Though effective, this approach is associated with significant drawbacks, including soft tissue damage, longer hospital stays, and risk of fracture at the resection site. In recent decades, minimally invasive techniques, such as radiofrequency ablation (RFA), laser photocoagulation, and cryoablation, have been developed to address these limitations [5,11]. Among them, RFA has gained widespread acceptance due to its high success rate, minimal morbidity, and rapid patient recovery [4,9]. The reason being higher outcome of incomplete tumour destruction with cryoablation and higher chances of injury to surrounding healthy tissue with laser photocoagulation [5,11].

The procedure involves inserting a probe into the nidus under CT guidance and usingthermal energy to destroy the tumor tissue [15,10,21]. Studies have consistently reported success rates exceeding 90%, with a low incidence of complications or recurrence [4,8]. Complications, though rare, can include skin burns, thermal injury to nearby nerves, or incomplete ablation [10,18]. Particularly in challenging anatomical areas like the lesser trochanter, where surgical access may be difficult and neurovascular structures are in close proximity, CT-guided RFA offers a safer and more efficient therapeutic alternative with favorable long-term outcomes [8,9,6,17].

Case Report:

A 15-year-old male presented with a six-month history of dull, aching pain localized to the medial aspect of the right thigh just below inguinal area. The discomfort was persistent, worsened at night, and was significantly alleviated by nonsteroidal anti-inflammatory drugs (NSAIDs). The patient was unable to carry out his daily routines due to pain and had dropped out of school during the period of pain. There was no history of trauma or constitutional symptoms. On clinical examination, localized tenderness was elicited on deep palpation over the region of the lesser trochanter. Hip flexion was painful beyond 125–130 degrees, while the rest of the joint range remained unaffected. Neurological evaluation revealed no sensory disturbances or motor deficits, and distal neurovascular status was intact. Initial radiographic imaging showed a dense sclerotic area involving the right lesser trochanter, with an oblong, radiolucent zone centrally located within the sclerosis. A high-resolution computed tomography (CT) scan revealed a 0.9 × 0.7 cm radiolucent lesion, consistent with a nidus, encased by dense sclerotic bone within the lesser trochanter—findings diagnostic of osteoid osteoma [3,12].

Fig .1 Pre-op X-ray of patient

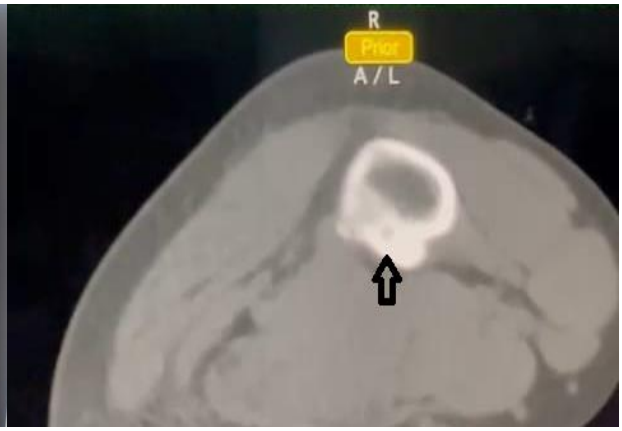

Fig .2 Pre-op CT axial section showing nidus of osteoid osteoma

Procedure:

The patient underwent CT-guided radiofrequency ablation (RFA) under spinal anesthesia. He was positioned in the left lateral decubitus posture, with the right hip and thigh facing upward. The local parts are thoroughly scrubbed and draped with Betadine, and grounding pads were placed on the distal aspects of both thighs. The lesion was localized using axial CT slices, and 1% lidocaine was infiltrated from the skin to the bone cortex. A stab incision

was made over the lateral prominence of the greater trochanter using a No. 11 blade. Following soft tissue dissection with artery forceps, a Cook Osteo-Site bone biopsy needle (11 G) was introduced to the cortex. A 2.7-mm drill bit was advanced toward the nidus using a power drill after removing the inner stylet, under continuous CT guidance. Once the nidus edge was breached, the Osteo-Site cannula was introduced with its inner sharp stylet. After confirming placement within the nidus via CT, the stylet was removed. An RFA probe (Covidien Cook-tip RF Ablation System, 11 G, with a 1.5-cm active tip) was placed into the nidus, confirmed by CT. Radiofrequency ablation was performed for 9 minutes(one cycle of 3minutes, three cycles) at 90 degrees Celsius after withdrawing the outer cannula to the cortex, following established protocols for effective nidus ablation. The probe was withdrawn, the wound was closed with a single skin suture, a sterile dressing was applied, and the procedure was completed without complications. Total duration of the procedure is about 30minutes.

Fig.3. under CT- guidance lesion was marked local anaesthesia infiltrated, stab incision given and entry made with bone biopsy needle.

