

Accuracy of ultrasound guided wire localization of the residual breast cancer lesion for breast conservation surgery: Experience at a tertiary care hospital in Pakistan

Anila Rahim¹, Omema Saleem², Ayesha Walid¹, Taqi Pir Zada³, Amjad Sattar¹,
Shirin Jalal-ud-Din Reshamwala⁴

¹Dow Institute of Radiology, Dow University of Health Sciences ²Department of Surgery, Dow University of Health Sciences ³HPB surgery and Liver Transplant department, Dow University of Health Sciences ⁴Aga Khan University, Karachi, Pakistan

Objective: To determine the accuracy of ultrasound guided wire localization of the residual breast cancer lesion in post chemotherapy patients.

Methodology: This retrospective study was conducted at Dow University Hospital after IRB approval. Data of all breast cancer patients who underwent ultrasound guided wire localization of residual breast lesion with intra-lesional liga clip from 2017 to 2000 was retrieved from patient record system.

Results: The study had 39 patients. All patients had successful localization of the intra lesional liga clip followed by efficacious retrieval of residual lesion along with the intra lesional liga clip and wire. That

retrieval was confirmed with post lumpectomy specimen radiograph, which confirmed the presence of liga clip in resected specimen further confirmation of tumor bed occurred on histopathology. In all 39 (100%) cases, clip and wire retrieval was successful.

Conclusion: Ultrasound guided wire localization of the intra lesional liga clip is the accurate method to facilitate the breast conservation in patients who have impalpable lesion. This is safe and cost effective method for the accurate removal of tumor or tumor bed.

Keywords: Ultrasound guidance, wire localization, clip, neoadjuvant chemo, breast conserving surgery.

INTRODUCTION

Breast conservation surgery (BCS) is the standard of care for early breast cancer while some patients need neoadjuvant chemotherapy to down size the tumor, which facilitate BCS. The response of chemotherapy in these patients is so complete that residual lesion become clinically impalpable, even not visualized on mammogram and ultrasound.¹ To facilitate the breast conservation, a radiopaque marker or metallic marker is placed in the lesion at the time of planning neoadjuvant chemotherapy. This provides a high chance of BCS. These markers are used to mark out the biopsy area so it will easily have identified even after chemotherapy when the lesion will disappear.² The role of breast interventional radiologist is decisive in the management of clinically occult breast cancer and in localization of post chemo residual tumor.³

To facilitate the BCS, the surgeon works in collaboration with radiologist for the identification and localization of the lesion to remove the tumor bed along with the clip completely and to achieve the good cosmetic results. As ultrasound breast is the best modality for assessment of post chemotherapy residual tumor size, planning of BCS can easily be done with the

help of ultrasound guided wire localization.⁴ This ultrasound guided assessment and wire localization of the residual tumor is a feasible and cost-effective procedure which avoids unnecessary resection of surrounding healthy breast parenchyma.^{4,5} The rationale of our study was to avoid mastectomy as a mode of treatment and reduced psychological stresses and to see the efficacy of wire localization in BCS.

METHODOLOGY

This retrospective study was conducted at Dow University Hospital after IRB approval for the study (Letter No. IRB-1779/DUHS/Approval/2020). Inclusion criteria was all female patients with biopsy-proven T2-T3 breast cancer who fulfilled criteria for breast conservation. No palpable residual tumor at the end of neoadjuvant chemotherapy to downsize the tumor were included in the study. Exclusion criteria were patients with incomplete record and were lost to follow up, with residual lesions that could not be detected with ultrasound/complete radiological response and patients who opted for mastectomy after neoadjuvant chemotherapy.

Data of all patients who underwent ultrasound guided

wire localization of residual breast lesion with intra-lesional liga clip from 2017 to 2020 was retrieved from patient record system; HMIS by using patients' MR number. Before the start of chemotherapy liga clip placement was performed under ultrasound guidance by the senior radiologist in the center of the biopsy proven breast carcinoma lesion. During and at the completion of chemotherapy, clinical examination was performed for the chemo response assessment while sonographic assessment was done around the completion of neoadjuvant chemotherapy to assess the size of residual non palpable lesions.

