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Case Report of a Superior Mesenteric Artery Syndrome, Diagnosis Based On Computerized Axial Tomographic Scan Image Features and Review of Literature

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ABSTRACT:

BACKGROUND: *Recurrent upper abdominal or epigastric pain is a clinical diagnosis often associated with gastritis, peptic ulcer disease and cholecystitis. Most times, a high index of suspicion is required to consider superior mesenteric artery (SMA) syndrome, even during Computerized axial Tomography (CT) scan evaluation, which is a rare occurrence in our resource deprived environment. The importance of definitive diagnosis in medical and surgical management cannot be overemphasized.*

OBJECTIVE: *To report a rare case of CT scan diagnosis of SMA syndrome in our environment*

METHOD: *A 53 years old female who recently lost weight presented with upper abdominal pain which is recurrent, colicky and is relieved by analgesic for the past four months. Other than mentioned, there is minimal epigastric tenderness, and even though physical attributes were normal. She was investigated along the line of acute abdomen, with CT scan.*

RESULTS: *CT scan images features showed entrapment of the distal segment of the duodenal lumen between the superior mesenteric artery and the abdominal aorta with significant narrowing with evidence of moderate distension of the gastric lumen and the C loop of the duodenum proximal to the entrapment. In addition, there is evidence of post obstructive mild distension of the adjoining jejunum. Also noted in the CT scan images were right lower pole renal cyst and evidence of non-obstructive free intraluminal gall bladder calculi*

CONCLUSION: *CT scan has brought out this rare occurrence of SMA syndrome which is undoubtedly missed in preference to other common conditions like peptic ulcer disease, gastritis or cholecystitis.*

Key words: *superior mesenteric artery (SMA) syndrome, Computed Tomography (CT) scan, Upper abdomen, Epigastric, Pain, Duodenal obstruction, Abdominal aorta, Acute Abdomen.*

I. INTRODUCTION AND LITERATURE REVIEW

Superior mesenteric artery (SMA) syndrome also known as duodenal ileus or Wilkie syndrome which results when the third part of the duodenum is compressed between the superior mesenteric artery and abdominal aorta.[1] Approximately 400 cases have been reported since it was first described by Carl Von Rokitansky in 1842.[2] It is a rare condition that occurs more in females.[3,4]

SMA syndrome results from decrease in the angle between the superior mesenteric artery and abdominal aorta.[5] This may be caused majorly by weight loss resulting in loss of the mesenteric fat pad. Patients may present with anorexia, early satiety, vomiting, and persistent stomach pain.[6]

SMA originates from the anterior surface of abdominal aorta at the level of the Lumber one (L1) vertebrae and normally form an angle with adjacent abdominal aorta ranging between 38 degree to 56 degree with mid average of 45 degree. Normally the distal or third part of C loop of duodenum passes or courses in between it.[5] Hence any factor that causes sharp narrowing of aortomesenteric angle to 6-25 degree can cause entrapment or compression of the adjacent duodenal part leading to partial obstruction to the flow of ingested food material. In addition, if aortomesenteric distance is reduced to range of 2-8mm, and note that the normal distance range is 10-20mm. The other implicated causes of SMA syndrome are high insertion of the duodenum at the ligament of Treitz, a low origin of superior mesenteric artery and compression of duodenum due to peritoneal adhesion. Other etiological factors that may precipitate to narrowing of aortomesenteric distance and angle are as follows; thin body build, exaggerated lumber lordosis, visceroptosis and abdominal wall laxity, weight loss causing mesenteric fat depletion due to catabolic states such as cancer, surgery, burns, trauma, malnutrition, psychiatric problems, anorexia nervosa and malabsorption disease. Recent case report has associated chronic cannabis use and SMA syndrome particularly when the use is accompanied chronic nausea, recurrent episode of vomiting and significant weight loss.[7] The unusual causes of SMA syndrome found in literature include the following, traumatic aneurysm of the superior mesenteric artery after stab wound, Abdominal aortic aneurysms and mycotic aortic aneurysms, familial SMA syndrome, Recurrent SMA syndrome and Idiopathic neonatal SMA syndrome. The exact incidence of SMA syndrome is unknown, but review article approximates it to 0.013-0.78%, and two third of cases involved women with average age of 41 years, in addition one third men with average age of 38 years. SMA syndrome is also found in older children and adolescents and one report case suggested that 75% of cases occur in the aged range of 10-30 years. The treatment prognosis is excellent, if the entity is diagnosed early in life of the lesion. A delay in diagnosis may lead to several complications such as follows; malnutrition, dehydration, electrolyte abnormalities, gastric pneumatosis and portal venous gas, formation of an obstructing duodenal bezoar, hypovolemia secondary to massive gastrointestinal bleeding, aspiration pneumonia and even death secondary to gastric perforation.[8] The most frequent complication is gastrointestinal mucosal injury and the incident, has been reported to about 25-59% in patient with SMA syndrome.[4] The following are symptoms most patients present with; are nausea, vomiting, abdominal pain and especially after eating, bloating and a feeling of fullness, in addition weight loss. The investigation of choice is CTscan, but contrast upper gastrointestinal series may be valuable in confirming duodenal compression by SMA if there no symptom of vomiting. The treatment of the patients is grouped into two parts; Conservative management and Surgical intervention. Conservative management focus treatment on weight gain and restoring the fat pad between the arteries. This may involve the following; Nutritional support (high calorie meals or and use feeding tubes), small and frequent meals and medication to reduce nausea or acid production.

