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Case Series of Common Omental and Mesenteric Pathologies

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Abstract
Radiological imaging plays a crucial role in the diagnosis and management of a wide range of abdominal pathologies, including those affecting the omentum and mesentery. The omentum and mesentery are important structures in the abdominal cavity, serving a variety of functions, such as providing support to the gastrointestinal tract and facilitating the flow of lymph and blood vessels. Pathologies affecting these structures can result in a wide range of clinical presentations, from mild discomfort to life-threatening complications. Omentum and mesentery are involved in various benign and malignant pathologies like omental infarction, omental torsion, encapsulated fat necrosis, fat saponification due to trauma or pancreatitis, mesenteric panniculitis, epiploicappendagitis, omental nodules and caking in infective and malignant conditions like tuberculosis, peritoneal carcinomatosis and metastasis [1]. Sometimes, there exists a diagnostic dilemma between the benign condition like focal encapsulated fat necrosis and malignant condition like liposarcoma, localized peritoneal carcinomatosis. Radiological imaging techniques, such as computed tomography (CT) and magnetic resonance imaging (MRI), are invaluable tools for the diagnosis of omental and mesenteric pathologies. In this context, radiologists play a vital role in the accurate interpretation of imaging studies, enabling timely and appropriate management of these complex and often challenging conditions.

Keywords: omentum; Mesentery; omental infarction, omental torsion; epiploicappendagitis; omental nodules; omental caking; mesenteric panniculitis; encapsulated fat necrosis

Introduction: Background

Peritoneum is the largest serous membrane of the human body, formed by parietal peritoneum that lines the abdominal cavity and visceral peritoneum, that envelopes abdominal viscera [2]. Peritoneal reflections like omentum, mesentery and intraabdominal ligaments interconnect the viscera with in the abdominal cavity. Omentum is a predominantly fat-containing sheet containing nerves, blood vessels, lymph channels, connective tissue and fat, present between stomach and other organs. There is greater and lesser omentum. Greater omentum aka epiploon is formed by double layer of peritoneum (4 layers in total) that hangs down from greater curvature of stomach and 1st part of duodenum for a variable length and folds back to finally insert on the anterosuperior surface of transverse colon [3]. Similarly lesser omentum extends from the lesser curvature of stomach to the ligamentum venosum in the liver. Mesentery is a double layered peritoneal tissue that connects small bowel, portions of the colon to the posterior abdominal wall. It contains adipose tissue, superior and inferior vessels and branches, lymphatics [4]. Small bowel mesentery, transverse and sigmoid mesocolon correspond to the name of the organ it connects to the posterior abdominal wall. Peritoneal reflection pathologies are mostly overlooked as they are missed during the 1st line of investigation, ultrasound and have gained interest due to the increased role of computed tomography in the diagnostic imaging.

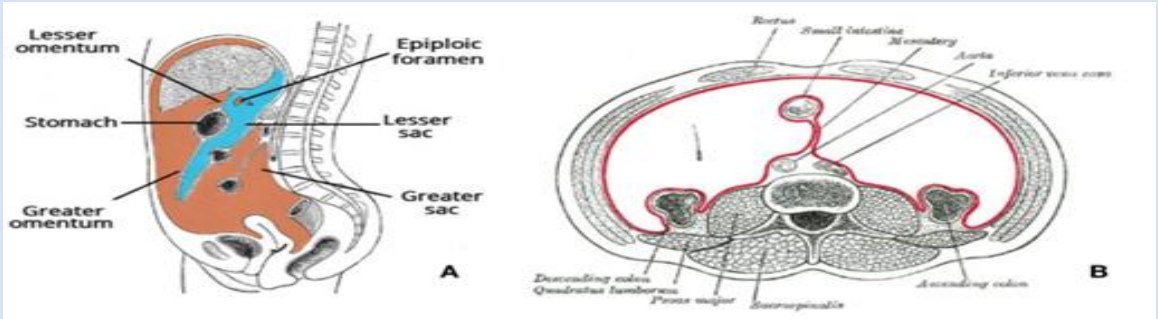

Figure 1A: Schematic diagram showing greater and lesser omentum in sagittal section. **Figure 1B:** Schematic diagram showing mesentery in axial section [5].