After all aseptic measures, local anesthesia was given and in the real-time scanning Kopans wire (size 20G X 10cm) is positioned using high resolution 7.5 MHz probe. The wire was inserted within 1 cm of the lesion and target was to keep thick part of wire adjacent to the liga clip. After dislodging the wire, bandage was applied to protect the external part of wire and to save it from dislodging (Fig. 1). All interventions breast procedure routinely done by two senior dedicated women imaging expert radiologists with more than 5-year experience Verbal and written details of the procedure were shared with referring surgeon.

Surface marking was also done by radiologist under ultrasound guidance. After wire localization of post chemotherapy residual tumor and post procedural mammogram, patient was shifted to the operating room for wide local excision of the localized tumor bed. In most cases where the lesions were in periphery of the breast, incision was given by surgeon directly at the site of tumor and in rest of the cases per areolar incision was given.

Statistical Analysis: SPSS 26 was used to analyze the data. Categorical data was analyzed as frequency and percentage.

RESULTS

Data of 39 patients were reviewed. Mean age of our cohort was 42.03 years (range 26 – 60). In 21 patients (53.8%), right breast was the involved site was upper outer quadrant. Mammogram were reported as B-0 (BIRAD-0) in 29 (74.4%) patients and in B-IV in 9(23.1%) patients. While 33(84.6%) patients had ipsilateral ultrasound reported as B-IV. Contralateral ultrasound breast in 94.8% patients reported either as normal or had benign looking changes.

The most commonly revealed histopathological type was Infiltrating Ductal Carcinoma (IDC), which was present in 36 (92.3%) cases. Only one patient had infiltrating lobular carcinoma and two had mucinous carcinoma. Most of the patients had hormone positive

(ER/PR) and HER2Neu negative disease, 28(71.8%) and 33 (84.6%) respectively (Table 1).

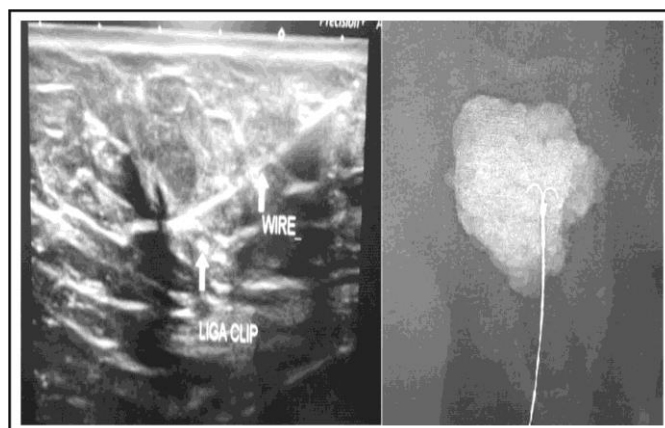


Fig. 1A: Ultrasound guided wire localization of residual lesion with liga clip. **1B:** Successful retrieval of tumor bed contain clip and wire in place.

Table 1: Ultrasound findings.

Ipsilateral Ultrasound	Number	%
B-IV	33	84.6
B-V	5	12.8
B-VI	1	2.6
Histological Type		
IDC	36	92.3
ILC	1	2.6
Mucinous	2	5.1
Histological Grade		
Grade II	27	69.2
Grade III	12	30.8
Hormonal Status		
Positive	28	71.8
HER2Neu Status		
Positive	6	15.4

On histopathological examination, 12 (30.8%) patients had complete pathological response followed by ypT1a in 10 (25.6%) patients. All patients received adjuvant radiation to the conserved breast +/- axilla where indicated. Patients also received hormonal therapy and targeted therapy as per their ER/PR/HER2Neu receptors status. All patients kept on surveillance, only 2 (5.1%) had local recurrence, rest of 94.9% of patient had no

loco regional recurrence in mean follow up time of 2.5 years (Table 2).

Table 2: Pretreatment and post-treatment tumor size assessment.

