Peer Reviewed **Article of Interest**

SIX CASES TO CONTRIBUTE TO CONTINUOUS PROFESSIONAL DEVELOPMENT LIFELONG LEARNING

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https://doi.org/10.54450/saradio.2023.61.2.803

Abstract

Six cases with different 'pathologies' are described. The CT images illustrate gastric varices, pericardial effusion, enlarged breasts, an object in the heart, an adrenal mass, and collapsed colon segments. An overview of each of the findings is provided.

Keywords. adenoma, atrial fibrillation, cirrhosis, diverticula, gastric varices, prostate cancer, tuberculosis

SIX CASES

Case 1

An enhanced CT study showing gastric varices in Figure 1a to d. Gastric varices may be described as dilated submucosal collateral veins.[1] They may be divided into those that occur in the cardiac region and those that occur in the fundal region.[2] In some cases they may be both cardiac and fundal in origin. The blood supply of cardiac varices is the left gastric vein of the cardiac branch; fundal varices are supplied by the short gastric vein (69%), left gastric vein (57%), and the posterior gastric vein (30%).[2] Bleeding from gastric varices occurs less frequently compared to bleeding from oesophageal varices. Gastric varices bleeding is however more severe because of their large size and the rapid blood flow of the varices. The incidence is about 16% in year one and rises to 44% by year five; mortality rate may reach up to 45%. The incidence of bleeding from oesophageal varices ranges from 16-75%. Oesophageal varices may develop in up to 70% of cases with cirrhosis and portal hypertension, whereas the incidence is lower for those with gastric varices. It is important to know the vascular anatomy to minimise complications during endoscopic ultrasound[3] and interventional radiology,[2,3] for example.

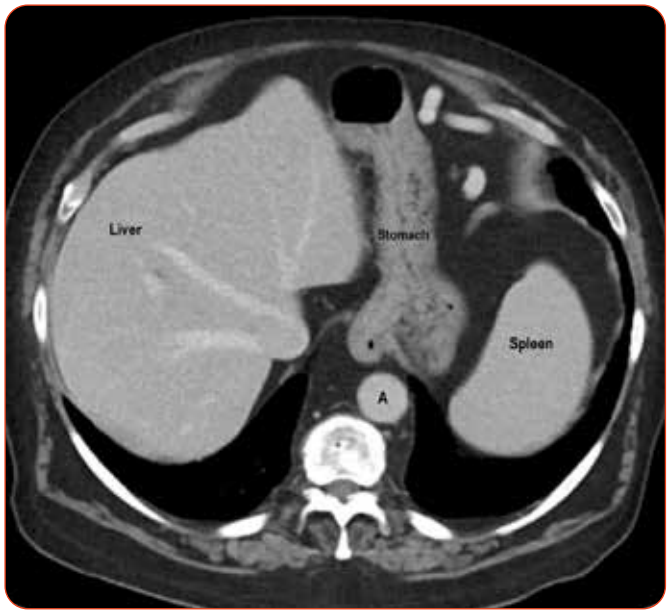

Fig 1a. Axial CT image showing liver, stomach, spleen and aorta (A).

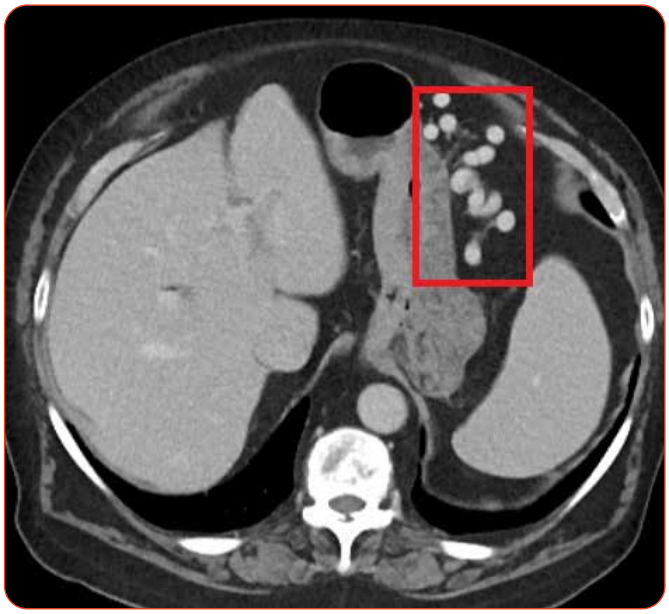

Fig 1b. Axial scan at a different level showing gastric varices (red rectangle).

