

Case Report

RARE ISOLATED BONY METASTASES TO THE CRANIUM IN ADVANCED COLON CARCINOMA AND THE SCINTIGRAPHY PATTERN SEEN ON BONE SCAN: A CASE REPORT

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ABSTRACT

Although infrequently encountered, skeletal metastases to spine, pelvis and long bones in colorectal cancer have been reported. However, isolated bone metastasis at the cranium is unusual. As for bone scan, it is a sensitive imaging modality commonly used to evaluate bone lesions. Hence, we report a case of advanced colon carcinoma with isolated bone metastases at the cranium to highlight this rare condition and the scintigraphy findings seen on bone scan. A 70 year-old lady with sigmoid colon adenocarcinoma underwent laparoscopic anterior resection in February 2013. Staging computed tomography (CT) scan showed bilateral lung metastasis. She received and completed twelve cycles of chemotherapy in October 2013. Repeat CT scan demonstrated no obvious local recurrence and fairly good response of pulmonary metastases towards chemotherapy. She unfortunately developed painful left posterior scalp swelling in early 2015. A destructive bony lesion with soft tissue component was noted at left posterior parietal bone and smaller lytic lesion seen at right occipital bone on CT scan that were suggestive of metastasis. Bone scan performed in June 2015 to ascertain other bony involvement had revealed features of isolated cranium metastases at left posterior parietal and right occipital regions. No other areas of increased tracer uptake visualised elsewhere especially the vertebrae, pelvis and long bones. Bone metastases to the cranium in advanced colon carcinoma without other skeletal involvement are rare. Bone scan findings of this patient had supported the diagnosis by excluding other sites of metastatic osteoblastic or mixed lytic-sclerotic bone lesions.

INTRODUCTION

Colon and rectal carcinoma or colorectal cancer (CRC) is the third most common cancer worldwide [1]. CRC has significant mortality risk. It was estimated that 56% of patients die from their cancer [1]. In Malaysia, CRC is one of the ten most frequent cancers encountered. Latest local data demonstrated that overall incidence rate was 21.23 cases/100000 and mortality rate of 9.79 cases/100000 based on the previous National Cancer Registry [2].

Approximately 20% of patients with CRC already have metastases at diagnosis [1]. The commonest sites for metastases are liver and lungs. Hence, staging of the disease is an important aspect in CRC management. Although infrequently encountered, skeletal metastases to the spine, pelvis and long bones have been reported [3]. Similarly, the cranium or skull is an unusual site for bone metastasis in CRC [4,5].

Bone scan or scintigraphy performed using phosphate

analogues labelled with isotope Technetium-99m has good skeletal localisation in area with osteogenic activity or osteoblastic process. It is commonly done with standard head-to-toe image acquisition. Bone scan is an established method for demonstrating skeletal diseases and being associated with high sensitivity but low specificity [6]. It enables whole-body scanning at relatively low radiation and low cost [7].

Bone scan has been recognised as an important oncological investigation and widely used to evaluate skeletal metastases mainly in prostate, breast and lung cancers. Although less commonly performed in CRC patients, it has been noted that several studies have utilised bone scan to complement evaluation of bone metastasis [3]. Hence, we report a case of isolated bony metastases to the cranium in advanced colon carcinoma to highlight this rare condition and its scintigraphy findings seen on bone scan.

CASE REPORT

A 70 year-old lady with sigmoid colon adenocarcinoma had undergone laparoscopic anterior resection in February 2013. Staging computed tomography (CT) scan showed bilateral lung metastases. Postoperatively, she received and completed twelve cycles of 5-fluorouracil-leucovorin based adjuvant chemotherapy in October 2013. Subsequently, a repeat CT scan demonstrated no obvious local recurrence and fairly good response of pulmonary metastases towards the chemotherapy.

She unfortunately developed painful left posterior scalp swelling in early 2015 and was later subjected to further investigations. A destructive bony lesion with soft tissue component was noted at left posterior parietal bone and smaller lytic lesion seen at right occipital region of the skull as seen on CT scan, suggestive of bone metastases. However, there was no demonstrable CT evidence of intra-parenchymal brain lesions seen.

A whole-body bone scan was performed in June 2015 to ascertain other bony involvement. It revealed abnormal increased tracer uptake at the right occipital region and another lesion of circumferential tracer uptake surrounding a photon-deficient area at the left posterior parietal region as shown in Figure 1. Supplementary imaging using single photon emission computerised tomography with computed tomography

(SPECT-CT) of the skull was also done as shown in Figures 2 and 3.

