

Flap Fixation; Post-Mastectomy Seroma Prevention in University of Benin Teaching Hospital, Nigeria

* ENAHOLO J, *AGBONROFO P

**Department of Surgery, University of Benin Teaching Hospital, Benin City, Edo State, Nigeria.*

ABSTRACT

Background: Post mastectomy seroma is the accumulation of serous fluid under the skin flap or axilla following mastectomy. It is a common complication post mastectomy. Several techniques have been attempted in preventing seroma following mastectomy including flap fixation. Flap fixation involves fixing the skin flaps to underlying pectoralis major muscle. The objective was to determine the efficacy of flap fixation in addition to conventional flap closure in the prevention of seroma formation post mastectomy at the University of Benin Teaching Hospital (UBTH).

Methods: This was a prospective comparative randomized study done over 12 months in UBTH. Sixty-four (64) breast cancer patients who had Auchincloss modified radical mastectomy (MRM) were randomized into two (2) groups in this study. Group A patients had flap fixation to the pectoralis major muscle with vicryl 2/0 suture followed by simple interrupted flap closure with prolene 0 while group B had simple interrupted flap closure with prolene 0 suture. Both Groups were followed up for one (1) month, examining for seroma, number of times seroma was aspirated and volume of seroma aspirated. The results were presented in tables and figures. P-value was set at < 0.05 .

Results: The incidence of seroma was lower in group A (15.6%) compared to group B (28.1%), ($p = 0.365$). Most patients who had seroma (80%) in group A were aspirated once while most patients (55.6%) in group B had multiple aspirations ($p = 0.001$). The mean volume of seroma aspirated was lower in group A (32.33 ± 12.01 mls) compared to group B (249.50 ± 207.04 mls), ($p=0.028$). The mean duration of surgery in group A was prolonged ($p=0.008$). Patient's satisfaction with scar outcome was not statistically significant in both groups ($p = 0.676$).

Conclusion: Flap fixation reduced the incidence of seroma formation. Flap fixation significantly reduced the volume of seroma and the number of times seroma was aspirated. However, it significantly prolonged the duration of operation.

Correspondence

Dr. Joel Enaholo
Department of Surgery
University of Benin Teaching Hospital,
Benin City, Edo State
Nigeria.
Email: joelenaholo18@gmail.com

Keywords: Breast cancer, flap fixation, mastectomy, seroma

INTRODUCTION

Breast cancer is the commonest malignancy affecting women worldwide. It accounts for one-fourth (25%) of malignancies in women globally. The life time risk of developing breast cancer has doubled in recent times reaching a ratio of one in every fourteen black women. (Archampong et al.,

2015). Female gender, ageing, history of breast cancer in the first-degree relatives, early menarche, late menopause, exposure to hormonal contraceptives, nulliparity, alcohol consumption, obesity is amongst the risk factors for developing breast cancer (Archampong et al, 2015; Townsend et al, 2017; Erhabor et al, 2018). Diagnosis of breast

cancer is largely by the triple assessment consisting of; clinical evaluation, radiological assessment and histological examination. (Archampong et al 2015; Townsend et al, 2017). Treatment of breast cancer is multimodal depending on the stage of the disease, age of the patient, hormone receptor status among others (Lasebikan, 2018; Rick et al, 2019). Surgery offers the possibility of a cure when diagnosed early coupled with one or more of chemotherapy, radiotherapy, hormonal and targeted therapy. Modified radical mastectomy is currently the most performed in developing countries due to late presentation aimed at loco-regional disease control (Ogundiran et al., 2013) However, there are a number of complications associated with mastectomy, including seroma formation (Aitken et al, 1983; Archampong et al, 2015).

Post-mastectomy seroma is accumulation of serous fluid under the skin flaps or axilla following mastectomy (Garzali et al., 2020). Incidence of seroma formation post mastectomy ranges between 3 to 90%. (Velotti et al, 2021). Seroma presents as a fluctuant swelling beneath the mastectomy skin flaps causing anxiety, pain or discomfort (Turner et al., 2014). Treatment of seroma involves repeated aspiration with attendant possibility of bacteria inoculation, colonization, surgical site infection, prolonged hospital stays, delay in return to normal activity as well as delays in commencement of other adjuvant therapy (Velotti et al., 2021). Treatment of seroma is challenging to the surgeon with associated risks and a huge burden to the patient. Hence, several approaches have been tried aimed at preventing or reducing seroma formation including electrocautery, use of sclerosant, tranexamic acids and sealants, various forms of drains, application of pressure garments and flap fixation amongst others (Cirolla, 2006; Timothy et al, 2010; Qvamme et al, 2015; Mannu et al, 2015; Bastelaar et al, 2016; Mukundkumar, 2019; Van Garzali et al, 2019; De Rooij, et al, 2021).