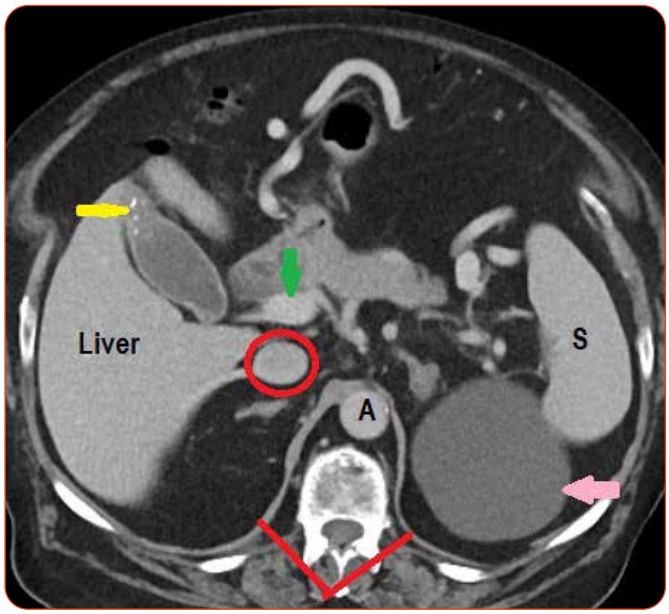

Fig 1c. This axial view shows the portal vein (green arrow). Red circle = IVC. Gallstones (yellow arrow). Spleen (S). Aorta (A). Crus of diaphragm (red lines). Cyst in left kidney (pink arrow).

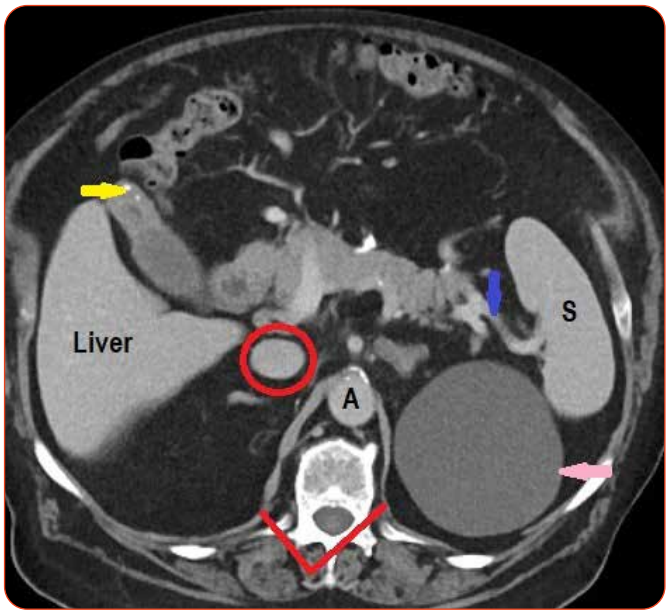

Fig 1d. The splenic artery (blue arrow) is visualised on this axial view as are the IVC (red circle), aorta with mild calcification (A), gallstones (yellow arrow), and crus of diaphragm (red lines).

Case 2

Figure 2a to d shows a pericardial effusion in four patients. The pericardium is a membrane that surrounds the heart. A pericardial effusion indicates the presence of excess fluid in the pericardial cavity.[4] When detected it is important to evaluate the size of effusion and check for a possible association with concomitant diseases.[5] The normal amount of fluid is usually <50mls. Excess of this amount indicates an effusion which may be small to large. If the latter this may cause cardiac tamponade (compression) of the heart.[4] The diagnosis may occasionally be made on plain-film X-ray or an electrocardiogram. Echo ultrasound, computed tomography and magnetic resonance imaging are the main diagnostic studies.

Any injury or inflammation to the pericardium may lead to an accumulation of fluid in the pericardial cavity. There are many known causes, but occasionally no cause may be found.[4-6] This is termed idiopathic pericardial effusion. The main causes as discussed in the literature[4-8] are presented below.

- Infection may be of bacterial origin (e.g., tuberculosis) or viral. In South Africa tuberculosis (TB) remains the most important cause; especially in patients who also suffer from HIV.[7,8] In the western world viral pericarditis from the coxsackievirus or cytomegalovirus is more common.
- Trauma, for example, an injury to the pericardium following a medical procedure or from a stab wound, may cause an effusion from blood leakage. If the latter is

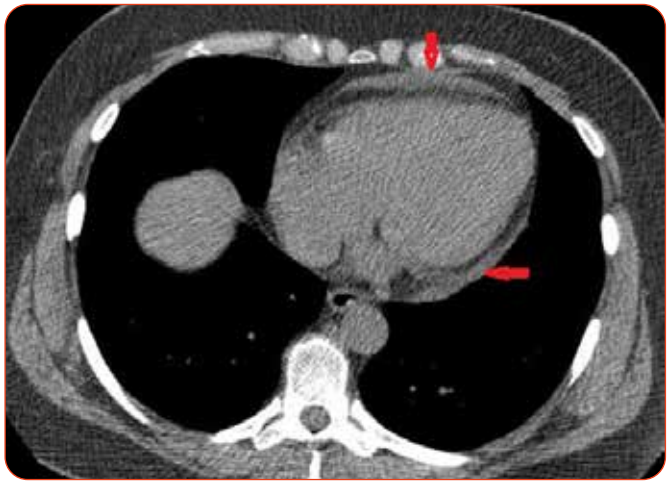

Fig 2a. Axial CT scan showing a small pericardial effusion (red arrows).