No other areas of increased tracer uptake or significant photon-deficient lesions visualised elsewhere especially in the vertebrae, pelvis and long bones. Hence, the bone scan findings were suggestive of isolated cranium metastases. In view of the localised bone metastases, she then underwent palliative radiotherapy to the skull. However, she finally succumbed to her illness approximately six months later in December 2015.

DISCUSSION

Metastatic spread from colonic cancer is initially by the lymphatics followed by haematogenous route [8]. From colon and proximal rectum, blood is drained through portal system to the liver and via the heart to the lungs. On the other hand, blood drainage from distal rectum surpasses the liver and first encounter the lungs [1]. Hence, bone metastases rarely occur in the absence of visceral metastatic disease [3].

Nozue M, et al. (2002) found that only 1.3% of resected primary CRC cases in a previous study involving 928 patients had bone metastasis [9]. Nevertheless, all of these cases with bone metastasis were highly advanced stage at the time of

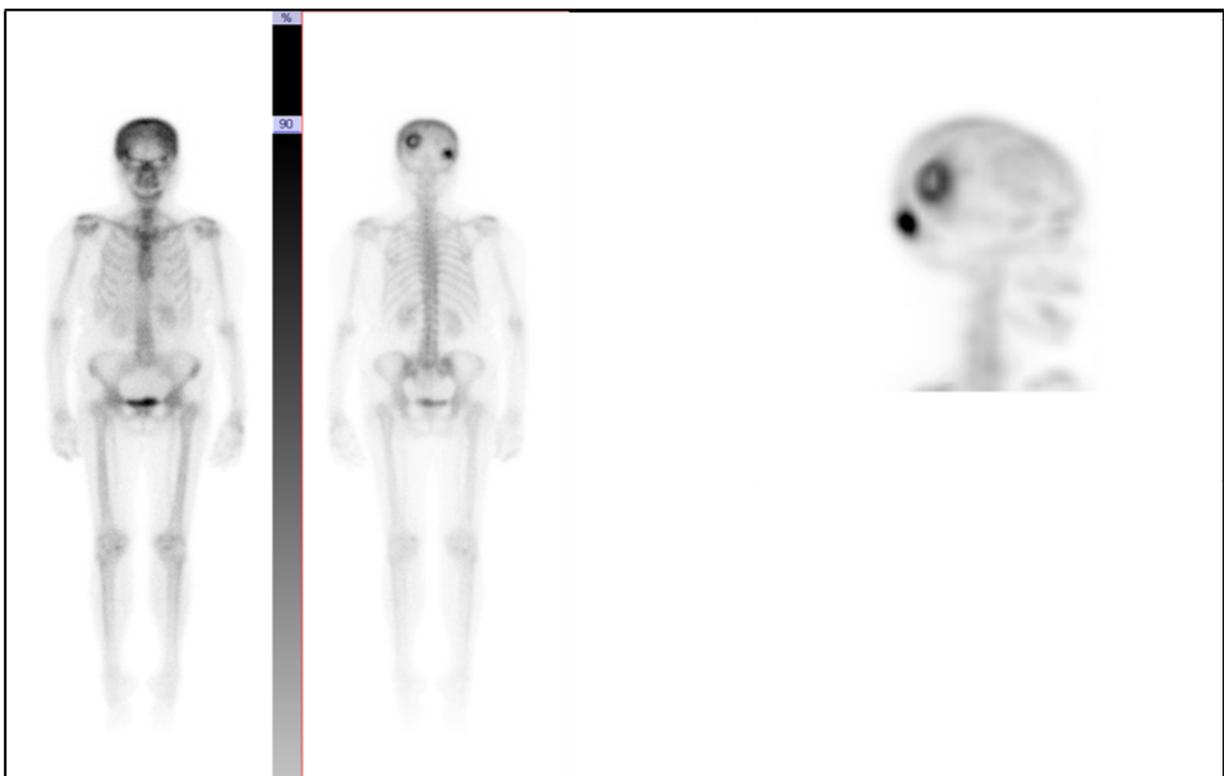


Figure 1: Whole-body bone scan and spot view of the skull images show abnormal increased tracer uptake at the right occipital region and another lesion of circumferential tracer uptake surrounding a photon-deficient area at the left posterior parietal region.