Factors	Frequency	Percentage
Ultrasound examination: Pre Chemo lesion size		
< 2.5 cm	3	7.7
2.6 – 3.5 cm	17	43.6
3.6 – 4.5 cm	16	41.0
4.6 – 5.5 cm	3	7.7
Ultrasound examination: Post Chemo lesion size		
No lesion identified	6	15.4
< 1 cm	18	46.2
1 – 2 cm	15	38.5
Histopathology: Lesion Size		
No residual tumor	12	30.8
< 1 cm	21	53.8
1 – 2 cm	5	12.8
2.1 – 3 cm	1	2.6
Pre-Chemo T (Tumor size) status		
T2	35	89.7
T3	4	10.3
Post-Chemo T (Tumor size) status		
T0	19	48.7
T1	19	48.7
T2	1	2.6
Pathological Status		
pCR	12	30.8
ypT1mic	3	7.7
ypT1a	10	25.6
ypT1b	9	23.1
ypT1c	4	10.3
ypT2	1	2.6
Retrieval of clip and wire	39	100

Margin Status: Clear	39	100
Follow up/Outcome		
No Recurrence	36	94.9
Local Recurrence	02	5.1

DISCUSSION

Pakistan has the largest occurrence of breast cancer in Asia with over 90,000 cases reported annually and one out of every nine women at risk of developing the disease.⁶⁻⁸ Quality healthcare services are almost non-existent in remote areas of Pakistan, with only a limited tertiary care set ups in large cities offering dedicated breast surgical and radiological services.⁶

The efficacy of these clips as cost effective tumor markers have already been established.^{9,10} None of the patients in our study complained of local symptoms as pain or hematoma at the time of clip insertion. There was no clip migration during the procedure, post chemotherapy or in surgical specimen. This is similar to previous studies by Alamdaran et al¹¹ and Shalaby et al.¹² The mean age of our study population was 42.03 years, which is lower than reported age for breast malignancy of 47 years from another tertiary care set up at Lahore.¹³

Our study also showed that 53.8% of patients had neoplastic lesion on the right side, most frequently involving the upper outer quadrant, similar to results of Alamdaran et al.⁷ IDC was most common malignancy, found in 92% cases, consistent with international and local literature.^{12,13} Majority of patients in our study had T2 lesion at the time of liga clip placement (n = 33, 84.6%). This is higher than international data which reports T2 at 54%.¹³

Complete radiological response was observed in only 6 patients (15.4%). This is close to the reported frequency of 19% by Javed et al¹³ in a recently performed local study with a large population size of 352 patients. On the contrary, similar studies by Soliman et al¹⁰ who studied 43 patients and Ediken et al³ investigated 49 patients, have reported higher frequency of complete radiological response up to 43.7% and 47%, respectively.

No complications occurred during the radiological procedure or later in surgery. Similar studies by Alamdaran et al⁷ and Shalaby et al¹⁴ have also reported 100% results with ultrasound guided clip localization through hook wire technique. Khan et al¹⁵ reported effective use of hook wire localization technique under mammographic guidance for excision biopsies in

Pakistan. Another local study by Masroor et al reported effective use of hook wire localization technique.¹⁶

There are a few limitations to our study. The sample size was small, so conclusions cannot be generalized. It was also a retrospective study, performed at a single center. Patients were followed up for local recurrence for a limited time.

CONCLUSION

Pre-operative wire localization is useful for patients with early breast cancer who are candidates of breast conservation surgery and who underwent liga clip placement prior to neo adjuvant chemotherapy in order to completely remove the tumor and achieve best cosmetic results at the same time. It is a safe, readily available and cost-effective technique, however, requires radiological and surgical expertise.

Author Contributions:

Conception and design: Anila Rahim.

Collection and assembly of data: Omema Saleem, Ayesha Walid, Taqi Pir Zada.

Analysis and interpretation of data: Taqi Pir Zada.

Drafting of the article: Amjad Sattar, Shirin Jalal-ud-Din Reshamwala.

Critical revision of article for important intellectual content: Anila Rahim, Shirin Jalal-ud-Din Reshamwala.

Statistical expertise: Taqi Pir Zada.

Final approval and guarantor of the article: Anila.

Corresponding author email: Anilab: dranilarahim@gmail.com

Conflict of Interest: None declared.

