Peer Reviewed **Case Report**

CT COLONOGRAPHY IN THE DIAGNOSIS OF COMPLICATIONS FROM SEVERE DIVERTICULAR DISEASE AS WELL AS VERTEBROPLASTY INJECTION: A CASE REPORT

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ABSTRACT

An elderly female with a history of long-standing diverticulosis presented for CT colonography. A narrowing of an area in her sigmoid colon was visualised. Also visualised was cement leakage from a percutaneous vertebroplasty (PVP) that she underwent fifteen years ago for pain relief of osteoporotic collapse of two thoracolumbar vertebrae. Images of her diverticular disease, and of cement leakage as an extracolonic finding, are presented. Literature for both findings is discussed.

Keywords: complications vertebroplasty, embolism, polymethylmethacrylate, filler, percutaneous, fluoroscopy

LAY ABSTRACT

An elderly female, with a history of outpouchings in her bowel, underwent a CT colonography examination. Her CT films showed narrowing of her bowel and also leakage of a filler used in her spine to relieve pain from fractures caused by bone thinning.

CASE REPORT

An eighty-three year old female presented for CT colonography (CTC). Her clinical history was lower left abdominal pain, diarrhoea, and falling haemoglobin levels; known history of long-standing diverticulosis with two episodes of diverticulitis: the most recent was three months ago. She had a percutaneous vertebroplasty (PVP) fifteen years ago for osteoporotic collapse of thoracic vertebra 12 (T12) and lumbar vertebra 1 (L1). She was advised to have the PVP as she had been experiencing backache for almost a year. She could not recall having any problems post-PVP as most of her pain had been relieved. She could not remember been informed of potential complications before she had the PVP.

For the CTC standard CO_2 insufflation was used and four views were required to distend the sigmoid colon adequately: supine, prone and both decubitus views. Figure 1a shows non-filling of the proximal sigmoid. No evidence of malignancy was detected (Figures 1a and b). A 5cm stricture of the sigmoid colon was noted (Figure 1c). There was no evidence of tumour in the area of narrowing, but diverticula were noted in the entire area of narrowing (Figures 1c and d). This was therefore indicative of an inflammatory stricture rather than underlying malignancy.

An extracolonic finding (ECF) showed evidence of PVP complications. However, as per her post-PVP history, she had no clinical symptoms after the procedure or subsequent years. The main ECFs were as follows. There was presence of the injectable filler polymethylmethacrylate (PMMA) in the soft tissues adjacent to the vertebral bodies as well as cement in the paravertebral veins (Figures 2a to 2g). Figure 2b shows PMMA present in D12 and L1 vertebral bodies, which show evidence of collapse. Some leak of cement is seen anterior to L1. Disc degenerative disease is seen between L2 and L3, L3 and L4 and L4 and L5. Osteoarthritic changes are seen posteriorly at these levels. There is a grade 1 spondylolisthesis of L5 on S1, i.e. L5 has slipped forward onto S1, and there is disc degenerative change at this level. The spondylolisthesis is due to degenerative change in the posterior joints. Figure 2h shows atherosclerotic calcification in some arterial vessels which was not mistaken for cement leakage. A small focus of PMMA was noted in the left base of the lung (Figure 2i) as shown on the scanned region of the CTC. This indicates embolism to the small vessel of the lung. A focus of PMMA was also noted in the right lobe of the liver (Figure 2j).

In view of her age (83 years), and poor physical condition, no surgical resection of the stricture was considered. Stool softeners were prescribed to aid in the passage of stool, The PVP procedure complications do not require any clinical management.

DISCUSSION

CT colonography entails performing a CT scan to cover from the proximal femora to the lung bases. This allows for as-

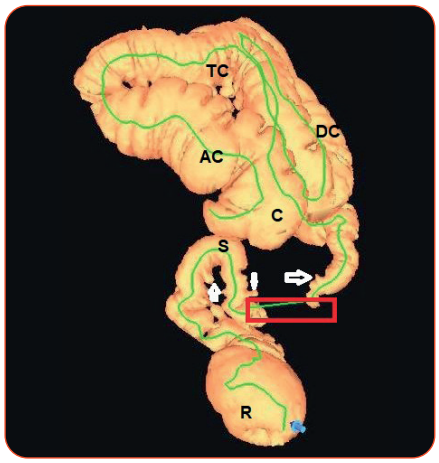

Figure 1a. Supine right side raised colon-map showing non-filling of the proximal sigmoid (red rectangle). White arrows = diverticula in sigmoid. R=rectum. S = sigmoid colon. C = caecum. AC = ascending colon. TC = transverse colon. DC = descending colon.