Flap fixation involves the use of absorbable sutures in anchoring the superior and inferior skin flaps at intervals to the underlying pectoralis major muscle during mastectomy thereby aborting the potential dead space. (Mannu et al, 2015; Van Bastelaar et al, 2016; De Rooij, et al, 2021,).

Presently, none of the methods of reducing seroma have proven superior to the other with each having varying results and satisfaction (Cirolla, 2006; Timothy et al, 2010; Qvamme et al, 2015; Mannu et al, 2015; Bastelaar et al, 2016; Mukundkumar, 2019; Van Garzali et al, 2019; De Rooij, et al, 2021). Also, there is paucity of similar studies in our

subregion. This study was intended to advance knowledge gap and thus establish a protocol in the prevention or reduction of seroma post-mastectomy in the subregion.

Citation: Enaholo J, Agbonrofo P (2026). Flap Fixation; Post-Mastectomy Seroma Prevention in University of Benin Teaching Hospital, Nigeria. *Nig J Med Dent Educ*; 8(1):116-122.

The objective of the study was to determine the efficacy of flap fixation in the prevention of seroma formation post-mastectomy compared to the conventional flap closure.

MATERIALS AND METHODS

This study was conducted in the General Surgery Unit of the Department of Surgery, University of Benin Teaching Hospital (UBTH); a tertiary healthcare located in Edo State, South-South, Nigeria. (*General information-UBTH, 2023*). This study was a prospective comparative randomized study done over a period of 12 months from March, 2023 to February, 2024. Ethical approval was obtained from UBTH Ethical Committee in conformity with the Helsinki declaration. The participants included all consenting female adults; 18 years and above with histological diagnosis of breast cancer who had Auchincloss modified radical mastectomy. Patients with history of hypersensitivity reaction to vicryl were excluded from the study.

Sixty-four (64) consecutive patients were recruited into 2 groups using simple random technique of computer-generated table of random numbers. Group A patients (intervention group) had flap fixation to the pectoralis major muscle with vicryl 2/0 suture followed by simple interrupted flap closure with prolene 0 while group B had simple interrupted flap closure with prolene 0 suture. All the patients had socio-demographic data, anthropometric measurements recorded and pre-operative work up. Prophylactic antibiotic, 1g ceftriaxone was administered intravenously to all the patients at induction of anaesthesia. All patients had general anaesthesia. All the patients had skin flaps raised with electrocautery, and Auchincloss modified radical mastectomy (Classe et al, 2006; Nadkarni et al, 2007; Brunicardi et al, 2015). All patients had a fenestrated closed passive drain using an improvised urine drainage bag inserted into the mastectomy bed through a stab wound below the mastectomy wound at the medial end and directed into the axilla. Thereafter, group A patients had the superior and inferior flaps fixed to underlying pectoralis major muscle (and fascia) in simple interrupted stitches with ethicon round body vicryl 2/0 suture vertically and

horizontally at intervals of 5cm apart, and the free edge of the flaps closed with simple interrupted stitches using prolene o suture while those in group B had the free edge of their skin flaps closed with simple interrupted stitches using prolene o suture. Duration of surgery was defined from skin incision to the application of last stitch. Post-operatively, analgesics and antibiotics were administered. The wound drain was removed when effluent was less than 30mls per day on two consecutive days. Outcome measures were presence of seroma; detected as a fluctuant palpable swelling beneath the mastectomy flaps, volume of seroma aspirated and number of times seroma was aspirated. Impalpable seroma was regarded as insignificant. Stitches were removed when healing was satisfactory and subsequently discharged. The patients were followed up on 17th and 30th post-operative days in the clinic. Patient satisfaction with the scar was assessed at post-operative day 30 which was the exit period in this study using the Visual Analogue Scale on a 10cm scale with the 'worst scar' at the right end (0cm) and the 'best

scar' on the left end (10cm). A VAS score of >5 was satisfactory while a score of ≤5 as unsatisfactory. Data was collected with the structured proforma and analyzed using IBM SPSS version 22.0. Results were presented in tables and figures. Level of significance was set at P < 0.05

RESULTS

The majority of patients with breast cancer were in their 5th decade accounting for 34.4% (Table 1). The mean duration of flap fixation was 11.50 ± 0.43 (Table 2). Figure 1 shows that the Incidence of seroma in study population was 21.9% (n=14). The incidence of seroma was 28.1% and 15.6% in the control and intervention groups respectively (Table 3). The majority of patients with seroma in the intervention group had aspiration once in 80% compared to multiple (three) aspiration in 55.5% in the control group (Table 4). The mean volume of seroma aspirated was significantly higher in the control group (Table 5). The majority of participants in the control group (93.7%) and intervention group (90.6%) were satisfied with their scar (Table 6).

