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Brachial Plexopathy Due to Breast Cancer Metastasis: Report of a Case and Systematic Review of Literature

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Abstract

Background: Metastatic Brachial plexopathy is a rare and significant cause of morbidity in patients with breast cancer that is increasingly being diagnosed with use of FDG PET scanning.

Case Report: A 55 years old woman presented with pain in the shoulder and in arm ,5 years after undergoing bilateral mastectomy for infilterating ductal carcinoma. MRI and PET scan confirmed metastasis to brachial plexus and liver. Biopsy from the brachial plexus and immunohitochemistry confirmed it to be metastasis from breast cancer. Patient was treated with chemotherapy and is alive with disease.

Methods of review: A literature search was carried out on Pubmed using a definite search strategy.

Results: Using the Prisma guidelines and after the review of 23 abstracts, relevant studies were identified. Six studies were identified by back reference and cross references from these articles. Thus identified total 29 articles are reviewed.

Conclusions: Metastatic involvement of brachial plexus is rare and is often part of disseminated disease elsewhere. Radiotherapy and systemic therapy is the treatment of choice. The prognosis is often poor and pain control is optimum with use of multimodal treatment.

Key words: Breast cancer, metastasis, chemotherapy, PET scan, radiotherapy, prognosis, imaging

Background

Brachial plexopathy is a significant cause of morbidity in breast cancer patients. The patients often present with pain that is usually severe and radiating; and shoulder or arm disability. It is mostly related to radiation to the supraclevicular fossa, however there are other causes too that may contribute metastasis to the brachial plexus. Though rare, metastasis to the brachial plexus is increasingly being identified these days with the increasing use of PET scan for evaluation of these patients. Though difficult to image due to its proximity to blood vessels and lymphatics [1, 2], the development in modern imaging techniques especially, in magnetic resonance imaging and positron emission tomography has made it possible.

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It is difficult to differentiate the plexopathy due to radiation from that due to metastasis however, absence of prior radiation and presence of lesions elsewhere along with careful review and interpretation of imaging data it is often possible to differentiate the two [1]. This is important as the management of the two is different. The prevalence of brachial plexopathy has been reported to be 0.4% from all causes [3] in a single centre study. Most of these are tumour of neural origin, extra nodal spread, while metastatic spread is common from breast and lung cancer. In the lung cancer the spread to the brachial plexus is supposed to be direct spread from apical lesions while in breast it is proposed to spread through perineural lymphatics from the axilla [4].

We report here a case of brachial plexus involvement by metastatic breast cancer in setting of disseminated metastasis and report the review of literature on metastatic brachial plexopathy.

Case Report

A 55 years old woman presented to surgical oncology out patient with complaints of severe pain in the shoulder with radiation to the arm and restriction of shoulder movements for past 3 months. She had seen her surgeon who had prescribed pain killers but there was no relief from pain except for few hours after taking the medicine. She had underwent bilateral modified radical mastectomy 5 years back for pT2N1 infilterating ductal carcinoma elsewhere and had received four cycles of adjuvant chemotherapy with Adriamycin and cyclophosphamide. No radiation was given at that time. The patient was not on regular follow-up after the completion of chemotherapy and her prior receptor status was not available.

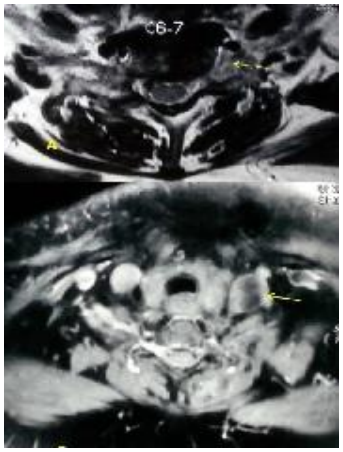

Figure 1: Magnetic resonance imaging picture showing the metastatic lesion at the C6/7 level. (A) T2 weighted image (B) T1 weighted image

On examination the vitals were stable, general examination revealed pallor. Examination of the neck revealed thickening of the brachial plexus, there were no supraclevicular nodes, examination of the chest wall and contralateral breast showed presence of nodularity on the chest wall under the MRM scar, right breast was normal however lymph nodes were present in the right axilla. Abdominal examination revealed hepatomegaly with liver span of 17 cm. No other abnormality was found.