In this article we describe the imaging findings of different omental and mesenteric pathologies we came across at our institute.

Omental Infarction

Omental infarction with or without torsion is a well-recognised cause of acute abdominal pain which is rarely diagnosed on ultrasound. It is commonly seen in the right lower abdomen, adjacent to the caecum, inferior to the liver due to higher mobiliting and greater length on the right side. Omental infarction is triangular in shape and results due to the kink in the venous channel or by omental torsion itself [6]. The cause of primary omental infarction is usually idiopathic and secondary omental infarction is seen post-surgery, trauma or inflammation. Patient presents with abdominal pain which is not associated with gastrointestinal symptoms or fever [7]. Sudden abdominal pain in runners, marathoners and healthy individuals should raise the suspicion of omental infarction due to low omental blood flow. It is usually self-limiting and treated with analgesics conservatively. Auto amputation can occur during resolution due to fibrosis and retraction. Complications like abscess formation necessitate surgical intervention. USG may not be very helpful in diagnosing omental infarction. If seen it is visualized as the focal area of hyperechogenecity in the omentum/ heterogeneous soft tissue density mass. CT scan is the imaging modality of choice for omental infarction, which is seen as the focal area of fat stranding with peripheral hyperechoic halo.

Figure 2: (A and B) - Omental infarction with fat necrosis in a 15-year-old patient with left sided abdominal pain. CT contrast axial section (Fig2A) and CT contrast coronal section (Fig2B) show focal area of fat stranding anterior descending colon just beneath the anterior abdominal wall represented by straight and curved arrows.

Omental Torsion

Omental torsion is one of the rare causes of acute abdominal pain. Twisting of the omentum along the long axis, compromising the vascular supply, results in omental torsion [8]. Primary omental torsion is seen in the absence of any intra-abdominal pathology and the thickened segment of omentum rotates around the proximal fixed point. Etiology of primary omental torsion is not well known and is assumed to be due to omental anomalies like bifid omentum, accessory omentum, anomalous vascular supply and kinking [9]. Secondary omental torsion is seen in patients with pre-existing intra-abdominal pathologies like inguinal hernia, abdominal wall hernias, tumors or cysts, post-surgical wound. Factors increasing the intra-abdominal pressure like coughing, labour, lifting heavy weights, heavy meals, forceful vomiting displace the omentum and predispose to omental torsion [10]. Acute appendicitis is the major clinical differential diagnosis of omental torsion.

If visualized on ultrasound, omental torsion is seen as a complex mass with solid and hypoechoic areas and intraperitoneal free fluid. CT abdomen has high sensitivity for omental torsion and seen as omental haziness with whirling of omentum in concentric pattern around central blood vessel (whirl sign). Recurrent episodes of incomplete omental torsion result in omental ball formation, thickened fibrosedomentum. In most cases, it is self-limiting. Sometimes, it necessitates treating the cause of secondary omental torsion.

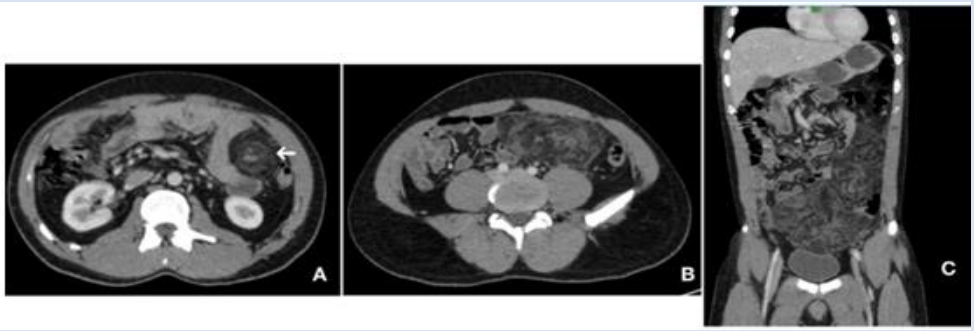

Figure 3: A, B, C–Omental torsion with infarction in a 36-year-old male patient who came with acute abdominal pain. Figure 3A and 3B axial CT contrast images and Figure 3C coronal CT contrast images show swirling of vessels in an area of fat stranding in the left side of abdomen and in the pelvis representing omental torsion.

