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CASE REPORT

A Rare Case of Ovarian Cancer with Heterotopic Myositis Ossificans in Abdominal Muscles

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ABSTRACT

Background: Heterotopic ossification (HO) describes the abnormal development of mature bone within soft tissues where bone does not typically exist that is at sites other than the skeleton system. It is a benign condition that, although rare, can develop in the abdominal wall following prior surgical intervention or trauma. Due to its infrequent occurrence and the limited number of documented cases, its true incidence remains unclear.

Case Presentation: A 41 year old P2+1 (L2) was diagnosed with high grade serous ovarian cystadenocarcinoma stage III C after laparotomy with omentectomy and ovarian biopsy. She received four cycles of neoadjuvant chemotherapy after which she underwent interval debulking surgery. Intra-operatively, a hard calcified bony structure was identified and removed through the planes of lower end of right rectus abdominus and both pyramidalis muscles. This was reported as myositis ossificans on histopathology due to evidence of mature lamellated bony tissue.

Conclusion: Our case highlights an uncommon presentation but a clinically significant manifestation of abdominal surgery. Establishing the diagnosis of HMO is critical as unnecessary investigations or over-treatment may have considerable consequences for the patients.

KEYWORDS

Myositis ossificans, Ovarian carcinoma, Abdominal surgery, Rectus abdominus, Heterotopic ossification, Interval debulking surgery, Neoadjuvant chemotherapy

INTRODUCTION

Heterotopic ossification (HO), a rare occurrence, is the process by which fully developed bone tissue forms in areas outside the normal skeletal system, often within muscles or other soft tissues. This condition commonly arises after trauma, surgical procedures, or neurological injuries.[1] This benign condition most frequently affects large muscle groups in the extremities, such as the thighs or arms and is then known as heterotropic myositis ossificans (HMO).[2]

First described by Askanazy and Lubarsh in 1901,[3] heterotopic ossification (HO) remains a rare clinical entity, with most available data limited to isolated case reports. HO following abdominal surgery is particularly uncommon, and its true incidence is difficult to determine due to the scarcity of published literature. In 1983, Lemershev *et al.*[4] and Hansen *et al.*[5] were among the first to document cases involving heterotopic ossification within the intestinal mesentery.

The exact pathogenesis of this condition is still not fully understood, though it is believed that a combination of local tissue trauma and systemic physiological stress may trigger a pro-inflammatory environment that promotes the formation of ectopic bone in soft tissues.[6] Most patients remain asymptomatic but imaging plays a critical role in differentiating HO from infections, neoplastic conditions and retained surgical materials.[7,8] HO doesn't require treatment unless symptomatic and establishing the diagnosis is critical as unnecessary investigations or over-treatment may have considerable consequences for the patients.[8]

CASE REPORT

A forty one year old female, P2+1 (L2) with provisional diagnosis of ovarian carcinoma, underwent staging laparotomy with infracolic omentectomy and left ovarian tissue biopsy. Complete staging could not be done due to extensive intra-

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abdominal adhesions and un-resectable nature of the disease. Histopathology of omentum and ovarian biopsy showed metastatic serous ovarian cystadenocarcinoma with CK-7, WT-1 and PAX-8 positive and CA-125 was diffusely positive. Peritoneal biopsies were free from tumor invasion.

Patient then received four cycles of neoadjuvant chemotherapy and was panned for interval debulking surgery. On clinical examination, a hard structure of approximately 5 x 1 cm was felt along the infra-umbilical vertical incision line. CECT scan showed bulky bilateral ovaries and no evidence of any enhancing or metastatic lesion. Preoperative CA-125 was 59.3 U/mL. During surgery which a 5 x 1.2 x 1 cm hard calcified tissue was obtained through the planes of lower end of right rectus abdominus and both pyramidalis muscles as shown in Figure 1 and 2. Prior clinical or imaging findings were not suggestive of any such lesion.

Histopathology report showed bilateral residual high grade serous ovarian carcinoma with myositis ossificans in rectus abdominus. Sections from specimen labelled as calcified mass within rectus abdominus showed mature lamellated bone formation with firbofatty spaces as shown in Figure 3. There was no evdience of malignancy in this specimen thus ruling out metastatic deposit.