Surgical Intervention is considered if the conservative treatment fails. The aim is to bypass the compressed part of the intestine.

II. CASE PRESENTATION

This is a case of a 53-year-old female patient that presented with recurrent upper abdominal pain of six months duration. Pain was insidious in onset, located in the right hypochondrial and epigastric region, colicky in the right hypochondrial and burning in the epigastric region. The pain radiated to the back and was severe enough to disturb sleep. Pain was not relieved by the use of antacids however the pain was partially relieved when she took analgesics (codeine and cocodamol).

She has history of early satiety and recent history of weight loss. However, there is no history of vomiting

There is no history of chronic use of non-steroidal anti-inflammatory drugs (NSAIDs). She has medical history of diabetes for about 18 years and hypertension for 2 years, and has been managed accordingly with change in living style and diet.

At presentation. She was afebrile, not pale, anicteric, a-cyanosed, not dehydrated and had no pedal edema. She weighed 39.5kg, height was 1.64m and BMI was 14.69 (underweight)

The abdomen was full and moved with respiration. There was mild epigastric tenderness. Murphy's sign was negative. There was no organomegaly or ascites

Her pulse, blood pressure and respiratory rate were within normal limit.

Investigation results include:

FBC (full blood count) was as follows; WBC (white blood cell count) 5900/ml, HCT (Hematocrit percentage) 35.7%, platelet 358000/ml and all were normal. The other investigations such as follows HbsAg (hepatitis B surface antigen) and anti HCV (anti- hepatitis C virus) were negative. FBS (fasting blood sugar) was 288mg/dl which was high.

The patient was managed as a case of acute upper abdomen, and the procedures done include:

1. Abdominopelvic CT scan,
2. Abdominal ultrasonography

Abdominal ultrasound scan revealed non-obstructive gall bladder calculi, right lower pole renal cyst and moderate distension of stomach.

CT of the abdominopelvic region carefully using moderate negative oral contrast media (mannitol mixed with clean water) since there was no significant history of vomiting. Intravenous contrast CT angiography was also done during the procedure, with low osmolar contrast media.

The following imaging findings were detected.

1. Distended stomach with air-fluid level and significant distension of the C- loop of the duodenum with entrapment or partial obstruction of the distal duodenum between the superior mesenteric artery and the abdominal aorta, with significant narrowing effect. In addition, there was significant post-obstructive mild distension of the adjoining jejunum. (fig. 1, fig.2). At the point of partial obstructive effect, the aortomesenteric angle was 8.7º and the aortomesenteric distance was 7.19mm (fig.3, fig.4)
2. There is evidence of normal gall bladder luminal volume with free intraluminal calculi. The gallbladder walls are normal in caliber with thickness of less than 1.9 mm. There is no pericholecystic fluid or oedema. (fig.5)
3. There is right lower pole renal cyst measuring by volume 2,69 cm^3 (fig.6)
4. Apart from these, the other intra-abdominal structures are normal in caliber.