With these findings patient was worked up. Haematological examination showed iron deficiency anaemia with haemoglobin of 7 gm/dL and microcytosis and anisocytosis, rest of the haematological parameters were normal. Biochemistry showed increase in the level of alkaline phosphatase and serum LDH levels, the renal function and rest of liver functions were normal. An ultrasonography of the abdomen revealed multiple liver lesions while chest X-ray was normal.

An Magnetic Resonance Imaging of the neck was carried out that revealed soft tissue density lesion in the region of the brachial plexus from C3 to C6 (Figure 1) and PET scan showed FDG avid uptake in brachial plexus, Liver, left chest wall, left axilla and right axilla (Figure 2, 3). An image guided biopsy was obtained from liver and the brachial plexus that showed poorly differentiated (grade 3) carcinoma (Figure 4). Immunohistochemistry was performed that showed tumor to be positive for CK7, ER, PR and GATA while it was negative for CK20 and HER2 (Figure 5). With the diagnosis of

infilterating mammary carcinoma (NOS) grade 3, rT1N1M1 pateint was started on palliative chemotherapy with docetaxel, epirubicin and carboplatin. Opioids were started for control of pain.

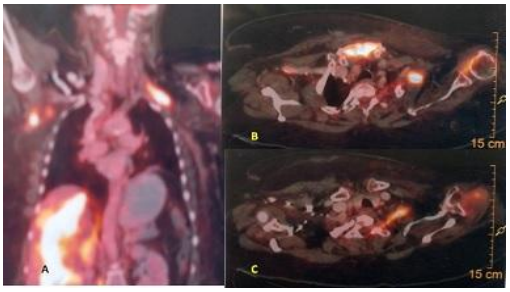

Figure 2: FDG PET image (A) showing FDG avid lesion in Left brachial plexus and right axilla (B) Showing FDG avaid lesion in upper and lower brachial plexus (C) showing FDG Avid lesion in lower brachial plexus

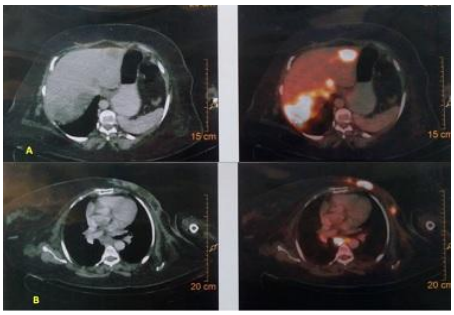

Figure 3: FDG PET Image (A) Showing multiple metastatic lesions in the liver (B) Showing uptake over the left chest wall and left axilla

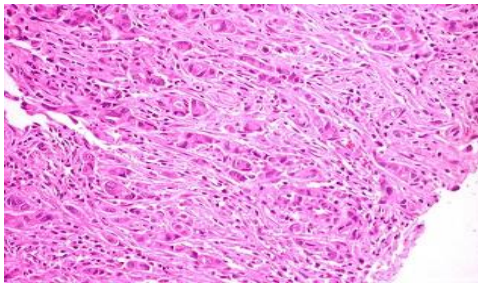

Figure 4: Photomicrograph showing pleomorphic cells in tubules with hyperchromatic nuclei and multinucleated cells seen (H&E x40)

Patient received 8 cycles of chemotherapy showing partial response, however she complained of tingling and numbness in her lower limbs. Nerve conduction studies were performed that suggested peripheral neuropathy. Patient was shifted to second line single agent gemcitabine. After completion of three cycles of gemcitabine, patient complained of swelling in her arm with development of open wound on her right chest wall.

Examination showed a 3 x 3 cm ulcerated lesion on right chest wall with severe oedema of the right arm, the ultrasound of the abdomen showed increase in the size of liver lesions. As there was no response to gemcitabine she was shifted to third line Capecitabine and Vinorelbine combination therapy. Patient completed 6 cycles of chemotherapy amidst severe bone marrow toxicity that become apparent from fourth cycle onward and often delayed administration of chemotherapy, by the end of 6th cycle the toxicity was grade 3 and took almost 6 weeks to recover. Looking at the bone marrow toxicity and late recovery it was decided to put the patient on hormone therapy and she was started on Letrazole. She is alive with disease on letrazole after 3 months of starting the therapy and requires 80mg of morphene everyday to control her pain.