Fig.4.Image showing RFA probe and ablation machine

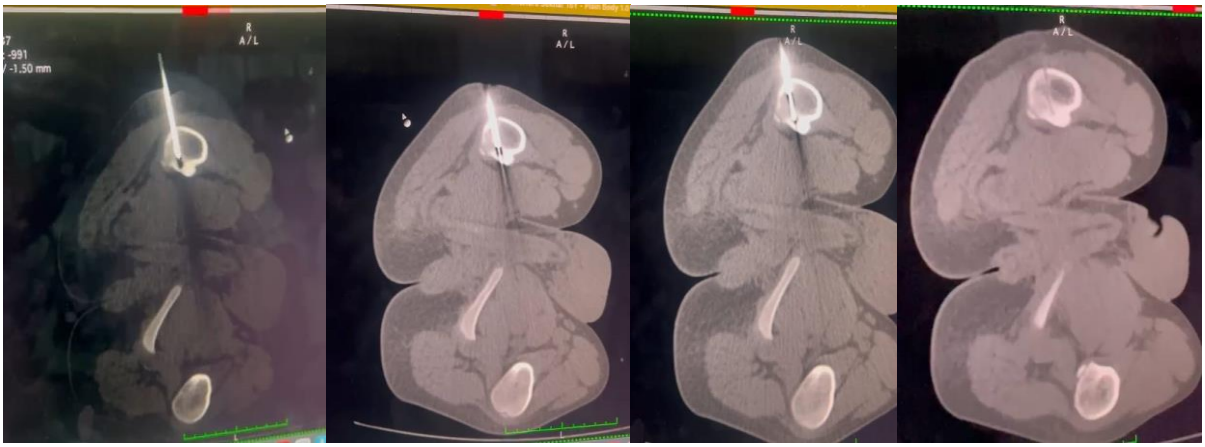

Fig.5.images showing serial axial sections of CT.
1) Entry made with bone biopsy needle and drill
2) RFA probe inserted into nidus
3) Outer cannula was retracted till cortex of bone
4) Post RFA showing tract of the RFA probe into the nidus

Postoperative outcome and follow up:

The patient experienced complete resolution of pain within 24 hours. Night pain did not recur, and he resumed normal activities within a few days. At the three-month follow-up, a repeat CT scan showed evidence of nidus resolution with no residual lesion. At six months post-procedure, the patient remained asymptomatic, with no clinical or radiographic signs of recurrence.

The patient reported a preoperative Visual Analog Scale (VAS) pain score of 8/10, indicating severe pain associated with an osteoid osteoma located in the lesser trochanter. Following radiofrequency ablation, the postoperative VAS score was 0/10, reflecting complete pain resolution.

Fig.6. Images showing 3 month old post op follow-up x-ray, Coronal and axial sections of CT (from left to right).

Discussion:-

Osteoid osteoma is a benign but painful osseous lesion predominantly affecting adolescents and young adults [13]. Its hallmark symptom is nocturnal pain that responds dramatically to NSAIDs [2]. Although commonly seen in the diaphysis of long bones, involvement of the lesser trochanter is distinctly uncommon and may delay diagnosis due to its atypical location and overlap with other hip pathologies [12]. The clinical presentation in this case—night pain responsive to NSAIDs, localized tenderness, and deep-seated discomfort near the hip—was consistent with osteoid osteoma [2,12]. However, because of the lesser trochanter's deep anatomical position, plain radiographs were insufficient for a definitive diagnosis [12]. MRI was valuable in identifying the surrounding edema and inflammation, but high-resolution CT imaging proved indispensable in confirming the presence of a well-defined nidus—considered the gold standard for diagnosis [12,3]. Historically, treatment consisted of open surgical excision of the nidus, often necessitating extensive bone removal and prolonged recovery. In anatomically constrained regions like the lesser trochanter, such an approach may risk damage to adjacent neurovascular structures or lead to postoperative complications, such as pathological fractures or joint stiffness [6]. Radiofrequency ablation (RFA) has emerged as a highly effective and minimally invasive option for managing osteoid osteoma [4,11]. The procedure involves inserting a thermal probe directly into the nidus under imaging guidance, with the intent of coagulating the tumor tissue through controlled heat application [15]. Multiple studies have reported success rates above 90%, with rapid symptom relief and minimal recurrence risk [4,8,20]. Complications are rare but can include skin burns, thermal injury to nearby nerves, or incomplete ablation [18]. In the presented case, CT-guided RFA was safely executed using a percutaneous lateral approach through the greater trochanter. A well-controlled ablation protocol, involving three cycles at 90°C, was employed to ensure thorough nidus destruction while minimizing the risk to surrounding tissues [15]. The patient experienced complete symptom relief immediately following the procedure and remained asymptomatic at six months, with post-procedural imaging showing complete resolution of the nidus [4]. This case underscores the diagnostic challenge posed by osteoid osteomas in unusual locations and highlights the clinical value of advanced imaging modalities and image-guided interventions, such as RFA, as preferred minimally invasive treatments [11,22].

Conclusion:-

Osteoid osteoma, though benign, can cause significant morbidity due to persistent and often debilitating pain, especially when located in anatomically challenging regions, such as the lesser trochanter [2,6]. Timely, high-resolution imaging techniques, like CT, play a pivotal role in accurate diagnosis, particularly when conventional radiographs and MRI findings are inconclusive [12]. Radiofrequency ablation has emerged as a safe, effective, and minimally invasive therapeutic modality for treating osteoid osteomas [4,11]. In this case, CT-guided RFA provided excellent clinical outcomes, including rapid pain relief, no procedural complications, and sustained symptom resolution at follow-up [4,15]. The precise targeting of the nidus under imaging guidance ensures thorough ablation while preserving surrounding healthy tissues [11]. This case reinforces the clinical utility of RFA as a first-line intervention for osteoid osteomas located in deep skeletal sites. It highlights the advantages of this technique in terms of safety, efficacy, and patient recovery, supporting its continued use in contemporary orthopedic practice [11,15,19].

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