The patient is being followed up for optimal conservative management of the case

III. DISCUSSION

SMA syndrome is a rare cause of partial or complete small bowel obstruction due to compression of the third part of the duodenum between the abdominal aorta and superior mesenteric artery. It results from reduction of the aortomesenteric angle from the normal range(38 - 56º) to abnormal range of 6- 25º and aortomesenteric distance from normal range of (10-28 mm) to abnormal of (2-8 mm).[5,7] Our subject has aortomesenteric angle of 8.7 º and distance of 7.19mm, which has cause compression of adjacent third part of duodenum in keeping with features of SMA syndrome.

The prevalence of SMA syndrome is 0.013-0.78%. There is a female predominance, as in case of study, of which literature review showed ratio of about two third for female to one third for male.[3,4] Children and adolescents between 10 and 40 years are more commonly affected among their group.[8] It occurs more in people with slender build and a history of weight loss as shown in our case of study. It is associated with malignancy, eating disorders, malabsorptive states, acquired immunodeficiency syndrome (AIDS), trauma and burns because of catabolic nature of sudden mesenteric fat depletion.[9] The findings in our subject suggested eating disorder and Diabetes mellitus since her living style and nutritional habit changed after being diagnosed with Diabetes mellitus. Congenital causes include low insertion of the SMA or high insertion of the ligament of Treitz, displacing the duodenum superiorly and bring it closer to sharp bifurcating angle of SMA. Acquired causes also include corrective spinal surgery for scoliosis, spinal trauma, total proctocolectomy and ilial J-pouch anal anastomosis

due to associated significant weight loss.[8] Our subject has history of weight loss possibly resulting from change in living style and diet. She is being managed for diabetes and hypertension.

SMA syndrome is difficult to diagnose in our environment and other centers due to its vague clinical presentation and low index of suspicion. Most patients including our patient presented with recurrent upper abdominal pain and weight loss. This may result in delay in the diagnosis of the condition due to suspicion of more common pathology like peptic ulcer disease, gastritis and cholecystitis. Others may present with vomiting and electrolyte imbalance, of which our patient did not present with. This condition reduces the quality of life of these patients. Hence, early diagnosis is crucial when there is a high index of suspicion to prevent the aforementioned outcome. This may be complicated more due to low available distribution of CTscan imaging centers. Our subject has not presented with vomiting, but has history of early satiety. Our aim for this report is to raise awareness, in order to prevent further deterioration of the disease condition in another environment

The investigation of choice in emergency setting is Computerized axial tomography.[10] This may show the dilated first and second part of the duodenum. Contrast enhanced Computerized tomography scan enables visualization of the arterial compressed of the duodenum and the precise measurement of the aortomesenteric angle and distance.[8] Other imaging modalities that can be of use for exclusion of other pathologies include plain and contrast radiography, magnetic resonance imaging and ultrasonography. Upper gastrointestinal series and hypotonic duodenography may be done in more stable patients, however, they are not readily available for use in emergency settings.[10]

Conservative management includes gastric decompression and posturing maneuvers during meals. Parenteral nutrition or post-pyloric feeding may be necessary. Surgery may be considered if parenteral feeding fails. Duodenojejunostomy may be done to relieve the obstruction.

IV. CONCLUSION

SMA syndrome is an uncommon disease and this is the first reported case in our center. This disease may be underdiagnosed due to the non-specific nature of this disease. It should be considered in patients with upper abdominal pains who have a history of acute weight loss. This may aid early diagnosis and reduce the complications of this syndrome.