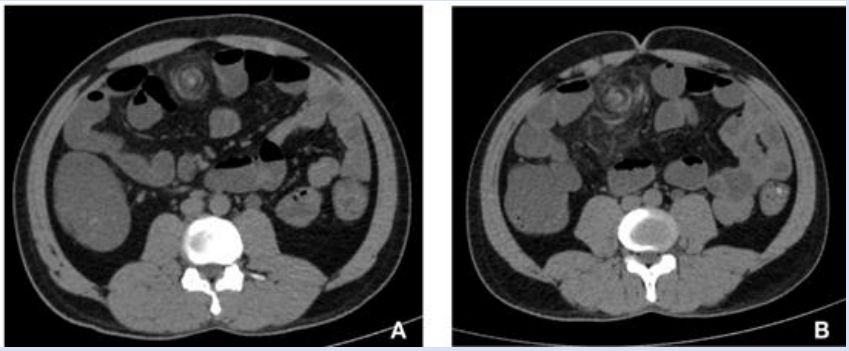

Figure 4: (A and B) – omental torsion in a 30-year-old female patient. CT abdomen plain axial images show swirling of vessels in right paramedian location, beneath the rectus abdominis muscle.

Epiploic Appendagitis

Epiploic appendages are benign peritoneal outpouches that arise from the serosal surface of the colon which contain adipose tissue and vessels. They are more commonly seen in the left colon and cecum and can measure upto 5 centimeters in length. The rectum does not contain any epiploic appendages. Inflammation of epiploic appendages is a resultant of torsion of epiploic appendages with vascular occlusion Patients usually present with acute left sided abdominal pain. On ultrasound it is visualized as around,noncompressible hyperechoic mass without internal vascularity, surrounded by a subtle hypoechoic line .On Computed tomography it is visualized as a fatty central core abutting the colon wall with surrounding inflammatory changes and a thin hyperdense rim-Hyperattenuating rim sign[11]. Presence or absence of central dot of high attenuation representing thrombosed vessels [12].

Figure 5: Ultrasound abdomen in a 33-year-old female with complaints of left iliac fossa pain for 4 days, showing ill-defined focal oval shaped area of increased echogenicity anterior to the sigmoid colon in left iliac fossa. Patient was advised contrast CT Abdomen for further evaluation.

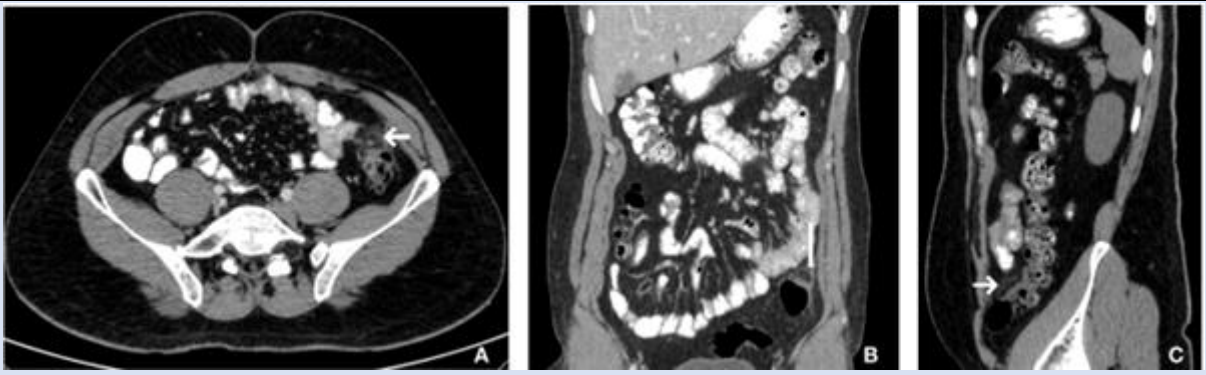

Figure 6: (A, B and C) – Axial (6A), Coronal (6B) and Sagittal (6C) sections of CT abdomen with contrast show small oval area inflammatory fat stranding surrounded by a soft tissue ring anterior to the sigmoid colon represented by arrows.