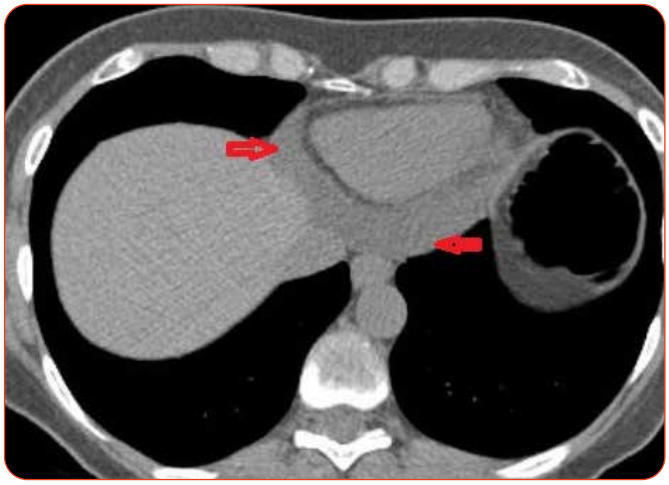

Fig 2b. Axial CT scan showing a large pericardial effusion (red arrows).

large enough it may ultimately lead to cardiac tamponade and sudden death.

- Aortic dissection
- Myocardial infection
  - » Following a heart attack as there may be necrosis of heart muscle leading to a massive leak from the damaged muscle. This may lead to early tamponade and death.[5]
  - » Post-cardiac surgery, especially to the coronary artery.
  - » Post myocardial infarction a collection of pericardial fluid may accumulate; this causes Dressler's syndrome.
- Cardiac inflammation leads to idiopathic pericarditis; the most common cause of pericardial effusion in the United States of America.
- Auto-immune disease (e.g., rheumatoid arthritis, lupus, Sjögren's syndrome, scleroderma).[5]
- Drug hypersensitivity (e.g. chemotherapy drugs such as doxorubicin and cyclophosphamide).
- Severe kidney failure
- Neoplastic causes: mainly from secondary cancers (e.g., breast and lung cancers) that have spread to the pericardium.
- Metabolic: hyperthyroidism
- Congestive heart failure (CCF)
- Nephrotic syndrome

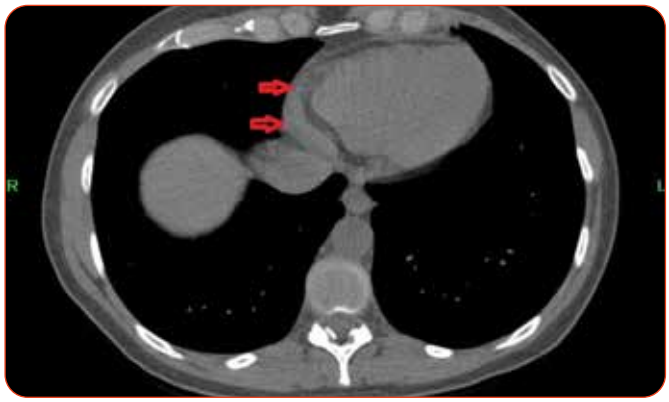

Fig 2c. Axial CT scan showing a small posterior pericardial effusion.

Fig 2d. Axial CT scan showing a pericardial effusion (red arrow).

Case 3

Figure 3 is of a male patient. As shown in Figure 3 there is bilateral enlarged breast tissue (gynaecomastia) in a male patient. It is a common benign disorder in males; it affects between 50 to 65% of boys and men worldwide.[9] During puberty there may be a drop in testosterone and a surge in oestrogen which cause the breasts to grow; in 90% of cases this resolves within 24 months.[10] Due to the production of less testosterone enlarged breasts are common in men over 50 years.[9] Renal disease, hyperthyroidism, and anabolic androgenic steroids, for example, may cause gynaecomastia.[10] It also occurs in males who have hormonal therapies for prostate cancer.[10-13] The patient in this case had been treated for prostate cancer. Patients with metastatic prostate cancer may be treated using androgen deprivation therapy or combined with radiation therapy for those with localised prostate cancer.[14] Literature reports that prophylactic radiation therapy plus daily tamoxfin can reduce the incidence of gynaecomastia and /or pain in prostate cancer patients.[14]

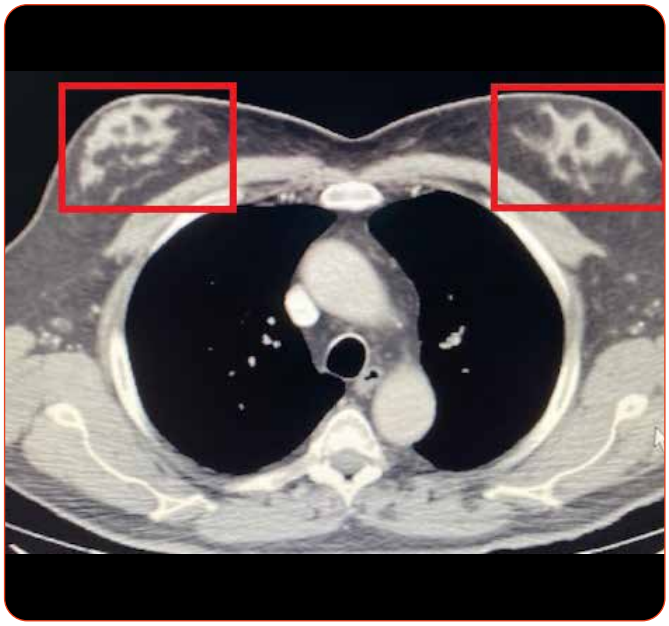

Fig 3. Axial CT scan showing enlarged breasts (red rectangles).