V. REFERENCES

1. Asbah M, Shrateh ON, Musleh A, Abbadi K, Nofal M, Tarifi S. Superior mesenteric artery syndrome in a 30-year old male patient: A case report and literature review. International journal of surgery cases. 2023; 106: 108267.
2. Mandarry MT, Zhao L, Zhang C, Wei ZQ. A comprehensive review of superior mesenteric artery syndrome. European Surgery 2010;42:229-236.
3. Hakimi Z, Khil MO, Shirpoor AS, Rahmani FR, Amarkhil OO, Hakimi T. Superior mesenteric artery syndrome- case report and literature review. International journal of surgery cases. 2025: 127: 110864.
4. Oka A, Awoniyi M, Hasegawa N, Yoshida Y, Tobita H, Ishimura N, et al. Superior mesenteric artery syndrome: Diagnosis and management. 2023;11(15):3369-3684.
5. Navandhar PS, Shinde RK, Gharde P, Nagtode T, Badwaik N. Understanding Superior Mesenteric Artery Syndrome: Etiology, Symptoms, Diagnosis, and Management. Cureus. 2024 Jun 2;16(6):e61532.
6. Biank V, Werlin S. Superior mesenteric artery syndrome in children: a 20-year experience. Journal of pediatric gastroenterology and nutrition. 2006; 42: 522-525.
7. Shanker AI, Li BUK, Kramer RE. Cannabinod hyperemesis syndrome co-occurring with superior mesenteric artery syndrome in adolescents. J Pediatric Gastroenterol Nutr. 2024 Sep. 79(3):495-500.
8. Van Horne N, Jackson JP. Superior mesenteric Artery syndrome. StatPearls [Internet] 2023 Jan.
9. Cantella R, Evola G, Fidio CD, Iudica M, Patane M, Piazza L. An unusual cause of abdominal pain: Case report of a superior mesenteric artery syndrome. International journal of surgery case reports. 2022; 94: 107034.

10. Zaraket V, Deeb L. Wilkie syndrome or syperior mesenteric artery syndrome: fact or fantasy? Case report. Gastroenterology. 2015;9(2): 194-199.
11. Kaur A, Pawar NC, Singla S, Mohi JK, Sharma S. Superior mesenteric artery syndrome in a patient with subacute intestinal obstruction: a case report. Journal of clinical and diagnostic research. 2016;10(6):TD03-TD05.
12. Teramoto T, Sasaki J, Ishibashi S, Birou S, Daida H, Dohi S, et al. Diagnosis of atherosclerosis: Executive summary of the Japan Atherosclerosis Society (JAS) guidelines for the diagnosis and prevention of atherosclerotic cardiovascular diseases in Japan - 2012 version. Journal of atherosclerosis and thrombosis. 2014;21(4):296–298.

