

ISOLATED METASTATIC INVOLVEMENT OF STERNUM IN BREAST CANCER: A CASE REPORT WITH MINI REVIEW

Maseehuz Zaman,¹ Nosheen Fatima,² Unaiza Zaman,³ Areeba Zaman,³ Rabia Tahseen,³ Gufran Khan,¹ Khalil Khan,¹ Sadaf Saleem,¹ Norin Hameed¹

¹ Section of Nuclear Medicine, Department of Radiology, The Aga Khan University Hospital, Karachi, Pakistan.

² Department of Nuclear Medicine, Dr. Ziauddin Medical University, Karachi, Pakistan.

³ 2nd year MBBS, DMC / Dow University of Health Sciences (DUHS), Karachi, Pakistan.

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ABSTRACT

Solitary metastasis involving sternum in breast cancer is very uncommon and less is known about the possible mechanism. Similarly, clinical significance of this uncommon presentation is elusive. We are presenting a case of breast cancer with isolated sternal metastasis on radionuclide bone scan which was also documented on chest CT study. In this mini-review we will be discussing the possible mechanisms for isolated sternal metastasis in breast cancer, its clinical significance and therapeutic approaches used.

Key words: Bone Scan, Isolated Sternal Metastasis, Breast Cancer

Case Report

Thirty two years old lady presented with a short history of left sided breast lump. Her mammogram revealed a soft tissue mass in upper outer quadrant of left breast with irregular margins, measuring 4.0 x 3.7 cm with pleomorphic calcification in its center and a solitary dense lymph node (Breast Imaging Reporting And Data System, BIRADS-category 5) (Fig. 1). Right breast mammogram was unre-markable. Ultrasound examination of left breast revealed an ill-defined predominantly hypoechoic solid mass measuring 4.45 x 3.38 cm with multiple subcentimetric nodes (few with loss of fatty hilum) (Fig. 2). Trucut biopsy showed infiltrating ductal carcinoma Grade-III on a scale of I to III according to Modified Bloom and Richardson grading system. The tumor was estrogen and progesterone receptor (ER, PR) positive and HER-2 (Human Epidermal growth factor Receptor-2) was negative. Her serum tumor marker CA-15-3 was 67.30 U/ml (Normal: upto 32.4 U/ml). Her radionuclide whole

body skeletal scintigraphy performed with 20 mCi (740 Mega Becquerel) of Technetium-99m Methylene Diphosphonate (MDP) revealed diffusely increased tracer uptake over body of sternum and manubriosternal junction suggestive of neoplastic process. A focal area of benign uptake was also seen over left 2nd costochondral junction (Fig. 3). Contrast enhanced CT study revealed mixed sclerotic and lytic lesion involving body of sternum along with primary neoplasm in left breast with invasion of underlying pectoralis major muscle (Fig 4).

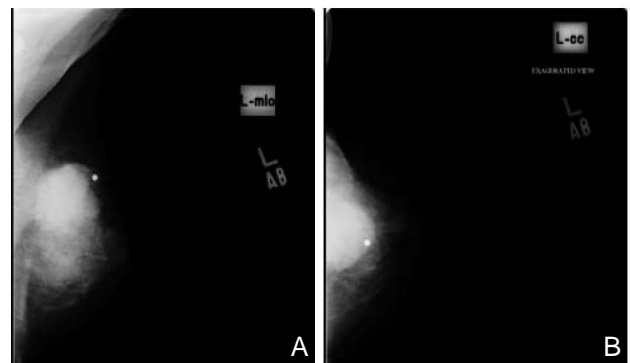


Figure 1: Left breast mammogram (a: mediolateral; b: craniocaudal views) showing a spiculated soft tissue mass in upper outer quadrant with pleomorphic calcification, (BIRADS-5).

Correspondence : Dr. Maseeh uz Zaman
Associate Professor and Section
Head Nuclear Medicine,
Department of Radiology, AKUH,
Karachi, Pakistan. Tel: 34930051 - Ext. 2020
Email: maseeh.uzzaman@aku.edu

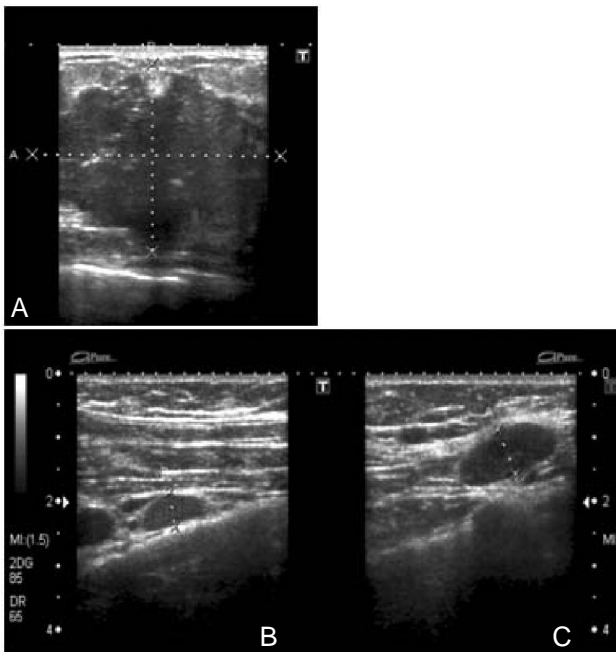


Figure 2: Ultrasound left breast showing (a) large ill-defined hypoechoic solid mass, (b and c) with subcentimetric axillary lymph nodes.