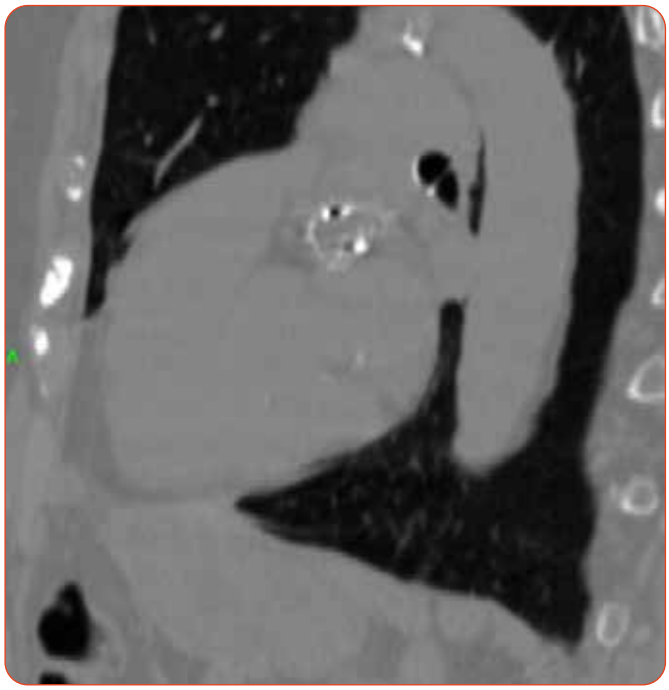

Fig 4a. Sagittal view showing an object in the heart.

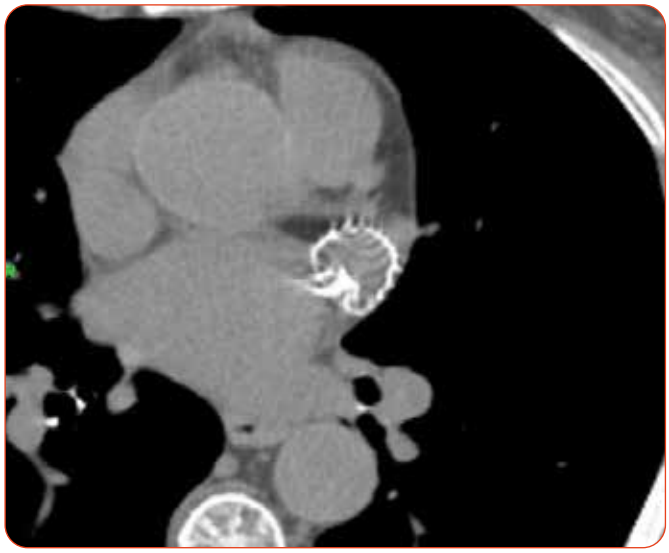

Fig 4b. Axial view showing an object in the heart.

Case 4

An object in the heart of a patient is shown in Figure 4a to c. What is this object and why was it inserted into the heart? The patient had a WATCHMAN procedure. The WATCHMAN™ is a small parachute-shaped device. Its function is to prevent blood clots from forming in the left atrial appendage.[15] It is only used in patients who suffer from atrial fibrillation (AF). A WATCHMAN device is inserted into the left atrial appendage.[16] This acts as an appendage closure device thereby preventing the development of blood clots, which may cause a stroke. The risk of stroke in patients with AF is five times higher than those who do not have AF. Patients that have this device no longer have to take anti-coagulation drugs[17] like Eliquis three months following the insertion of closure device.

The procedure is performed using fluoroscopy. Patients require general anaesthesia. A special catheter is inserted into the right femoral vein and then into the right atrium. The atrial septum between the right and left atria is then punctured and the left atrium is entered. The draining pulmonary veins into the left atrium are then ablated; the appendage closure device is then inserted into the left atrial appendage.[15] Complication risk is very small; usually about 1% mainly experience bleeding. Success rate of the procedure is approximately 95%.