FIGURES AND LEGENDS

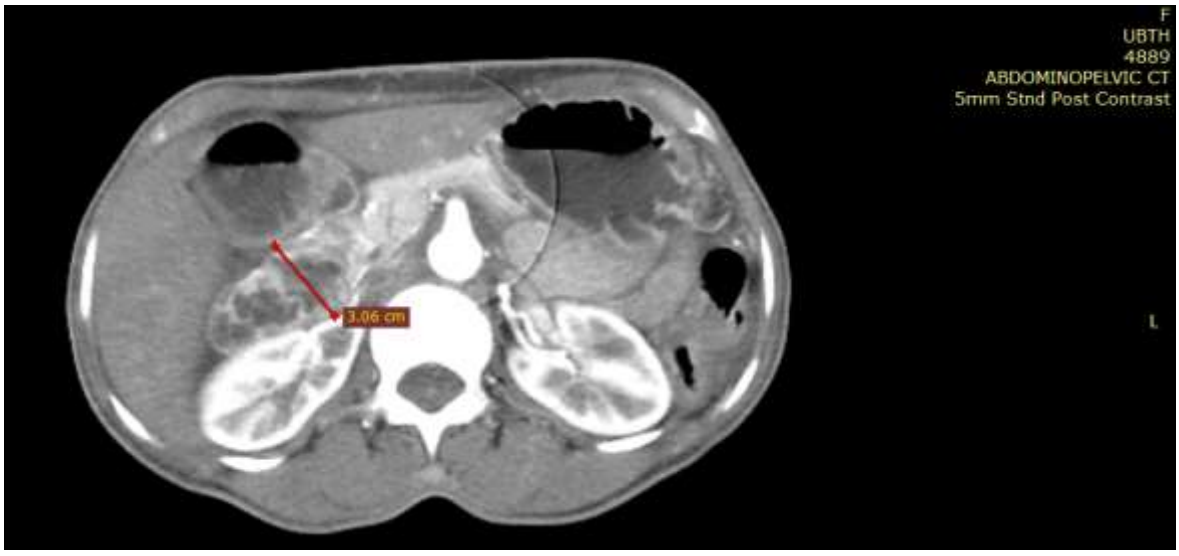

Fig 1: Contrast enhanced axial CT of the abdomen showing distension of the duodenum

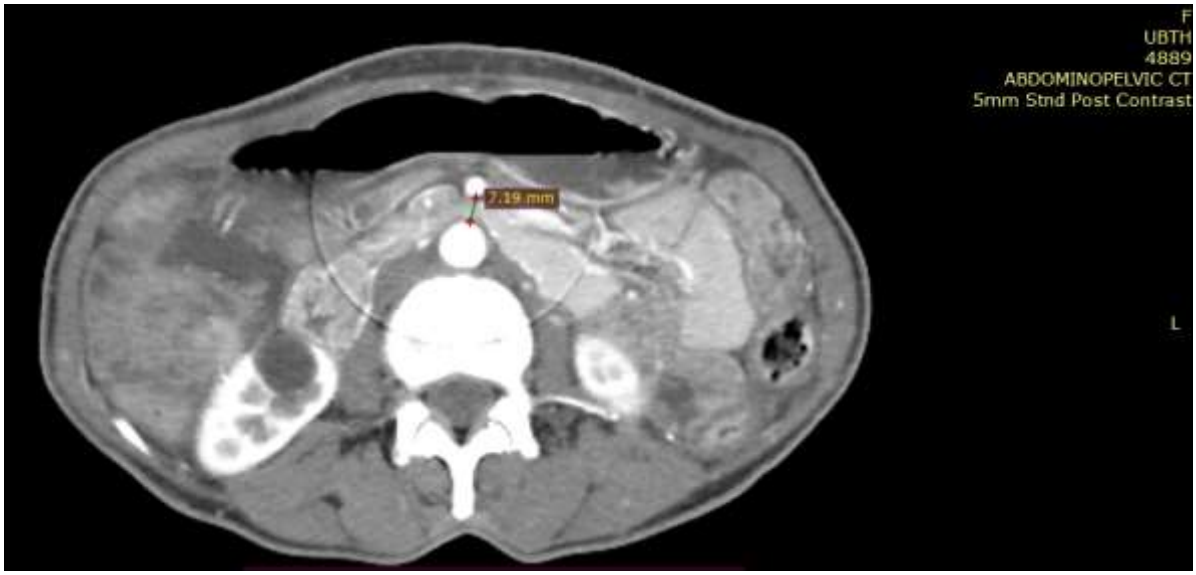

Fig 2: Contrast enhanced axial CT of the abdomen showing an aortomesenteric distance of 7.19 mm and distended stomach with air fluid level and distended second part of C loop duodenum, and mild post obstructive jejunal distension