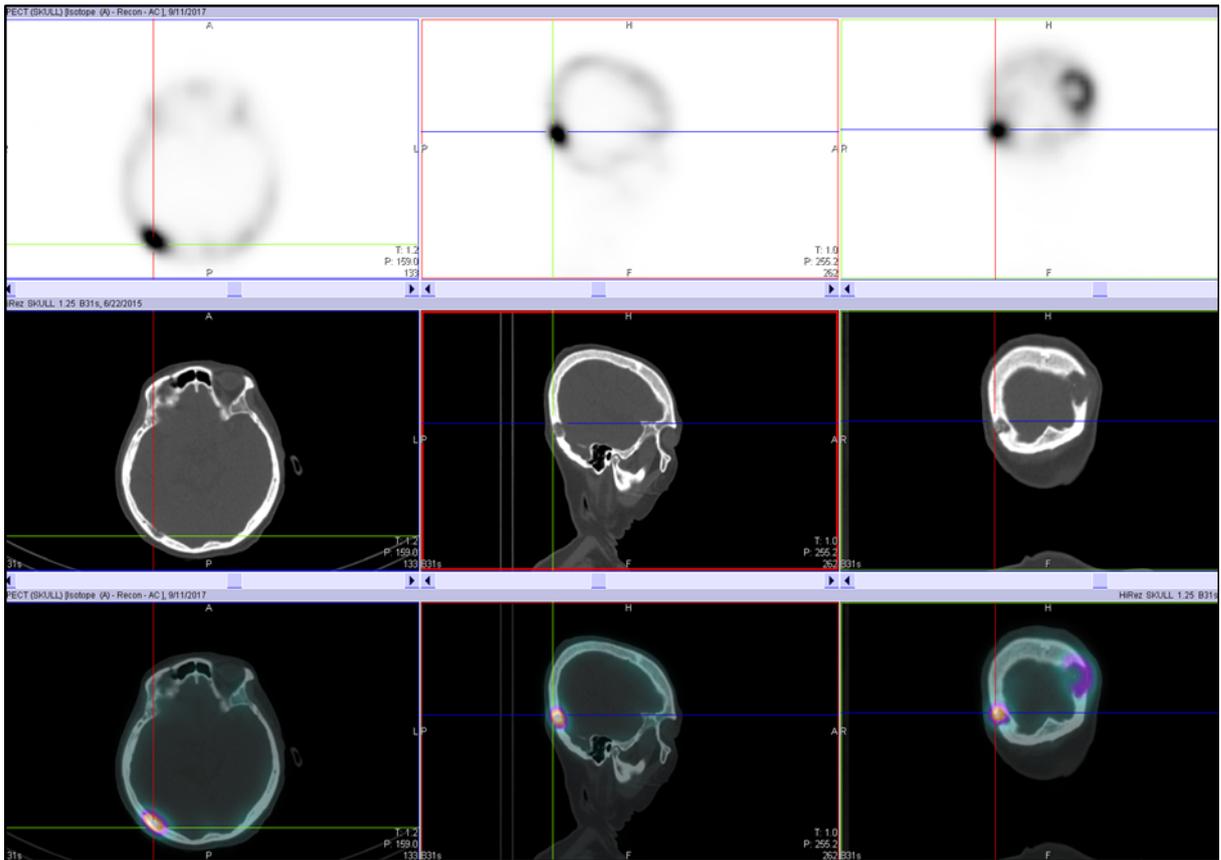


Figure 2: Hybrid SPECT-CT of skull (bone-window) images show abnormal increased tracer uptake at the cranium corresponding to destructive lytic bone lesions with slightly sclerotic edges.