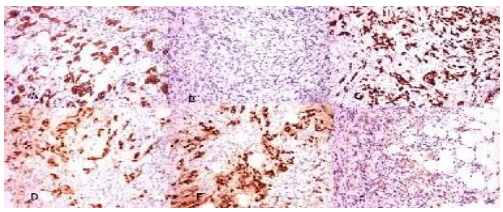

Figure 5: Photomicrograph showing (A) CK 7 x10 (B) CK 20 x10 (C) GATA x10 (D) ER x10 (E) PR x10 (F) HER2x10

Review of Literature

A review of literature (Pubmed) was carried out using the following syntax on second September 2018 following the PRISMA guidelines.

(("brachial plexus"[MeSH Terms] OR ("brachial"[All Fields] AND "plexus"[All Fields]) OR "brachial plexus"[All Fields]) AND ("neoplasm metastasis"[MeSH Terms] OR ("neoplasm"[All Fields] AND "metastasis"[All Fields]) OR "neoplasm metastasis"[All Fields] OR "metastasis"[All Fields])) AND ("breast neoplasms"[MeSH Terms] OR ("breast"[All Fields] AND "neoplasms"[All Fields]) OR "breast neoplasms"[All Fields] OR ("breast"[All Fields] AND "cancer"[All Fields]) OR "breast cancer"[All Fields])

Result

This resulted in 65 articles, the title and abstract of these articles were screened and only 23 of these were found to be relevant to present case. Among the causes of exclusion the majority was as they were reporting on brachial plexopathy as a results of radiation therapy (23), complicationof surgery (6) complication of physiotherapy (1), Other lesions/mimics/other cancers (6) among others. Two cases of plexopathy of lower nerves were found and were also excluded (Figure 6). Six articles were identified through back references making a total of 29 articles reviewed.

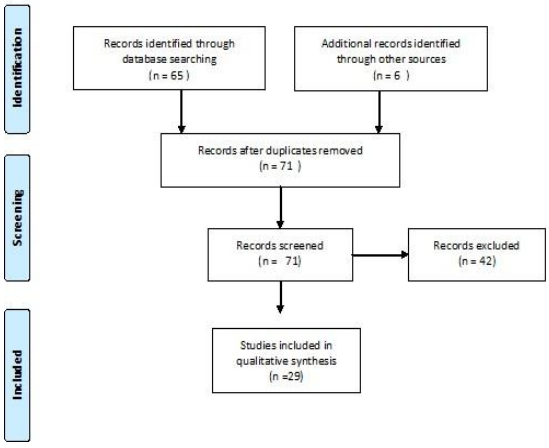

Figure 6: Flow Diagram of literature review

Discussion

Brachial plexopathy is a rare condition that may occur due to numerous reasons most common among the patients with cancer are the radiation and metastasis. The plexopathy appears to be more common then reported, with increasing number of cases being reported in literature [2, 4-19]. The increasing detection can be contributed to the refinement in the techniques of CT and MR imaging [9, 13, 15, 18, 20, 21] and increasing use of PET scan in evaluation of breast cancer patient either upfront or in cases with suspected metastasis [1, 2, 10, 11, 22].

The presenting symptoms that suggest the involvement of brachial plexus is pain in the shoulder region and the arm with or without shoulder dysfunction. Conduction anomalies are also reported in some patients with sensory or motor loss [23]. The pain is often severe and intractable and often does not respond to NSAID's. There are reports of treatment with opiates, radiation, pregablin and pulsed radiofrequency has been tried with limited results [24-27]. However, the best results appear to be with systemic chemotherapy or definite radiation [27, 28].

Behnke et al., [6] reported 4 cases of brachial plexus involvement treated with pericapsular amputation. At the time of their reporting 3 of their patients were alive with satisfactory pain relief while one died of progressive disease. Narakas AO [29] reported 5 pateints with metastatic plexopathy that were treated with surgical neurolysis out of 45 patients in their series. Our review failed to come across any other report of surgery being used to treatment of brachial plexus metastasis. It is apparent from the review that brachial plexus involvement is rarely isolated and most of these patients have other metastatic lesions and hence, use of systemic chemotherapy, tratsuzumab or hormone therapy appears to be more plausible options. Radiation can be used if the involvement is isolated.