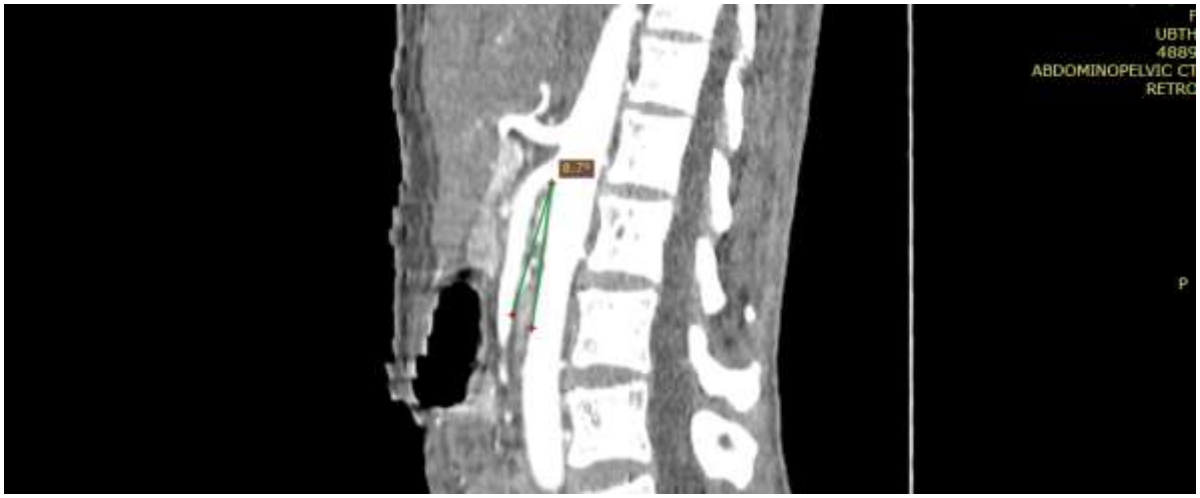

Fig 3: Contrast enhanced sagittal CT of the abdomen showing an aortomesenteric angle of 8.7°

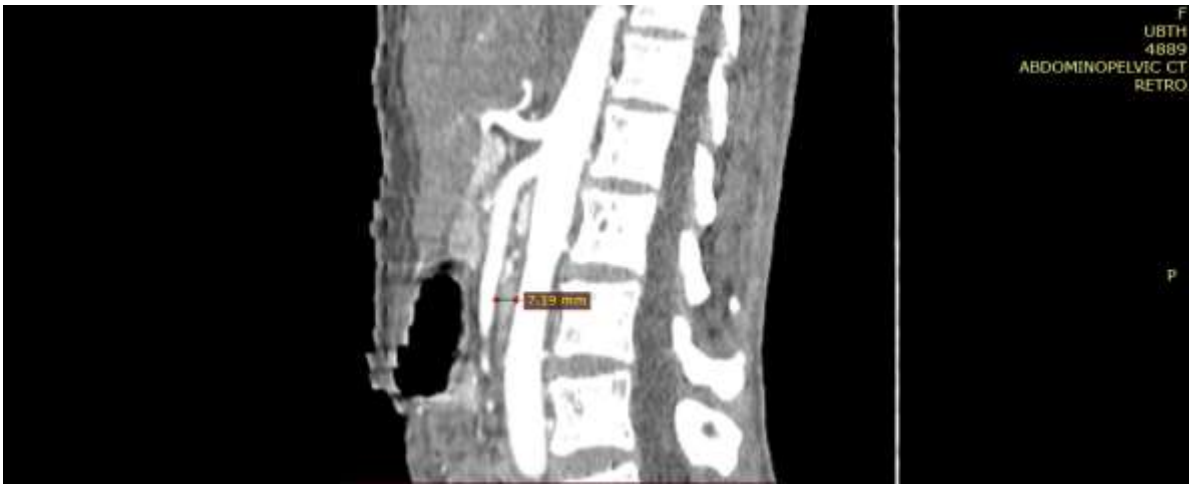

Fig 4: Contrast enhanced saggital CT of the abdomen showing an aortomesenteric distance of 7.19 mm