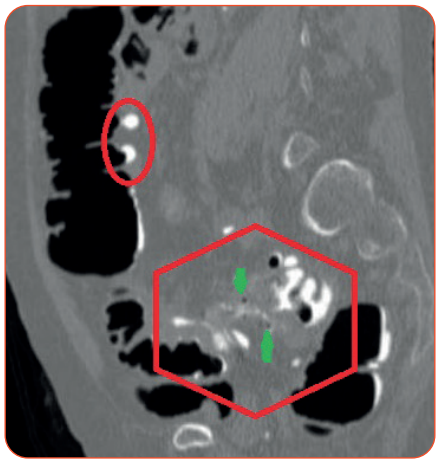

Figure 1b. 2D supine sagittal view showing diverticula in the sigmoid with distortion of the folds(red hexagon) and small air-filled diverticula (green arrows). Red circle = barium filled diverticula.

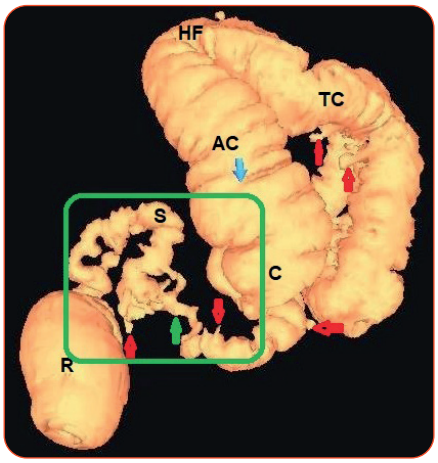

Figure 1c. Colon-map of left lateral decubitus with the patient slightly oblique demonstrates the entire sigmoid area(green square). S = sigmoid colon. Narrowed region of sigmoid (green arrow). Red arrows = diverticula in transverse colon (TC) and in the sigmoid. C = caecum. AC = ascending colon. HF = hepatic flexure.

sessment of structures outside the colon. For example, the pathology in the spine in Figure 2b is an incidental finding: an extracolonic finding. There were two main findings in this case: an inflammatory diverticular stricture in an elderly patient with a long-standing history of diverticular disease; and evidence of complications of a PVP performed 15 years ago. Diverticular disease is a common disorder in the elderly.[1,2] A diverticulum forms as a result of herniation of the mucus membrane lining through a defect in the muscular portion of the bowel wall.[1] Diverticulitis is a low grade chronic inflammation; it develops when the mucosa is abraded by inspissated faecal material.[1] The single strongest feature at CTC in favour of chronic diverticulitis is the presence of diverticula in the affected segment or adjacent to it.[3] Other imaging features favouring chronic diverticulitis include: a long segment (≥10cms) of involvement; a thick fascia sign (75%) without evidence of lymphadenopathy; bowel wall which is usually mildly thickened; tapered margins; distorted mucosal folds that are preserved; pericolonic infiltration (75% of cases); diverticula in the affected segment or adjacent to it; and abscesses or fistulae.[2,3] As visualised in Figure 1c diverticula were noted in the entire area of narrowing. Literature does include a diverticular disease severity score (DDSS) from 1 to 4 for CTC studies.[4] The score is based on the maximum wall thickness and minimum lumen diameter. For example, DDSS 1 = maximum wall thickness of < 3mm and minimum lumen diameter of ≥ 15mm and DDSS 4 = ≥ 8mm and < 5mm, respectively.[4] However, to determine a DDSS requires intravenous administration of 100ml of non-ionic contrast media followed by a 50ml saline flush immediately after a standard CTC study in order to obtain images during the portal venous stage.[4] A DDSS was not done in this case as it was a standard CTC study. Findings suggesting malignant tumour are: bowel wall thickening usually > 2cms; short segment; no diverticula in the affected segment, but may be adjacent to it; shoulder forming; distorted folds; no pericolonic infiltration; presence of lymphadenopathy; and no thick fascia sign.[3] As evident in Figures 1b and d there were no malignant features.