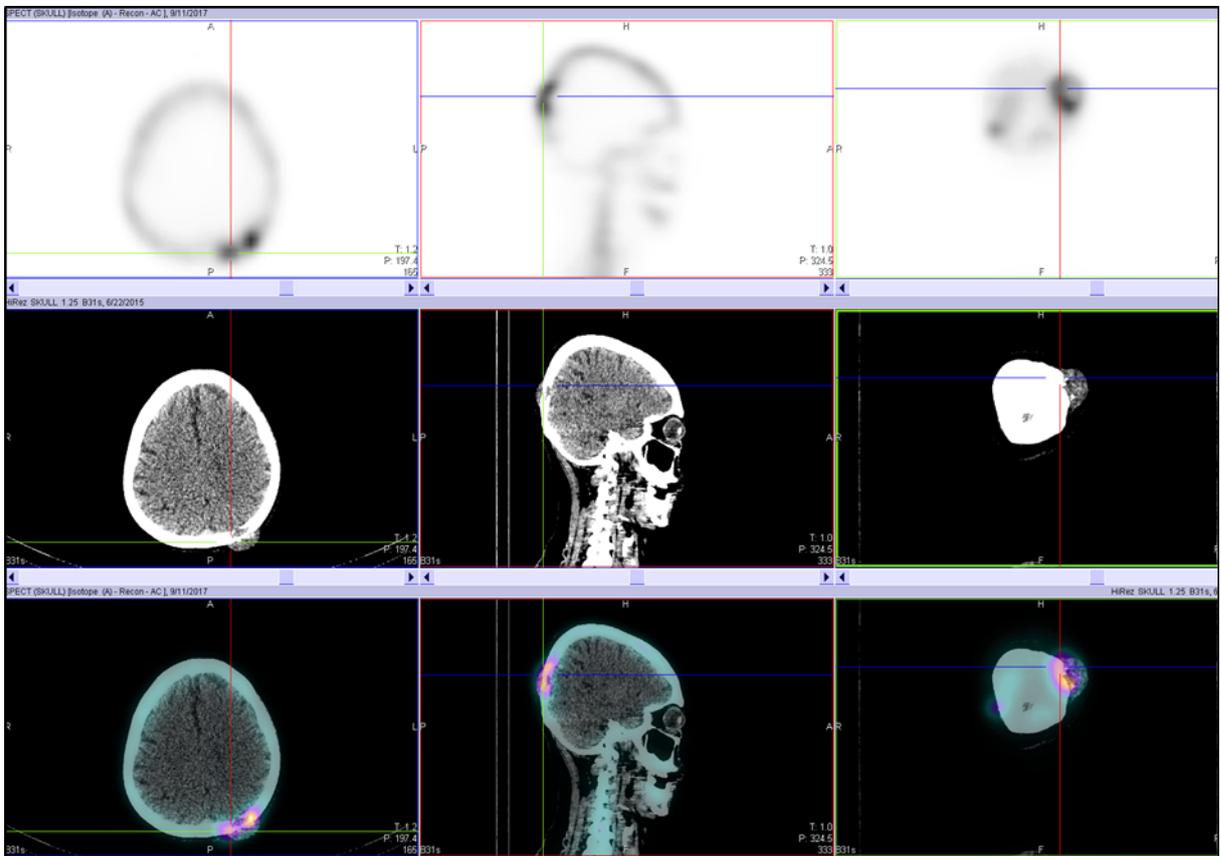


Figure 3: Hybrid SPECT-CT of skull (soft tissue-window) images demonstrate a destructive lesion with soft tissue component at left posterior parietal region no obvious intracranial extension or involvement of the adjacent brain parenchyma.

diagnosis. At the onset of bone metastasis, nine cases also had other metastatic sites compared with only three cases with bone metastasis alone [9].

In terms of skeletal metastasis in CRC, the commonly involved bones were the vertebrae (65%) followed by pelvis-hip (34%) and long bones (26%) [10]. The postulated factors behind this metastatic pattern are due to the para-vertebral valveless venous plexus of Batson, arterial spread to appendicular skeleton and breakage of lymphatic system especially if these lymphatics do not belong to the portal system [3].

Osteolytic lesions were found to be more prevalent (81%) compared to mixed lesions (13%) and osteoblastic lesions (6%) in CRC patients with bone metastases [10]. Osteoblastic reparative activity in response to tumour osteolytic process will lead to increased tracer accumulation seen on bone scan and the scintigraphy pattern of multiple randomly distributed foci of tracer uptake of varying size, shape and intensity is highly suggestive of bone metastases [11].

A patient with diffuse mixed sclerotic-lytic bone lesions seen on CT scan was reported to have widespread skeletal metastases including the skull as depicted on bone scintigraphy in a case series involving few CRC cases presenting with back pain [3]. Nonetheless, metastatic disease occasionally manifests as a solitary abnormality usually in the spine as well as an area of decreased rather than increased tracer activity [11].

Osteolytic metastasis giving rise to photon-deficient lesions at axial skeleton on bone scan has been documented previously [12]. Our patient showed abnormal scintigraphy pattern of increased tracer uptake at right occipital region and another lesion of circumferential tracer uptake surrounding a photon-deficient area at left posterior parietal region. Otherwise, her whole-body scintigraphy revealed no other significant abnormal findings elsewhere in the skeletal system and thus indicating isolated cranium metastases.

Cranium metastases are considered rare entity and could present either at diagnosis or as an initial symptom of recurrence with the absence of visceral metastasis and vertebral or other skeletal involvement [4,5,13]. Rodrigues J, et al. (2012) reported a 62 year-old lady had presented with left forehead swelling without any history of trauma or neurological deficit. Her investigations confirmed a metastatic hepatic flexure adenocarcinoma with no liver or lung metastasis [13].