Omental Gist

Gastrointestinal stromal tumours are benign/ malignant mesenchymal tumours of Gastrointestinal tract, most commonly arising from stomach and small intestine [13]. Extra gastrointestinal stromal tumours can arise from mesentery, retroperitoneum, omentum, liver [14]. Omental GIST is not a common entity. They usually present with complaints of abdominal pain, distension, fatigue, making the early diagnosis difficult and are diagnosed at larger sizes. Majority of omental GIST arise from the greater omentum and large sized (usually >10 cm). Prognosis of extra gastrointestinal stromal tumors is worse compared to gastrointestinal stromal tumors. These are KIT + and KIT/PDGFRA mutation driven mesenchymal neoplasms [15]. On plain radiograph it can be seen as soft tissue density displacing the bowel loops in case of large tumors. On ultrasound It is seen as large tumor with heteroechogenecity and central necrosis but it is difficult to identify the organ of origin.Computed tomography is used for definite diagnosis, and visualized as soft tissue density mass with central areas of necrosis, seen as fluid fluid level. Calcifications are uncommon. Mostly shows peripheral enhancement. Treatment is usually by En clock resection and chemotherapy with Imatinib.

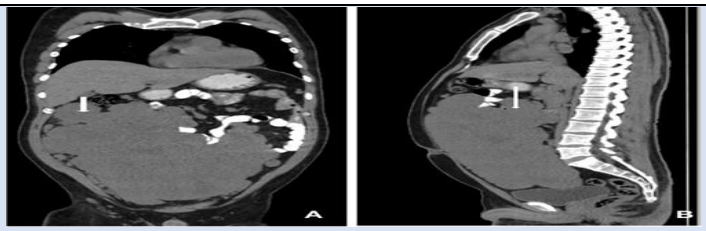

Figure 7: (A and B) omental GIST in a 42-year-old male patient who came with complaints of abdominal distension for 2 months. CT abdomen plain coronal (7A) and sagittal (7B) images show large well defined lobulated intraperitoneal soft tissue density mass along the anterior abdominal wall and mesentery extending from the epigastrium to the pelvis, abutting the hepatic flexure of colon proximal sigmoid colon with no obvious involvement. No evidence of bowel dilatation was noted.

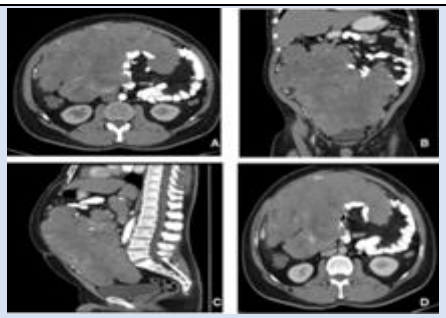

Figure 8: (A, B, C and D) – arterial phase axial (8A), coronal (8B), Sagittal (8C) and venous phase axial (8C) section images of CT Abdomen with contrast show mild heterogenous enhancement of the lesion with few non enhancing central necrotic areas. Possibility of omental, mesenteric GIST and desmoid tumor were given as diagnosis.

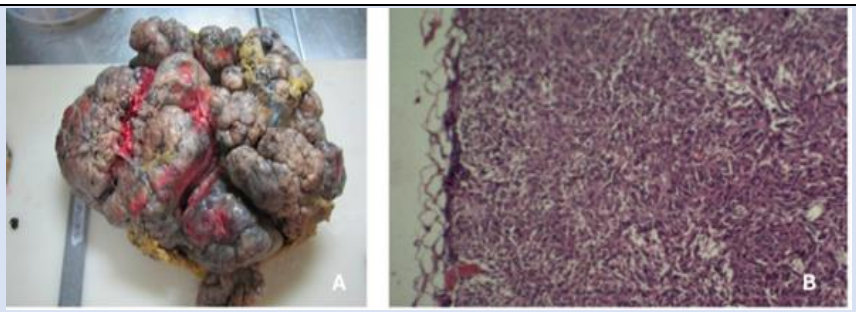

Figure 9: A Gross specimen of the tumor after explorative laparotomy and resection of tumor, Figure 9B: Histopathological image showing spindle shaped cells in fascicles with nuclear palisading – Mesenteric GIST with omental deposits.