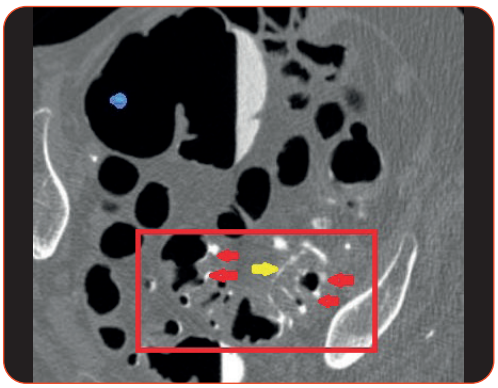

Figure 1d. 2D left lateral decubitus view showing sigmoid colon to the best effect (red square). Note thickening of colon with multiple diverticula throughout the sigmoid colon (red arrows). Yellow arrow = presence of an intramural sinus tract which indicates a linear collection of fluid within the thickened wall.

Vertebroplasty was developed in France in 1984.[5] Percutaneous vertebroplasty (PVP) is a minimally invasive procedure that is effective in decreasing pain in compressed fractures. PVP requires intravenous sedation and not a general anaesthetic. The procedure is performed by a specially trained interventional radiologist or neuro-radiologist. The technique involves insertion of a hollow G11 (gauge 11) needle into the vertebra and is performed under fluoroscopy control. The cement, which is premixed before the procedure, comprises PMMA and barium.[6] Barium is added to make the cement visible at fluoroscopy.[7] Complica-

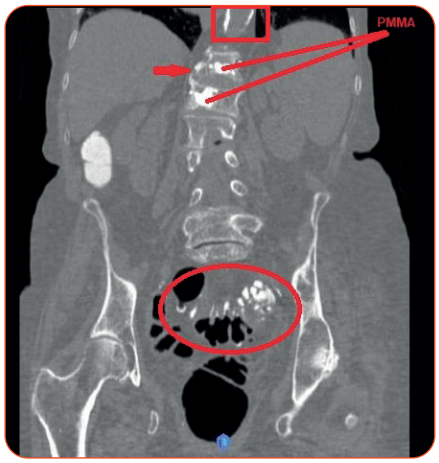

Figure 2a. Coronal view showing diverticulosis in sigmoid colon (red circle) and PMMA in the bodies of T12 and L1 with some extravasation into soft tissues on the right (red arrow). Aortic calcification (red square).

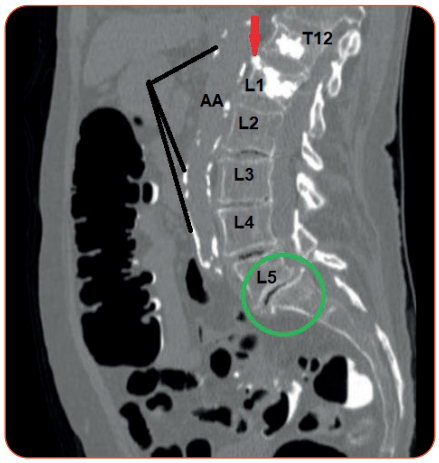

Figure 2b. Supine sagittal view showing PMMA in the bodies of T12 and L1 with slight anterior extravasation (red arrow). AA = abdominal aorta showing marked atherosclerotic calcification (black lines). There is a grade 1 spondylolisthesis at the L5/S1 level (green circle). There is disc degenerative disease between L2/L3, L3/ L4, L4/L5 and L5/S1.