Prognosis of the patients appears to be poor with most studies not reporting on long term

outcome in these patients. The prognosis appears to be poor in patients with associated visceral metastasis compared to isolated metastasis. However, most of the evidence comes from isolated case reports and small retrospective reviews (Evidence level III/IV/V), no level I or II studies were identified in this review suggesting the need to accumulate all the cases reported in the literature and analysing the pooled results. Or in the current prospective studies that are ongoing in breast cancer, investigators should actively look for involvement of brachial plexus as well. It is however clear that with increasing use of FDG PET use for evaluation of breast cancer, more cases will be identified and reported and management of metastatic brachial plexopathy will improve.

Learning Points

1. Metastatic involvement of brachial plexus is rare
2. Breast and lung are the commonest primary tumor that metastatize to brachial plexus
3. In the breast cancer the spread appears to be through perineural lymphatics from axilla
4. In lung its mostly through direct involvement from apical tumors
5. Brachial plexopathy can also occur by extranodal spread from supraclevicular nodes
6. Management is by systemic treatment, while isolated metastasis can be treated by radiation

Authors Contribution

MP: designed the study, and edited the manuscript
MS: conducted the literature review and prepared the draft manuscript.

Consent for publication
The written informed consent was obtained from the patient for publication of this case report

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Reference List

1. Ahmad A, Barrington S, Maisey M, Rubens RD. Use of positron emission tomography in evaluation of brachial plexopathy in breast cancer patients. Br J Cancer 1999 February;79(3-4):478-82.[PubMed][PMC Full Text]

2. Chandra P, Purandare N, Agrawal A, Shah S, Rangarajan V. Clinical Utility of (18)F-FDG PET/CT in brachial plexopathy secondary to metastatic breast cancer. Indian J Nucl Med 2016 April;31(2):123-7.[PubMed][PMC Full Text]

3. Noonan AM, McCaffrey J. Frequency and outcome of neoplastic brachial plexopathy: single institution experience. Ir Med J 2011 March;104(3):76-8.[PubMed]

4. Kannan T, Sivaram Naik G, Sridhar Babu KV, Vijayalakshmi B. Metastatic brachial plexopathy in breast cancer. J Clin Sci Res 2012;1:196-8. http://svimstpt.ap.nic.in/jcsr/oct-dec%2012_files/cr3.pdf

5. Artico M, Scarpinati M, Salvati M, Nucci F. Late intraneural metastasis of the brachial plexus from mammary carcinoma. Report of a case. J Neurosurg Sci 1991 January;35(1):51-3.[PubMed]

6. Behnke NK,Crosby SN, Stutz CM, Holt GE. Periscapular amputation as treatment for brachial plexopathy secondary to recurrent breast carcinoma: a case series and review of the literature. Eur J Surg Oncol 2013 December;39(12):1325-31.[PubMed]

7. Closon J, Lemaire M. [Glandular epithelioma of the breast: metastases in the homolateral brachial plexus?] J Radiol Electrol Med Nucl 1967 November;48(11):746-8.[PubMed]

8. Eksioglu E, Aydog E, Unlu E, Cakci A, Keyik B. Brachial plexopathy due to breast cancer metastases. Neurol India 2007 April;55(2):176-7.[PubMed]

9. Fishman EK, Campbell JN, Kuhlman JE, Kawashima A, Ney DR, Friedman NB. Multiplanar CT evaluation of brachial plexopathy in breast cancer. J Comput Assist Tomogr 1991 September;15(5):790-5.[PubMed]

10. Hathaway PB, Mankoff DA, Maravilla KR Austin-Seymour MM, Ellis GK, Gralow JR, Cortese AA, Hayes CE, Moe RE. Value of combined FDG PET and MR imaging in the evaluation of suspected recurrent local-regional breast cancer: preliminary experience. Radiology 1999 March;210(3):807-14.[PubMed]

11. Ho L, Henderson R, Luong T, Malkhassian S, Wassef H. 18F-FDG PET/CT appearance of metastatic brachial plexopathy involving epidural space from breast carcinoma. Clin Nucl Med 2012 October;37(10):e263-e264.[PubMed]

12. Kamenova B, Braverman AS, Schwartz M Sohn C, Lange C, Efiom-Ekaha D, Rotman M, Yoon H. Effective treatment of the brachial plexus syndrome in breast cancer patients by early detection and control of loco-regional metastases with radiation or systemic therapy. Int J Clin Oncol 2009 June;14(3):219-24.[PubMed]