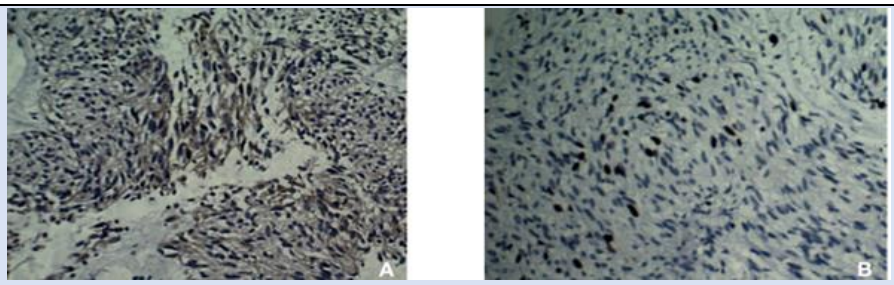

Figure 10: A and 10B showing positivity for CD117 and Ki67 respectively.

Omental Nodules and Caking

Normal omentum has attenuation similar to fat, therefore any disease process in the omentum makes it evident. When the omentum is affected by an inflammatory/ infectious/ neoplastic disease process, the initial response is by omental thickening, nodules which later progresses to form a mass which is referred to as omental cake [16]. It is commonly associated with ovarian malignancy, pseudomyxomaperitonei, stomach and bowel carcinomas [17].

Figure 11: Omental caking in a 55-year-old female patient with right ovarian malignancy. Ultrasound abdomen image showing thickened hypoechoic omentum in the umbilical region – Suggestive of metastasis.

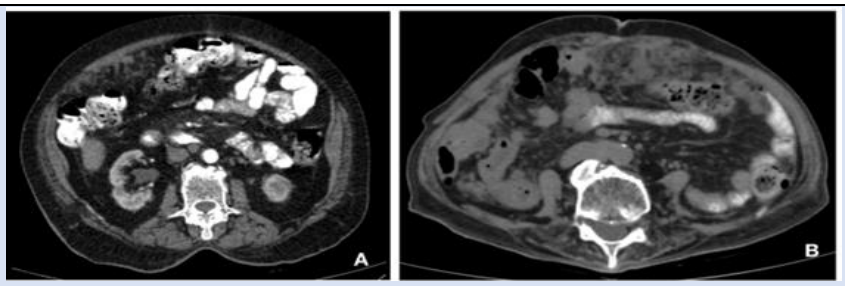

Figure 12: A – CT abdomen with contrast arterial phase axial section image showing omental nodules in right hypochondrium. B - CT abdomen plain axial section image showing omental caking in epigastric and umbilical region in a 55-year-old female patient with known history of right ovarian carcinoma

Mesenteric Panniculitis

Mesenteric panniculitis is benign and chronic inflammatory condition of unknown origin, involving the small intestine or colonic mesentry [18]. It can be classified according to three pathological changes (i)Chronic nonspecific inflammation, (ii) fat necrosis

and (iii) fibrosis. If inflammation and fat necrosis are predominant, the condition is known as mesentricpanniculitis. When fibrosis and retraction are predominant it is known as retractile mesenteritis [19]. On computed tomography the imaging features are high attenuating mesenteric fat, mass effect on neighboring bowel loops, presence of lymph nodes, hypoattenuating halo sign surrounding the vessels and lymph nodes, hyperattenuating pseudo capsule [20].