In another case report, a 65 year-old lady with history of resected colorectal adenocarcinoma has been disease-free for five years before presenting again with a progressively increasing in size of right fronto-parietal destructive bony metastasis [4]. Whereas, Kacan T, et al. (2014) has reported a 44 year-old man with rectal adenocarcinoma post-surgery and adjuvant chemotherapy whom

developed rapidly growing right parietal bone metastasis after being in remission for three years [5].

Survival after the onset of bone metastasis in CRC was demonstrated to be very poor with median survival of five months and a survival rate of 20% at one year [9]. Furthermore, in a large study comprising 264 patients with CRC involving bones, the median overall survival after diagnosis of bone metastasis was noted around seven months (95% CI 5.75 – 8.70 months) with higher number of lesions and osteolytic type being associated with shorter median survival ($p < 0.05$) [10]. Both studies included bone scan as part of the staging investigations.

Although not performed for this patient, another important molecular imaging that can be done was the flurodeoxyglucose (FDG) positron emission tomography with computed tomography (PET-CT). Imaging with FDG has been accepted and demonstrated as an effective method in the assessment of metastasis, recurrence, patient selection for surgery and treatment response evaluation that could lead to changes in CRC management. FDG PET-CT is both sensitive and specific in diagnosing bone metastasis with excellent positive predictive value [14].

CONCLUSION

Bone metastases in CRC are associated with poor prognosis. Bone scan could be a useful investigation tool for advanced CRC as demonstrated in this case report and may affect management decisions. Bone metastases to the cranium in advanced colon carcinoma without other skeletal involvement are rare. Bone scan findings of the patient in this case report had supported the diagnosis by excluding other sites of osteoblastic or mixed lytic-sclerotic metastatic bone lesions.

ETHICS

This case report has been registered with the National Medical Research Register, Ministry of Health Malaysia (NMRR-19-907-48053) and received the permission from the Head of Nuclear Medicine Department, Hospital Kuala Lumpur. Efforts have been taken to ensure confidentiality of our patient. The authors declare no conflict of interests and did not receive any fund or grant for this case report publication.

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REFERENCES

1. Riihimaki M, et al. (2016). Patterns of metastasis in colon and rectal cancer. *Scientific Reports*; 6: 29765. doi:10.1038/srep29765.
2. Hassan WRA, et al. (2016). Incidence and mortality rates of colorectal cancer in Malaysia. *Epidemiol Health*; 38: e2016007.
3. Assi R, et al. (2015). Metastatic colorectal cancer presenting with bone marrow metastasis; a case series and review of literature. *J Gastrointest Oncol*.; 7(2): 284-297.
4. Firat C, et al. (2012). Atypical presentation of skull metastasis from rectal adenocarcinoma as an initial symptom of recurrence. *Case Reports in Medicine*; 794354. doi:10.1155/2012/794354.
5. Kacan T, et al. (2014). Parietal bone metastasis of rectal adenocarcinoma as an initial diagnosis of recurrence: Case report. *SAJ Case Rep*.; 1: 101. doi:10.18875/2375-7043.1.101.
6. Hin S.F., et al. (2002). Functional imaging and the orthopaedic surgeon. *Journal of Bone and Joint Surgery*; 84: 3: 315-321.
7. Ilaslan H., et al. (2010). Clinical presentation and imaging of bone and soft-tissue sarcomas. *Cleveland Clinic Journal of Medicine*; 77: 1.
8. Attili VSS, et al. (2006). Unusual metastasis in colorectal cancer. *Indian Journal of Cancer*; 43 (2): 93-95.
9. Nozue M, et al. (2002). Treatment and prognosis in colorectal cancer patients with bone metastasis. *Oncol Rep*.; 9(1): 109-112.
10. Santini D, et al. (2012). Natural history of bone metastasis in colorectal cancer: final results of a large Italian bone metastases study. *Annals of Oncology*; 23: 2072-2077.
11. Love C, et al. (2003). Radionuclide bone imaging: An illustrative review. *RadioGraphics*; 23: 341-358.
12. Aydin M, et al. (2005). Photon-deficient bone metastases secondary to pleural malignant mesothelioma. *Turk J Nuclear Med*.; 14: 65-67.
13. Rodrigues J, et al. (2012). A Rare Case of Colon Cancer with Metastases to the Bone with Review of the Literature. *The Internet Journal of Oncology*; 8(2).
14. Cinar A, et al. (2013). Restaging of colorectal cancer and PET/CT. *Ulusal Cer Derg*.; 29: 76-80.