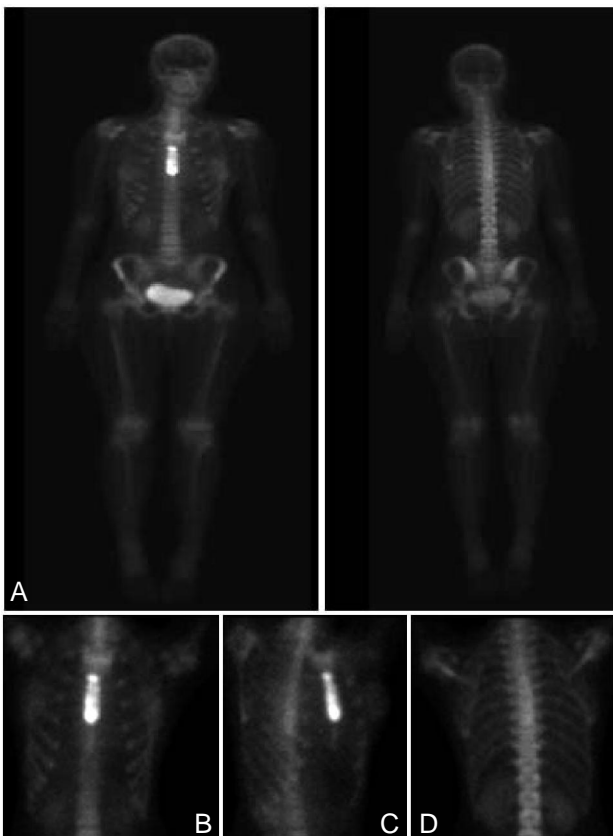


Figure 3: Radionuclide skeletal scintigraphy performed with Tc-99m MDP (a) whole body anterior and posterior images and spot images (b: anterior; c: right anterior oblique; d: posterior views) showing isolated dense and non-homogenous tracer uptake over body of sternum and manubriosternal junction.



Figure 4: CT Scan (bone windows in a: sagittal, b:axial at manubrial sternal level, c: at body of sternum level) showing mixed sclerotic and lucent appearance of body of sternum with normal bony outline of manubrium sterni and heterogenous soft tissue mass in left breast as well.

Discussion

Breast cancer tends to metastasize to bones, and multiple metastases are frequent¹ and 70% of all patients dying of breast cancer have evidence of metastatic bone disease.² Despite of its clinical importance, the underlying cellular and molecular mechanisms driving bone metastasis remain elusive. Two fundamental models have been proposed; first speculates that primary tumor in an organ arises from same cell which undergoes clonal evolution with phenotypic diversity and potential to spread to distant organ. Second model suggest that primary tumor in an organ is initiated by activation of cancer stem cells and driving the ability to metastasize with a variable predilection to different tissues.³ Possible routes of skeletal metastasis are direct extension or invasion, lymphatic spread, hematogenous dissemination and intraspinal spread.⁴ Breast cancer predominantly spreads through lymphatic and hematogenous routes.⁴ Reported incidence of solitary bony metastasis on bone scan in patients with breast cancer varies from 21%⁵ to 41%.⁴ In patients with breast cancer, the presence of either sternal involvement or an isolated sternal metastasis is relatively uncommon, with reported incidences of 5.2% and 1.9% to 2.4%, respectively.⁶ On bone scan uniform tracer distribution over sternum is the usual normal presentation with a well-defined enhanced uptake at manubriosternal junction in 36% of normal bone scans.⁷ The isolated sternum involvement can be explained by the lack of blood vessel-communication with the paravertebral plexus, venous drainage of the sternal area is not through the paravertebral plexus, or as direct invasion by enlarged internal mammary nodes (IMNs).⁸ However, spread through IMNs primarily involves manubrium, manubriosternal junction and proximal part of body of sternum as >70% of these nodes are located in 1st and 2nd intercostal spaces.⁹ While hematogenous spread is responsible for involvement of body of sternum.⁹

There are conflicting data regarding the clinical significance and outcome of patients with solitary sternal metastasis compared to solitary non-sternal or multiple osseous metastases. Lee et al¹⁰ warned that solitary sternal metastasis is more likely to herald systemic disease. According to the study published by Kwai et al,⁹ 54% of patients with solitary sternal

metastasis did develop multiple lesions in bone and lung within 20 months which was attributed to drainage of IMNs into subclavian vein. However, study published by Koizumi et al,⁴ transformation of solitary bone metastasis to multiple metastases was longer for solitary sternal lesions than non-sternal solitary bone metastasis but no significant difference in survival between two groups was observed.

Breast cancer patients with isolated sternal involvement represent a separate entity as there is no consensus regarding the treatment. According to American Joint Commission on Cancer (AJCC) staging system,¹¹ these patients are classified as stage IV disease despite the fact that it may represent direct tumor extension via IMNs rather than hematogenous spread. There is no single standard of care treatment for these patients and various reports revealed surgical resection and/or radiotherapy. The sternum can be resected with curative intent or to effectively palliate the symptoms. Various surgical approaches have been adopted to address the issue like total sternectomy and chest wall reconstruction using a Gore-Tex patch and myocutaneous flap.⁶ Another reported innovative approach is complete exeresis of the sternum, ex-vivo repair under hypothermia (by immersing in liquid nitrogen), and reimplantation.⁸

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