Table 1: Socio-demographic characteristics of study population

Variable	Frequency (n = 64)	Percent
Age group (years)		
18-29	1	1.6
30-39	14	21.9
40-49	22	34.4
50-59	14	21.9
60-69	11	17.2
70 and above	2	3.1
Mean ± SD age (years)	48.3 ± 14.8	

Table 2: Duration of surgery

Variable	Group A (n=32)	Group B (n=32)	Test statistic	p-value
Mean ± SD duration of surgery (minutes)	117 ± 0.26	107 ± 0.20	t = -2.724	0.008
Mean ± SD duration of flap fixation (minutes)	11.50 ± 0.43			
Minimum duration	6.50 minutes			
Maximum duration	14.00 minutes			

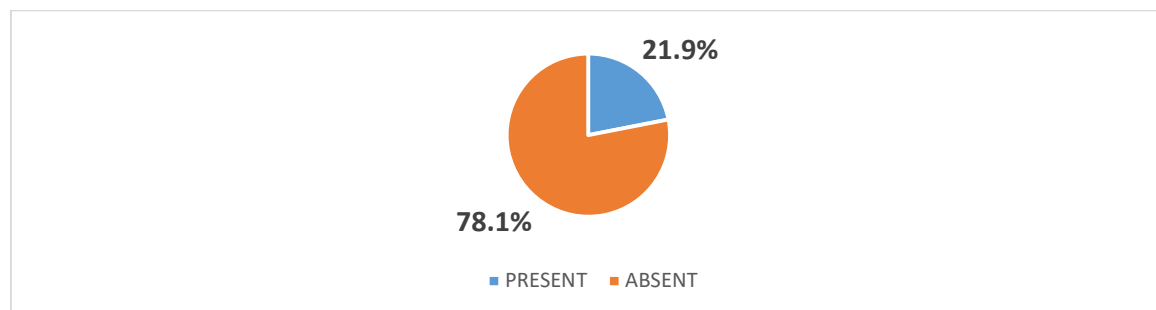


Figure 1: Incidence of seroma in study population

Table 3: Incidence of seroma in study groups

Seroma	Group A (n=32) n (%)	Group B (n=32) n (%)	Test statistic	p-value
Present	5 (15.6)	9 (28.1)	$\chi^2 = 1.463$	0.365
Absent	27 (84.4)	23 (71.9)		

Table 4: Number of times seroma was aspirated among study population

Frequency of Seroma aspiration	Group A (n=32) Freq. (%)	Group B (n=32) Freq. (%)	Test statistic	p-value
Nil	27 (84.3)	23 (71.8)	# = 6.949	0.001
One	4 (8.0%)	2 (22.2)		
Two	1 (2.0%)	0 (0.0)		
Three	0 (0.0)	5 (55.5)		
Four	0 (0.0)	2 (22.2)		

Table 5: Volume of seroma aspirated among study population

	Group A (n=32)	Group B (n=32)	Test statistic	p-value
Mean \pm SD total volume of seroma aspirated (mls)	32.33 \pm 12.01	249.50 \pm 207.04	t = 2.565	0.028

Table 6: Satisfaction with scar among study population

Satisfaction score	Group A (n=32)	Group B (n=32)	Test statistic	p-value
Mean \pm SD	8.06 \pm 1.86	8.06 \pm 1.86		
Minimum (VAS)	4.0	4.0		
Maximum (VAS)	10.0	10.0		
Patient satisfaction				
Satisfactory	29 (90.6)	30 (93.7)	# = 2.065	0.692
Unsatisfactory	3 (9.4)	2 (6.3)		

DISCUSSION

The age of the participants in this study ranged from 27 to 74 years with a mean age of 48.3 ± 14.8 years. Most of these patients were premenopausal. The majority of the participants were in their 5th decade accounting for 34.4%. This finding is similar to the study done in South-West Nigeria by Olaogun et al (2020) and Ogundiran et al (2013) with mean age of 48.9 and 47.4 years respectively. Garzali et al (2019) in Northern Nigeria, also had a similar report with mean age of 46.3 years. This finding is at variance with the finding by De Rooij et al (2021) and Van Bastelaar et al (2016) in Netherland, with a higher mean age of 65.3 ± 13.5 and 71 ± 11 years respectively. The finding in this study is probably due to the early onset of breast cancer in blacks.