13. Lingawi SS, Bilbey JH, Munk PL, Poon PY, Allan BM, Olivotto IA, Marchinkow LO. MR imaging of brachial plexopathy in breast cancer patients without palpable recurrence. Skeletal Radiol 1999 June;28(6):318-23.[PubMed]

14. Maaroufi M, Kamaoui I, Boubbou M, Sqalli N, Tizniti S. [A rare cause of brachial plexopathy: a metastasis of breast cancer]. Pan Afr Med J 2014 May3;18:12.doi:10.11604/pamj.2014.18.12.1008 .eCollection@2014.:12.[PubMed] [PMC Full Text]

15. Mizuma A, Kijima C, Nagata E, Takizawa S. A Case of Suspected Breast Cancer Metastasis to Brachial Plexus Detected by Magnetic Resonance Neurography. Case Rep Oncol 2016 July 28;9(2):395-9.[PubMed] [PMC Full Text]

16. Terstriep S, Amrami K, Spinner R, Moynihan T. Brachial plexopathy in breast cancer. J Clin Oncol 2006 June;24(18_suppl):10601. http://ascopubs.org/doi/abs/10.1200/jco.2006.24.

18_suppl.10601

17. Willeme J,Mouchette R.[Late intra-nerve metastases, at the brachial plexus leve, of a grandular breast epithelioma]. Rev Med Liege 1963 September 1;18:533-6.:533-6.[PubMed]

18. Wittenberg KH, Adkins MC. MR imaging of nontraumatic brachial plexopathies: frequency and spectrum of findings. Radiographics 2000 July;20(4):1023-32.[PubMed]

19. Zingale A, Ponzo G, Ciavola G, Vagnoni G. Metastatic breast cancer delayed brachial plexopathy. A brief case report. J Neurosurg Sci 2002 December;46(3-4):147-9.[PubMed]

20. Bartolome A, Gonzalez-Alenda J, Bartolome MJ Fraile E, Sánchez de las Matas I, Villanueva A, Pérez-Romero M.[Study of the brachial plexus by magnetic resonance]. Rev Neurol 1998 June;26(154):983-8.[PubMed]

21. Moskovic E, Curtis S, A'Hern RP, Harmer CL, Parsons C. The role of diagnostic CT scanning of the brachial plexus and axilla in the follow-up of patients with breast cancer. Clin Oncol (R Coll Radiol) 1992 March;4(2):74-7.[PubMed]

22. Wahl RL. Current status of PET in breast cancer imaging, staging, and therapy. Semin Roentgenol 2001 July;36(3):250-60.[PubMed]

23. Seror P. Brachial plexus neoplastic lesions assessed by conduction study of medial antebrachial cutaneous nerve. Muscle Nerve 2001 August;24(8):1068-70.[PubMed]

24. Arai YC, Nishihara M, Aono S Ikemoto T, Suzuki C, Kinoshita A, Ushida T. Pulsed radiofrequency treatment within brachial plexus for the management of intractable neoplastic plexopathic pain. J Anesth 2013 April;27(2):298-301.[PubMed] [Free Full Text]

25. Badiyan SN, Shah C, Arthur D, Khan AJ, Freedman G, Poppe MM, Vicini FA . Hypofractionated regional nodal irradiation for breast cancer: examining the data and potential for future studies. Radiother Oncol 2014 January;110(1):39-44.[PubMed] [Free Full Text]

26. Gachiani J, Kim DH, Nelson A, Kline D. Management of metastatic tumors invading the peripheral nervous system. Neurosurg Focus 2007 June 15;22(6):E14.[PubMed]

27. Nisce LZ, Chu FC. Radiation therapy of brachial plexus syndrome from breast cancer. Radiology 1968 November;91(5):1022-5.[PubMed]

28. Tognetti F, Poppi M, Poppi V. A multidisciplinary approach for the treatment of metastatic brachial plexus neuropathy from breast cancer: neurosurgical, plastic, and radiotherapeutic. Neurochirurgia (Stuttg) 1983 May;26(3):86-8.[PubMed]

29. Narakas AO. Operative treatment for radiation-induced and metastatic brachial plexopathy in 45 cases, 15 having an omentoplasty. Bull Hosp Jt Dis Orthop Inst 1984;44(2):354-75.[PubMed]