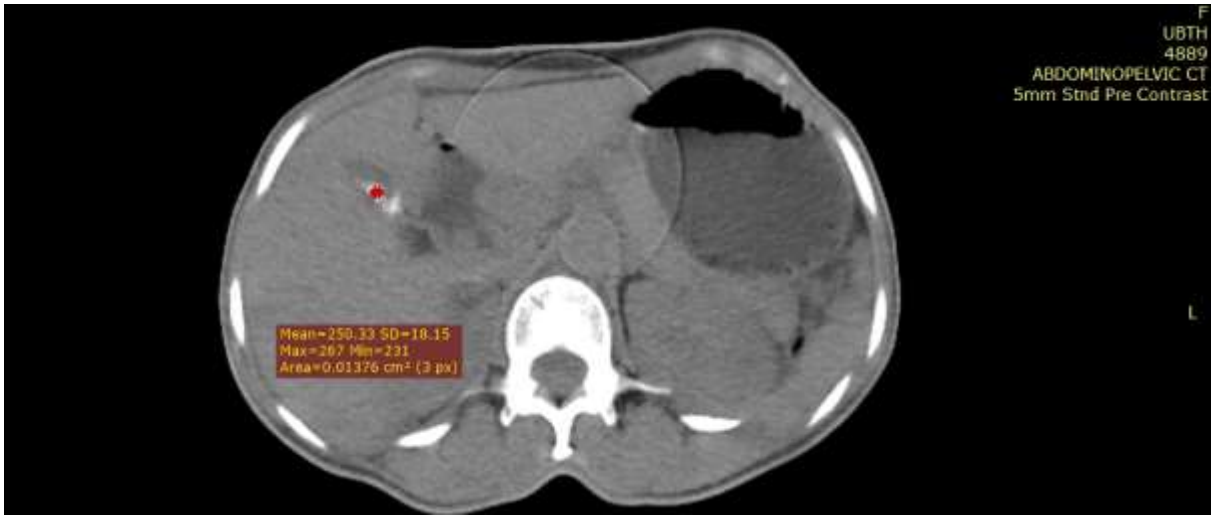

Fig 5: Unenhanced axial CT of the abdomen showing a gall stone with HU of 250 and distended stomach with air fluid level

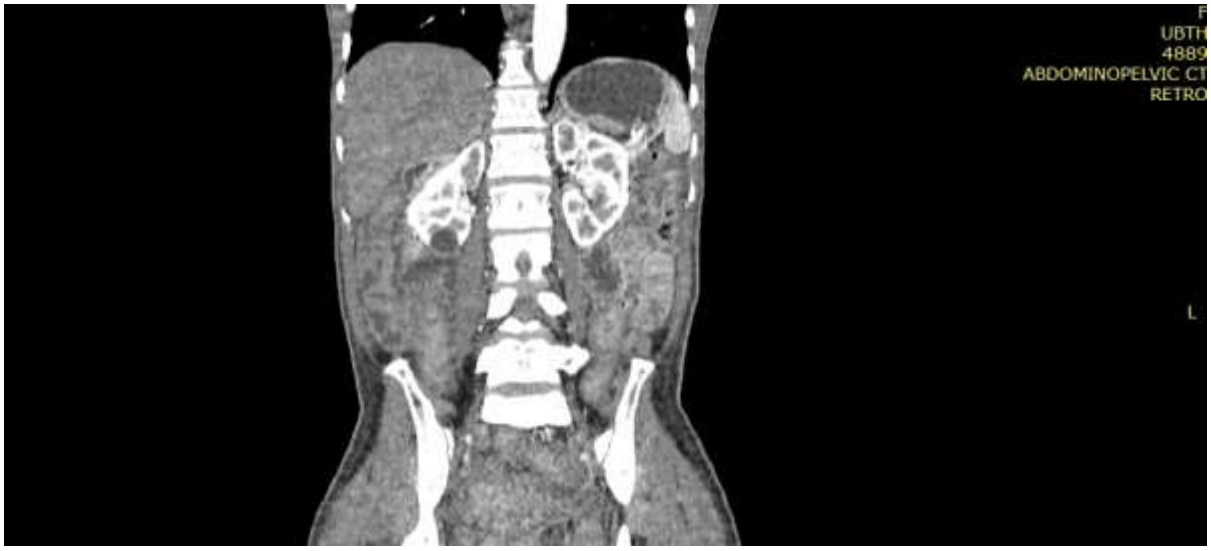

Fig 6: Contrast enhanced coronal CT of the abdomen showing a right lower pole renal cyst