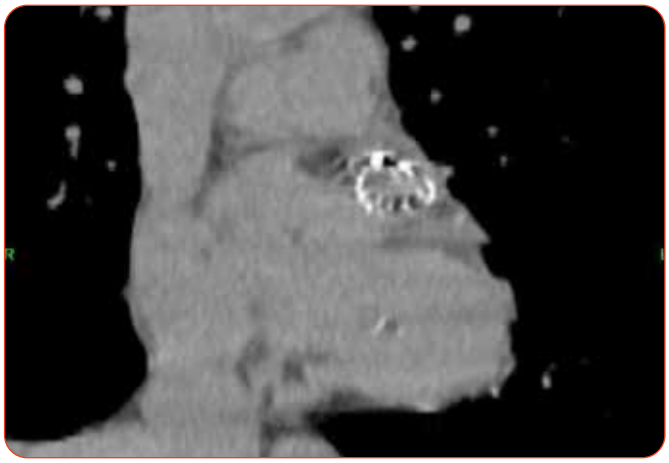

Fig 4c. Coronal view showing an object in the heart.

Case 5

Figure 5a to c is of an asymptomatic patient who presented for a screening CT colonography (CTC) study. The commonest adrenal pathology noted in clinical practice is a benign adrenal adenoma. It is usually visualised on an abdominal CT scan for an unrelated clinical reason.[18] It is also detected on abdominal MRI scans.[19] Positron emission tomography CT is highly sensitive and specific in terms of differentiating malignant versus benign adrenal disease.[20] An adrenal adenoma is usually a non-functioning lesion (non-hormone producing) and its unsuspected frequency is 0.14% for persons below the age of 29 years and 7% for those over 70 years.[21] Adrenal adenomas have a low density hence their HU value is usually <10. In this case the HU was 7. At this level the sensitivity is approximately 71% and it specificity range is 98%. Because of this iodine contrast injection is not necessary when the HU is 10 or less. If the HU is >10 then a washout CT procedure should be performed.[21] This procedure's protocol is a non-contrast study followed by a contrast enhanced scan, with a delay of 60 to 90 seconds, and then a 15 minute delayed scan. Non-hormone producing adenoma that are small in size do not require additional treatment; hormonal producing adenomas require manag-

ing the hormonal imbalance or surgery.[22] Other causes of an adrenal mass may be a malignancy or metastasis. Typically adrenal adenomas are round and small with a low density and smooth border; atypically haemorrhage, calcification, necrosis, reduced fat and a large size may occur.[19]

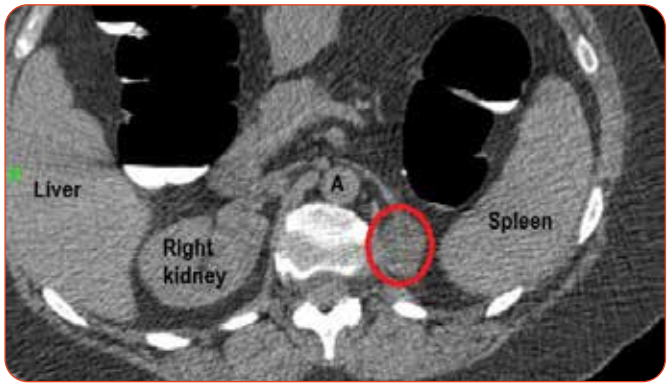

Fig 5a. Non-enhanced abdominal axial scan shows the right kidney and an absent left kidney. A small well defined nodule is seen on the left (red circle) with a HU of 7 indicating a benign adrenal adenoma. Aorta (A).

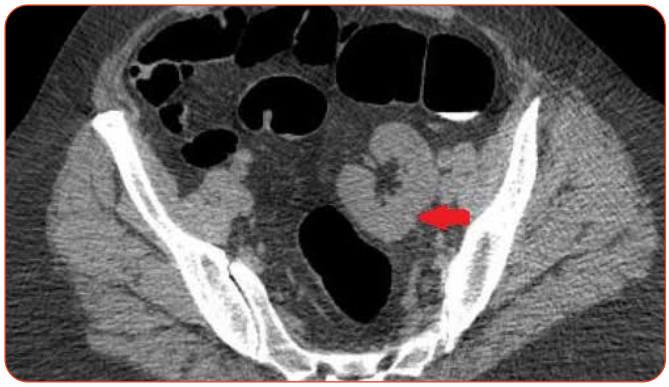

Fig 5b. Axial scan of the pelvic region shows a normal size left pelvic kidney (red arrow). The kidney failed to ascend to its normal position.

Fig 5c. Left sagittal view shows the pelvic kidney (red arrow), adrenal adenoma (yellow arrow), and spleen (green arrow).

Case 6

The images of a screening CTC patient are presented in Figure 6a to g to highlight the importance of supine and prone projections to visualise distended colon segments. A completed CTC study consists of views of the colon in supine and prone positions. A right lateral decubitus is also required if the bowel is not adequately distended or there are collapsed colon segments.[23] It is important to emphasise that should there be a collapsed segment on the supine projection then one must ensure that the segment if completely visualised on the prone view.