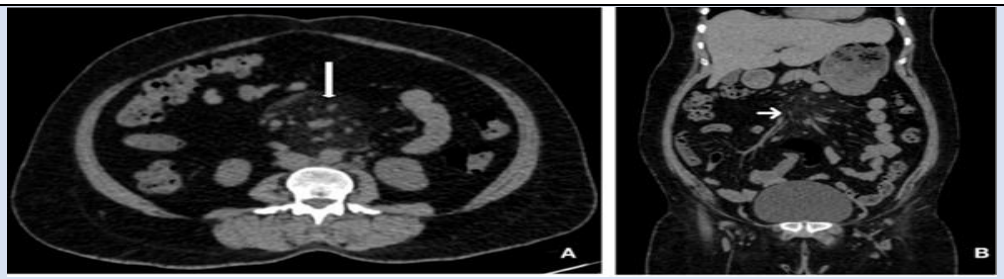

Figure 13: (A and B) Mesenteric panniculitis in a 42-year-old female patient. CT abdomen plain axial (13A) and coronal (13B) section images showing inflammatory fat stranding around the mesenteric vessels displacing the bowel loops but not displacing the mesenteric vessels.

Encapsulated Fat Necrosis

Intra-peritoneal encapsulated fat necrosis (IPEN) is a rare condition in which Post traumatic or ischaemic insult fat degeneration are encapsulated within a fibrous capsule in the peritoneal cavity.

On CT scans, IPEN typically appears as well-circumscribed, round or oval-shaped masses that are iso- or hypodense relative to adjacent fat tissue. These masses can be located anywhere within the peritoneal cavity, but are most commonly found in the omentum or mesentery. The fibrous capsule around the necrotic fat can appear as a thin or thick rim of soft tissue density. In some cases, calcifications may be present within the capsule. On ultrasound, IPEN can appear as a heterogeneous, hypoechoic mass with internal echogenic foci. The fibrous capsule may appear as a hyperechoic rim surrounding the mass. The presence of acoustic shadowing can also be seen in some cases. Mild mass effect on the adjacent organs and enhancement of the fibrous capsule in encapsulated fat necrosis mimics liposarcoma or peritoneal carcinomatosis [21]. Clinical history of the patient is critical in differentiating it from liposarcoma, as patient's encapsulated fat necrosis have a history of surgery/ trauma. Temporal evolution also helps in differentiating the two entities, as encapsulated fat necrosis decreases in size over time. IPEN is typically a benign condition that does not require treatment unless it is causing symptoms or complications such as bowel obstruction.

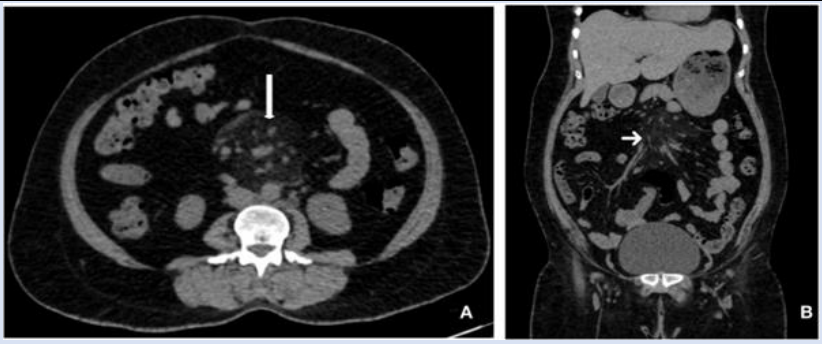

Figure 14: (A and B) Encapsulated fat necrosis in a 45-year-old female patient who underwent hysterectomy for fibroid uterus 15 days back. CT abdomen plain axial (14A) and Sagittal (14B) images show well defined encapsulated area of fat necrosis in the right Para median location in the infraumbilical region.

Conclusion

A number of mechanical, inflammatory, infective and neoplastic pathologies effect of the omentum and mesentery. A thorough understanding of radiological appearance of these conditions is crucial for accurate diagnosis and effective treatment of various abdominal conditions. In case of fat necrosis mimicking liposarcoma and peritoneal carcinomatosis, prior imaging and clinical history helps in the diagnosis of fat necrosis

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