Rec. Date: Aug 9, 2021 Revision Rec. Date: Feb 9, 2022 Accept Date: Mar 10, 2022.

REFERENCES

- Kaufmann M, von Minckwitz G, Mamounas EP, Cameron D, Carey LA, Cristofanilli M, et al. Recommendations from an international consensus conference on the current status and future of neoadjuvant systemic therapy in primary breast cancer. *Ann Surg Oncol*. 2012; 19: 1508-16.
- Kaufmann M, Hortobagyi GN, Goldhirsch A, Scholl S, Makris A, Valagussa P, et al. Recommendations from an international expert panel on the use of neoadjuvant (primary) systemic treatment of operable breast cancer: an update. *J Clin Oncol*. 2006; 24: 1940-9.
- Edeiken BS, Fornage BD, Bedi DG, Singletary SE, Ibrahim NK, Strom EA, et al. US-guided implantation of metallic markers for permanent localization of the tumor bed in patients with breast cancer who undergo preoperative chemotherapy. *Radiology*, 1999; 213: 895-900.
- Phillips SW, Gabriel H, Comstock CE, Venta LA. Sonographically guided metallic clip placement after core needle biopsy of the breast. *Am J Roentgenol*. 2000; 175: 1353-5.
- Shetty MK. Presurgical localization of breast abnormalities: an overview and analysis of 202 cases. *Indian J Surg Oncol*. 2010; 1: 278-83.
- Agha N, Tarar MG, Rind RD. Exploring Breast Cancer Patients' Experiences of Struggle against Socio-Economic and Geographical Barriers in Rural Pakistan. *J Int Women's Studies*, 2021; 22: 318-32.
- Ullah Z, Khan MN, Din ZU, Afaq S. Breast Cancer Awareness and Associated Factors Amongst Women in Peshawar, Pakistan: A Cross-Sectional Study. *Breast Cancer: Basic Clin Res*. 2021; 15: 11782234211025346.
- Malik N. Level of knowledge and perceived barriers about mammography among females. *J Islamabad Med Dent College*, 2016; 5: 187-91.
- Masroor I, Zeeshan S, Afzal S, Sufian SN, Ali M, Khan S, et al. Outcome and cost effectiveness of ultrasonographically guided surgical clip placement for tumor localization in patients undergoing neoadjuvant chemotherapy for breast cancer. *Asian Pac J Cancer Prev*. 2015; 16: 8339-43.
- Soliman AH, Osman AM. Cost-effectiveness of ultrasound-guided surgical clips placement for breast cancer localization prior to neoadjuvant chemotherapy. *Egypt J Radiol Nucl Med*. 2018; 49: 1163-8.
- Alamdaran S A, Gharib M, Homae Shandiz F, Bizhani O, Forghani Torghabani M N, et al. Accuracy Assessment of Surgical Clip Marker/Wire Localization in Advanced Breast Cancer. *Rep Radiother Oncol*. 2017; 4: e80855.
- Shalaby LA, el din Khallaf ES, Moussa MM. Clip and wire localization of locally advanced malignant breast masses in patients undergoing neoadjuvant chemotherapy and breast conservation therapy. *Egyptian J Radiol Nucl Med*. 2019; 50: 1-9.
- Javed N, Rehman B, Iqbal E, Afzal S, Jamal A, Parvaiz MA. Breast conservation surgery (BCS) for breast cancer in a resource limited country-Are we upto the challenge! *J Pak Med Assoc*. 2021; 71: 2748-54.
- Sarveazad A, Babahajian A, Shamseddin J, Bahardoust M. 5-year survival rates and prognostic factors in patients with synchronous and metachronous breast cancer from 2010 to 2015. *Asian Pac J Cancer Prev*. 2018; 19: 3489-3493.
- Khan S, Mitha N, Kazi F, Siddiqui M. Needle localization of non-palpable breast lesions. *J Pak Med Assoc*. 1996; 46: 149-52.
- Masroor I, Afzal S, Shafqat G, Rehman H. Usefulness of hook wire localization biopsy under imaging guidance for nonpalpable breast lesions detected radiologically. *Int J Women's Health*, 2012; 4: 445-9.