As shown in Figure 6a the supine colon-map shows a collapsed segment of the sigmoid colon. On the fly-through, as evident in Figure 6b, multiple diverticula are visualised. However, the prone view shows three polypoid lesions in Figure 6d that are in the exact segment that was not dis-

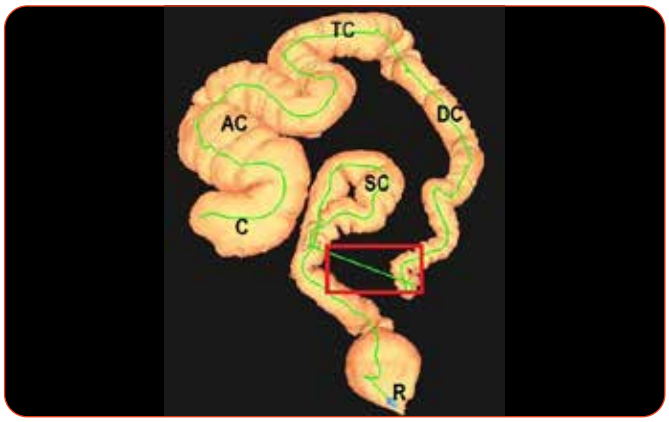

Fig 6a. Supine colon-map showing rectum (R), segment of sigmoid colon (SC), descending colon (DC), transverse colon (TC), ascending colon (AC), caecum (C) and incomplete filling of part of the sigmoid colon (red rectangle).

tended in Figure 6a. This occurs often in patients suffering from diverticular disease;[24] segments of the colon with multiple diverticula frequently re-act with irritability. Colon segments may collapse when carbon dioxide is introduced to distend the colon.

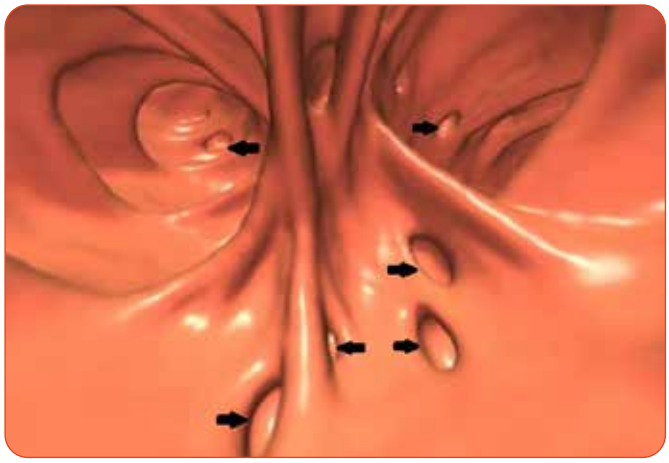

Fig 6b. 3D view showing multiple diverticula (black arrows).

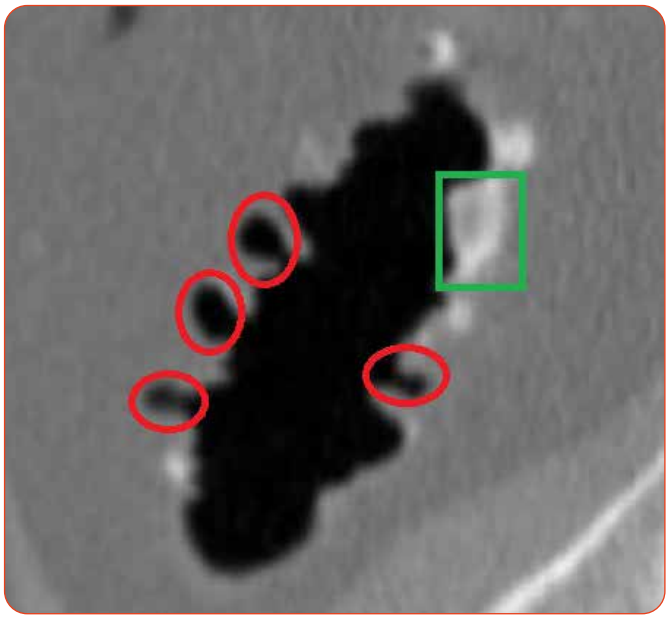

Fig 6c. 2D view shows outpouching of diverticula (red circles) and an impacted diverticulum (green rectangle).

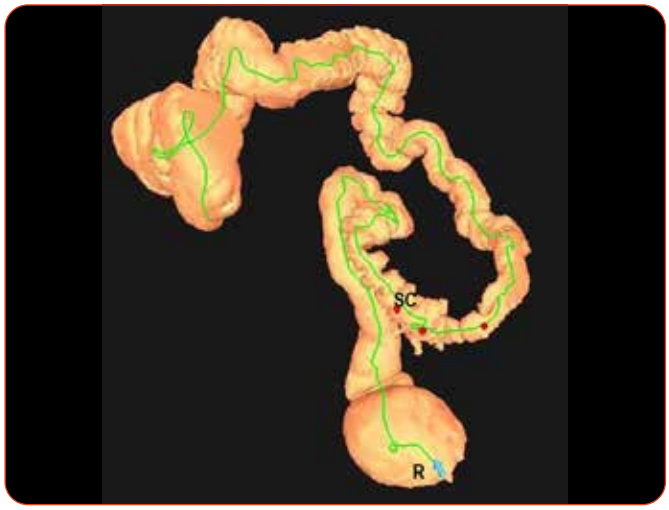

Fig 6d. Prone colon-map shows filling of the sigmoid colon (SC) that was not visualised in Fig 6a. The three dots indicate position of polypoidal lesions. Rectum (R).