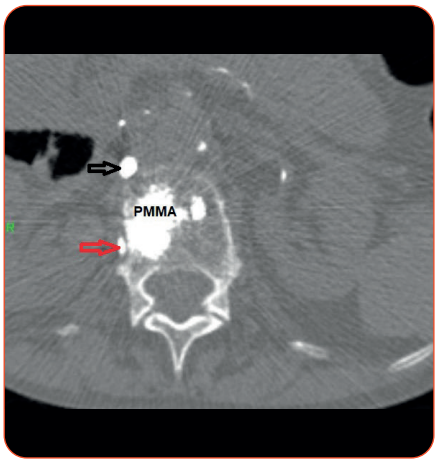

Figure 2c. Axial view showing PMMA in body of vertebra on the right. Leakage of cement laterally (open red arrow) and anterior to vertebral body (open black arrow). Cortex of vertebral body not visible on the right.

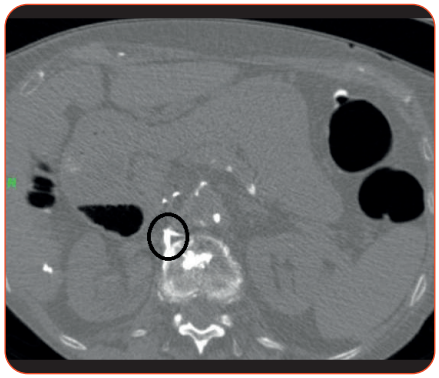

Figure 2d. Prone axial 2D view showing early filling of vertebral body with PMMA and early leakage of cement anteriorly (black circle). During a PVP procedure when this occurs the injection should stop.[8]

Figure 2e. Prone sagittal view showing filling of paravertebral vein with cement between the vertebral bodies (black arrow).

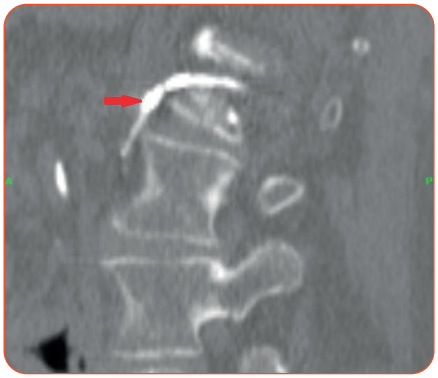

Figure 2f. Sagittal view showing filling of paravertebral vein between T12 and L1 (red arrow) passing inferiorly to join with an anterior paravertebral vein at the L2 level.

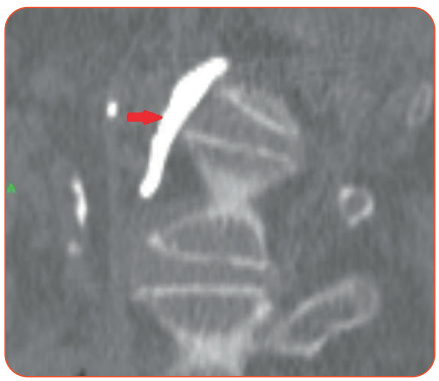

Figure 2g. Sagittal view showing marked distension of paravertebral vein with cement (red arrow) at L1-L2 level.

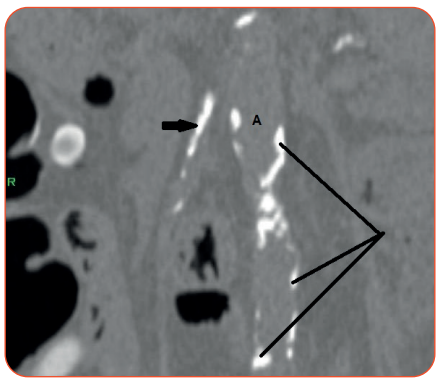

Figure 2h. 2D view showing abdominal aorta (A) with atherosclerotic calcification (black lines). Superior mesenteric artery (black arrow) with atherosclerotic calcification. Compared to Figure 2a there is no visualisation of PMMA leakage on this scan.

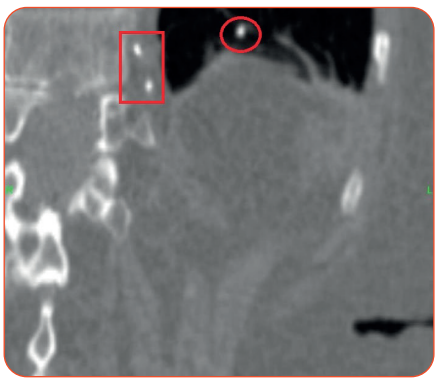

Figure 2i. Coronal view with limited inclusion of left lung . There is a small focus of cement (red circle) in the left lower lung vessel in keeping with embolisation. There are two small foci of cement (red square) in the left paravertebral area.