Postoperative course was uneventful and treatment completed with three cycles of adjuvant chemotherapy. Patient is doing well and is on regular surveillance since then.

Figure 2: Hard calcified tissue extracted from rectus abdominus muscle

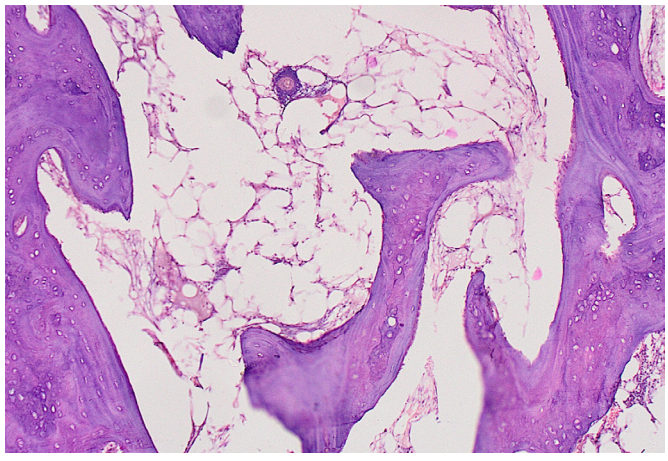

Figure 3: 10x, Hematoxylin and Eosin: section from calcified mass over rectus abdominis showing mature lamellated bone with fibrofatty spaces

DISCUSSION

Myositis ossificans (MO) is broadly categorized into four distinct clinical subtypes: (i) MO traumatica or circumscripta, (ii) MO associated with paraplegia, (iii) Non-traumatic or pseudomalignant MO, and (iv) MO progressiva (MOP), also referred to as fibrodysplasia ossificans progressiva (FOP).[8] MO traumatica is characterized by a benign, non-neoplastic proliferation of osteogenic and chondrogenic elements within skeletal muscle subjected to prior trauma. The paraplegia-associated subtype arises in the context of neurological injury, particularly lesions of the brain or spinal cord, although reports in the literature remain scarce. Non-traumatic MO, in contrast, develops without antecedent trauma and is frequently misdiagnosed as a malignant neoplasm due to its atypical presentation; it is the least frequently reported subtype in published case series. The progressive form, MOP/FOP, represents a rare hereditary disorder with autosomal dominant transmission, resulting from mutations in the ACVR1 gene. Clinically, this entity is distinguished by congenital digital malformations and the relentless development of heterotopic ossification within skeletal musculature.[8]

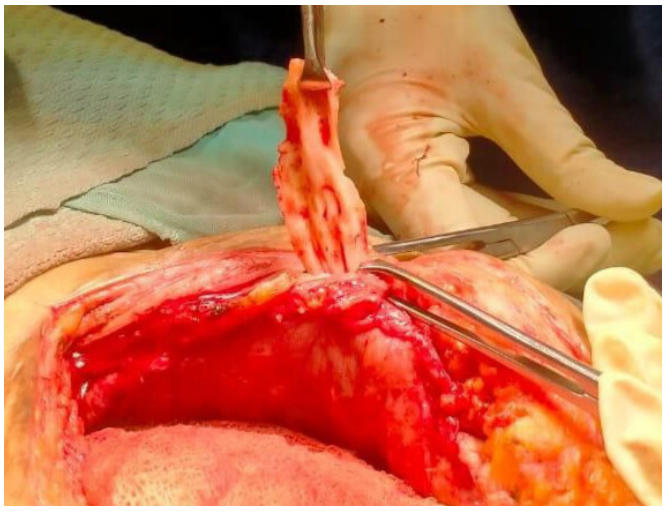

Figure 1: Bony mass being extracted from rectus abdominus muscle

The exact incidence of HO following laparotomies is not known due to scarcity of published case reports. It is widely recognized in orthopedic research, with occurrence rates reported between 30 and 60% after total hip arthroplasty. In contrast, myositis ossificans traumatica involving the abdominal region has typically been viewed as an uncommon outcome. However, it appears more frequently among patients who undergo damage control laparotomy. Kim *et al.*[9] observed that 25% of patients who underwent open abdominal surgery showed evidence of heterotopic ossification (HO) on postoperative CT imaging. Similarly, Wang *et al.*[10] reported a higher prevalence, with 53% of individuals developing HO after damage control laparotomy. MO was detected in our

case after a primary surgery for ovarian carcinoma which is a rare occurrence and a similar case has not been found in our review of literature.