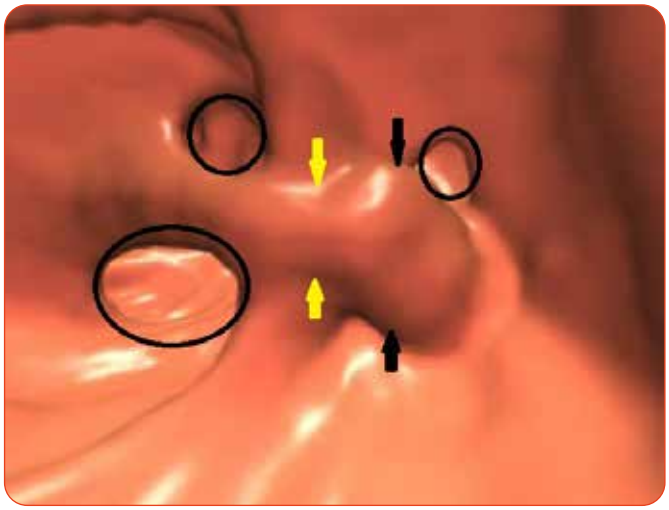

Fig 6e. 3D view shows a pedunculated polyp in the sigmoid colon in close proximity to diverticula (black circles). A pedunculated polyp has a head (black arrows) and a stalk (yellow arrows).

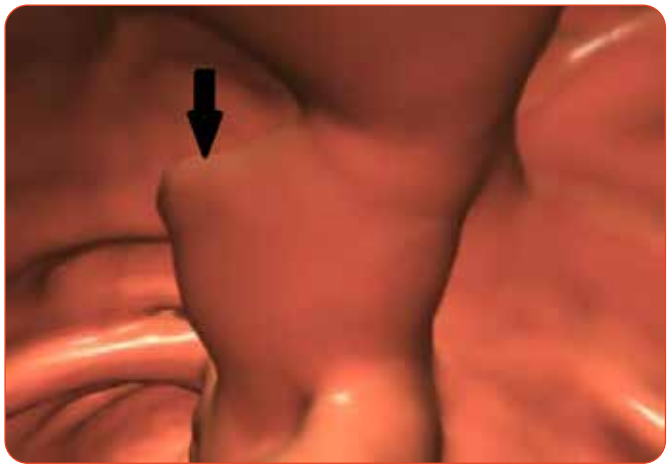

Fig 6f. 3D of the second polypoidal lesion (black arrow).

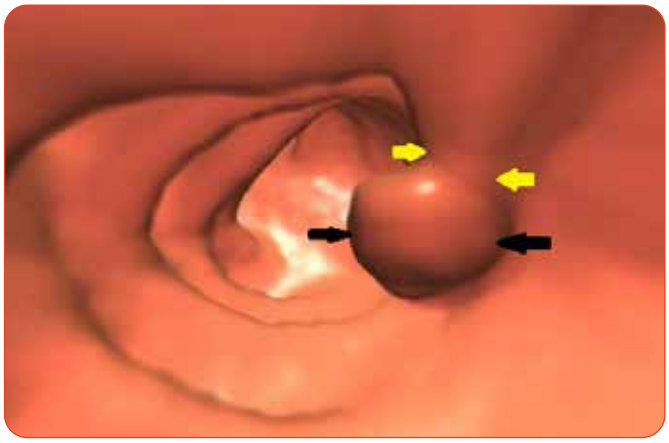

Fig 6g. 3D view of a pedunculated polyp: black arrows = head; yellow arrows = stalk.

CONCLUSION

CT images of gastric varices, pericardial effusion, enlarged breasts in a male, WATCHMAN device, an adrenal adenoma, and polypoidal masses visualised on a prone CT colonography view presented. A discussion of the findings contributes to lifelong learning.