Figure 2j. Coronal view showing a dense focus of cement (red circle) in the inferior aspect of the liver on the right. RK = right kidney.

tions occur in approximately 50% of patients, but in 95% of them they do not produce clinical symptoms. PVP is used for treating pain due to vertebral fractures from osteoporotic, neoplastic or traumatic cases.[8] Vertebroplasty is also used to treat painful haemangioma of a vertebral body.[5] The findings of an analysis of 1100 procedures by Saracen and Kotwica[8] are as follows: local complications occurred in 50% of osteoporotic patients, 34% of neoplastic patients, and 16% of traumatic fracture cases.

Women are more at risk of experiencing osteoporotic fractures compared to men.[9] Also at risk are those of Caucasian or Asian ancestry, cigarette smokers, those that had a hysterectomy without hormone replacement therapy, and persons on chronic steroid therapy.[6] Vertebral fractures can have a devastating and lasting effect on quality of life. For example, more than a quarter of patients (27%) stated that it took more than a year for them to be able to perform daily activities. Kallmes et al[10] did a comparative study of pain scores of 131 patients which comprised those that had a PVP and those that had a simulated procedure (control group). The same technique was performed on both groups except that in the control group everything was the same but that they were not injected with PMMA.[10] The findings were that there was no significant difference between the pain scores of those that had a PVP and those that had a simulated PVP.[10]

Most cases of complications are not significant clinically. Post-PVP complications may be categorised as mild, moderate, and severe.[11] Mild complications include: (a) transient arterial hypotension, and (b) cement (i.e., PMMA) leakage into intervertebral disc space or into the prevertebral soft tissue with no clinical consequence (see Figures 2a to d). Moderate complications include: (a) infection, (b) cement leak into epidural/foraminal space, and (c) misplaced needle in the tract such as needle traversing of lamina instead of pedicle. Severe complications include cement leaking into paravertebral veins leading to pulmonary embolus, cardiac complications and cerebral embolism. Pulmonary embolism is a rare (5%) complication of vertebroplasty; if a patient develops sudden onset of chest pains and hypotension then oxygen and short-term anticoagulation therapy is administered.[11] Cerebral embolism is usually due to fat embolism from increased intramedullary pressure occurring at the time of cement injection. The cement may spread into the spinal canal and this might affect the foraminal area or epidural space.[11]

Apart from osteoporotic fractures, PVP is also used to treat neoplastic pain due to infiltration of bone caused by myeloma or lytic or blastic (e.g., prostate or breast secondaries) metastasis. Haemangiomas of the vertebra may also cause pain and accounted for 9% of PVP cases.[8] Saracen and Kotwica[8] in their study found that most lesions were in the thoracic spine followed by the lumbar spine. Osteoporotic collapse constituted most (72%) of those treated with PVP; malignant disease accounted for 12% of fractures; and traumatic fractures accounted for 7% of cases.[8] There was a 3:1 female to male ratio in the 1100 procedures analysed. In terms of complications Saracen and Kotwica[8] reported the most common was PMMA leakage into surrounding tissues (20%); paravertebral vein embolism (13%); intradiscal leakage (8%); and leakage into the spinal canal (0.8%). PVD complications occur in less than 50% of cases, but the overwhelming majority (95%) do not produce any clinical symptoms. The patient in this case did not have clinical symptoms from the cement leakage.

CONCLUSION

Due to the poor physical condition of this elderly female, surgical resection of the stricture in her sigmoid colon was not considered. Although there was evidence of cement leakage following a PVP fifteen years ago no further management was necessary. It is important that bone mineral density should be regularly assessed in both females and males in order for timeous treatment of this silent disease. Hence opportunistic screening to check for osteoporosis during screening CTC examinations should be routinely performed.[9]

COMPETING INTEREST

The author declares that he does not have any financial or personal relationships that may have inappropriately influenced him in writing this article.

AUTHOR CONTRIBUTION

Sole author.

ETHICAL CONSIDERATIONS

This article followed all ethical standards for research.

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