Determining the precise timeline for HO onset remains challenging, though it generally emerges within a few months post-surgery, most often within the first year. In our case, ectopic bone formation was evident within four months of the operative procedure though not suspected clinically or radio logically. Rather there was a clinical doubt of metastasis or fibrosis in the abdominal wall before the debulking surgery. MO may mimic malignant tumors, including osteosarcoma or soft tissue sarcoma, making accurate diagnosis essential. A good imaging plays a critical role in differentiating HO from infections, neoplastic conditions and retained surgical materials.[8]

Despite various theories proposed, the exact pathogenesis of HO remains uncertain.[11] Two predominant mechanisms are frequently cited: one suggests intraoperative seeding of periosteal fragments from the xiphoid process or symphysis pubis into the incision site, while the other implicates the differentiation of mesenchymal stem cells into osteoblasts in response to localized tissue trauma.[12] Although the biological pathways are not fully understood, it is widely accepted that both local injury and systemic inflammatory responses contribute to creating a microenvironment favorable to ectopic bone development.[6]

In terms of size variability, Kim *et al.*[9] reported considerable differences in HO dimensions, and Wang *et al.*[10] found that 42% of their patient cohort developed lesions measuring more than 10 cm in length and 1 cm in thickness. Our case featured a 5 x 1.2 x 1 cm hard calcified mass. While many patients, similar to ours remain asymptomatic, larger ossifications can result in clinical issues such as localized pain, abdominal wall rigidity, and discomfort.[7]

Radiologic assessment often reveals characteristic features of HO. It may be discovered incidentally on plain radiographs, where a lateral view can show a linear, bone-like density within the abdominal wall. CT imaging frequently identifies mature peripheral calcification with a central radiolucent core. Nuclear imaging techniques, including three-phase bone scans and SPECT, can provide additional information on maturation.[13] In our case prior imaging with CECT was not suggestive of any such lesion and thus making it an incidental finding.

To confirm the diagnosis and exclude malignancy, fine-needle aspiration (FNA) followed by cytological analysis, ideally performed by an experienced cytopathologist, can provide reliable preoperative insight. Pathologists should be aware on this reactive process to prevent misdiagnosis of these lesions as sarcomatous. Histologically, MO evolves through distinct stages, and its appearance changes accordingly over time. A defining histological feature MO is its zonal maturation pattern. This pattern involves well-formed lamellar bone at the periphery and a central region consisting of fibroblastic or spindle-shaped cells without cytological atypia, a key feature that distinguishes MO from malignancies. In the early or active phase, the lesion primarily contains proliferating fibroblasts and myofibroblasts in the core. As it progresses to the intermediate or subacute phase, osteoid material and active osteoblasts begin to appear, surrounded by a rim of developing lamellar bone. In the mature or chronic phase, the lesion becomes predominantly composed of mature lamellar bone, consistent with what was observed in our case.[8]

Most HO cases do not require treatment unless they become symptomatic. When intervention is necessary, surgical excision followed by primary closure is the standard approach.[10,14] Preventive measures play an important role in the overall management of heterotopic ossification, aiming to reduce the risk of its development. Orthopedic literature has shown that short-term use of NSAIDs can significantly lower the risk of HO formation. However, in critically ill trauma patients, the potential side effects of NSAIDs such as bleeding and renal impairment must be carefully considered.[15]

The prognosis for HO is generally favorable, as the condition is benign with no reported risk of malignancy. Conservative management is usually preferred to minimize the risk of recurrence due to surgical trauma.[11] Nevertheless, cases presenting with complications like bowel obstruction may necessitate operative removal of the ectopic bone. In our patient it was detected as an incidental finding intra-operatively and hence resected. She is currently on adjuvant chemotherapy and no shows signs of re-occurrence of myositis ossificans.

CONCLUSION

This case of Heterotropic Myositis Ossificans (HMO) is noteworthy due to the size of the ossification, its anatomical position in the rectus abdominus and pyramidalis muscles and its presentation in a post-operative patient of ovarian carcinoma.

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