REFERENCES

1. Aleem A, Shah H. Gastric Varices. [Updated 2023 Mar 27]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. [cited 2023 July 17]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK570618/
2. Kiyosue H, Ibukuro K, Maruno M, Tanoue S, Hongo N, Mori H. multidetector CT anatomy of drainage routes of gastric varices: a pictorial review. RadioGraphics. 2013; 33(1): 87-100.
3. Wani ZA, Bhat RA, Bhadoria AS, Maiwall R, Choudhury A. Gastric varices: Classification, endoscopic and ultrasonographic management. J Res Med Sci. 2015 Dec; 20(12): 1200-7. doi: 10.4103/1735-1995.172990
4. Pericardial disease. Cleveland Clinic [cited 2023 July 7]. Available from: https://my.clevelandclinic.org/health/diseases/17351-pericardial-effusion
5. Vakamudi S, Ho N, Cremer PC. Pericardial effusions: causes, diagnosis, and management. Progress in Cardiovascular Diseases. 2017; 59 (4): 380-388. doi:10.1016/j.pcad.2016.12.009
6. Reuter H, Burgess LJ, Doubell AF. Epidemiology of pericardial effusions at a large academic hospital in South Africa. Epidemiology & Infection. 2005; 133(3): 393-9.
7. Reuter H, Burgess LJ, Louw VJ, Doubell AF. The management of tuberculous pericardial effusion: experience in 233 consecutive patients. Cardiovasc J South Africa. 2007; 18:20-25.
8. Imazio M, Adler Y. Management of pericardial effusion. Eur Heart J. 2013; 34(16): 1186-97. doi: 10.1093/eurheartj/ehs372
9. Enlarged male breast tissue (gynecomastia). Cleveland Clinic. https://my.clevelandclinic.org/health/diseases/16227-enlarged-male-breast-tissue-gynecomastia
10. Kanakis GA, Nordkap L, Bang AK, Calogero AE, Bártfai G, Corona G, Forti G, Toppari J, Goulis DG, Jørgensen N. EAA clinical practice guidelines-gynecomastia evaluation and management. Andrology. 2019; 7(6): 778-793. doi: 10.1111/andr.12636
11. Dobs A, Darkes MJ. Incidence and management of gynecomastia in men treated for prostate cancer. J Urol. 2005 Nov; 174(5): 1737-42. doi: 10.1097/01.ju.0000176461.75794.f8
12. Autorino R, Perdonà S, D'Armiento M, De Sio M, Damiano R, Cosentino L, Di Lorenzo G. Gynecomastia in patients with prostate cancer: update on treatment options. Prostate Cancer Prostatic Dis. 2006; 9(2): 109-14. doi: 10.1038/sj.pcan.4500859
13. Fagerlund A, Cormio L, Palangi L, Lewin R, Santanelli di Pompeo F, Elander A, Selvaggi G. Gynecomastia in Patients with Prostate Cancer: A Systematic Review. PLoS One. 2015 Aug 26; 10(8): e0136094. doi: 10.1371/journal.pone.0136094
14. Ghadjar P, Aebersold DM, Albrecht C et al. Treatment strategies to prevent and reduce gynecomastia and/or breast pain caused by antiandrogen therapy for prostate cancer. Strahlenther Onkol. 2020; 196: 589-597 doi:10.1007/s00066-020-01598-9
15. Wintgens LIS, Maarse M, Swaans MJ, Rensing BJW, Van Dijk VF, Boersma LV. The WATCHMAN left atrial appendage closure device for patients with atrial fibrillation: current status and future perspectives. Expert Review of Medical Devices. 2020; 17(7): 615-626. doi: 10.1080/17434440.2020.1781615
16. Tan BE, Boppana LKT, Abdullah AS, Chuprun D, Shah A, Rao M, Bhatt DL, Depta JP. Safety and feasibility of same-day discharge after left atrial appendage closure with the WATCHMAN device. Circ Cardiovasc Interv. 2021; 14(1): e009669. doi: 10.1161/CIRCINTERVENTIONS.120.009669
17. Litwinowicz R, Filip G, Sobczyk D, Lakkireddy D, Vuddanda VLK, Bartuś M, Kapelak B, Bartuś K. Long-term effect of anticoagulation following left atrial appendage occlusion with the LARIAT device in patients with nonvalvular atrial fibrillation: impact on thromboembolism, bleeding and mortality. Real life data. Postepy Kardiol Interwencyjnej. 2020; 16(1): 89-96. doi: 10.5114/aic.2020.93916
18. Kloos RT, Gross MD, Francis IR, Korobkin M, Shapiro B. Incidentally discovered adrenal masses. Endocr Rev. 1995; 16(4): 460-84. doi: 10.1210/edrv-16-4-460
19. Boland GW, Lee MJ, Gazelle GS, Halpern EF, McNicholas MM, Mueller PR. Characterisation of adrenal masses using unenhanced CT: an analysis of the CT literature. AJR. 1998; 171(1): 201-4. doi: 10.2214/ajr.171.1.9648789
20. Park JJ, Park BK, Kim CK. Adrenal imaging for adenoma characterisation: imaging features, diagnostic accuracies and differential diagnosis. BJR. 2016; 89: 20151018. doi:10.1259/bjr.20151018
21. Boland GW, Dwamena BA, Jagtiani Sangwaiya M, Goehler AG, Blake MA, Hahn PF, Scott JA, Kalra MK. Characterization of adrenal masses by using FDG PET: a systematic review and meta-analysis of diagnostic test performance. Radiology. 2011 Apr; 259(1): 117-26. doi: 10.1148/radiol.11100569
22. Mahmood E, Loughner CL, Anastasopoulou C. Adrenal adenoma. [Updated 2023 Aug 17]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. [cited 2023 August 05]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK539906/
23. Bortz JH. CT colonography: an approach for a successful examination. S Afr J Rad 2014; 18 (1); Art. #607, 11 pages. https://doi.org/10.4102/sajr.v18i1.607
24. Bortz JH. Colonic diverticular disease. In Bortz JH, Ramlaul A, Munro L, editors. CT colonography for radiographers. A guide to performance and image interpretation 2nd ed. Springer (in press).