The mean duration of surgery among participants in group A 117 ± 0.26 minutes compared to 107 ± 0.20 minutes in the participants in group B. The mean duration spent on fixing flaps was $11:50 \pm 0.43$ minutes. This difference was statistically significant ($p=0.008$). This finding is supported by

Garzali et al (2019) who observed that flap fixation significantly prolonged the surgery with an average of 20 minutes. Renjin et al., Haroun et al., Ozaslan et al., and Habashy et al also noticed increase in operation time by 10:20 minutes similar to the finding in this study. However, Jabir et al. noted that there was no significant difference impacted by flap fixation on duration of surgery. Erhabor et al (2018) and Garzali et al (2019). These differences recorded by different authors on duration of surgery may be attributed to the definition of duration of surgery which was not clearly defined by these studies. This study defined duration of surgery from incision to the last stitch. The overall incidence of seroma in this study was 21.9% (n=14). This makes seroma a very common complication following mastectomy. This finding is similar to a study by Sultan et al (Najeeb, Rashid and Zaffar, 2019), in Egypt, with incidence of seroma observed as 25%. This finding is also incorporated by the meta-analytic finding of Velotti et al (2021) that seroma formation is the

most common complication post mastectomy with a variable incidence ranging between 3 to 90%.

The incidence of seroma in group A was 15.6% (5 patients) compared to 28.1% (9 patients) in group B. This finding was not statistically significant ($p = 0.365$). Erum et al demonstrated a similar non-statistically significant incidence of seroma observed as 5.7% and 8.6%, following flap fixation and conventional closure respectively. (Najeeb, Rashid and Zaffar, 2019). This study also showed some similarities with the study by Sultan et al., with incidence of seroma of 10% following flap-fixation and 40% in conventional closure although their finding was statistically significant ($p = 0.028$). (Sultan, El-Wahab and Hussain, 2019). The finding of this study is in sharp contrast with the study by Garzali et al (2019) and De Rooij et al (2021), where incidence of seroma was 27% and 57% respectively for the flap-fixation and non-flap-fixation groups which was also statistically significant ($p = 0.02$). Their finding was about twice the incidence observed in this study. Early drain removal on post-operative day 4 and 7 for the flap fixation and conventional closure respectively may account for the difference in their study compared to this study in which the mean duration of wound drain removal was 7.13 ± 2.18 and 7.34 ± 2.15 for flap fixation and conventional closure respectively.

This study showed that among patients who had seroma, seroma was aspirated once in 4 (80%) patients in group A and 2 (22.2%) patients in group B respectively. Also, seroma was aspirated three times in the majority of the patients (55.6%) who had seroma in group B. All the patients in group A were aspirated once (80%) or twice (20%). None was aspirated three or four times. This finding was statistically significant ($p = 0.001$).

Garzali et al (2019), recorded similar finding in their study where the number of aspirations to resolve seroma formed post mastectomy following flap fixation was once compared to three times or more for non-flap-fixation patients before resolution. A study by Mannu et al (2015) showed similarities where number of aspirations was 152 and 23 in the non-flap fixation and flap fixation groups respectively that was also statistically significant ($P = 0.001$). This finding in this study is also supported by the observation by Bastelaar et al (2016). This finding is likely due to the fact that flap fixation obliterates or reduces the dead space created following removal of the specimen thereby preventing or reducing seroma collection. (Thomas, 1951; Keyes et al, 2015; Sultan et al, 2019; Vellotti et al, 2021).

The mean volume of seroma aspirated was lower in the intervention group (32.33 ± 12.0 mls) compared

to control group (249.50 ± 207.04 mls). This finding was statistically significant ($p = 0.028$) (table V). Mannu et al (2015), demonstrated similar statistically significant finding with volume of 63mls and 427mls of seroma aspirated following flap fixation and conventional closure respectively ($P = 0.0008$). This is also similar to the finding of Sultan et al (2019) with volume of 415mls and 1685mls of seroma aspirated for flap-fixation and non-flap-fixation groups respectively ($p < 0.001$). The findings by Erum et al and Sakkaray et al were also in accordance with the finding in this study. (Najeeb, Rashid and Zaffar, 2019). This finding is probably due to the reduction or obliteration of the dead space following flap fixation.

The analyses of patient's satisfaction with post-mastectomy scar in both groups showed that majority of patients were satisfied with the scar outcome. Three (9.4%) patients who had flap fixation compared to 2 (6.3%) patients who had conventional closure expressed dissatisfaction with their scar outcome. This finding was not statistically significant ($p = 0.692$). This difference in cosmetic outcome is due to skin tethering noted following flap fixation especially in thin flaps. Patient's satisfaction with procedure was more encompassing as observed by Velloti et al (2021) following meta-analysis of 12 studies that most of the patient with flap fixation had better patient's satisfaction. Flap fixation technique conferred better safety profile i.e. fewer cases of seroma, hence fewer seroma aspirations and wound complication, ultimately better patient's satisfaction with overall outcome. The difference in outcome by Velloti et al (2021) and this study is due to the differences in definition of outcome. This study defined patient's satisfaction with scar outcome as against patient's overall outcome defined by Velloti et al (2021).

CONCLUSION

Patients who had flap fixation following modified radical mastectomy for breast cancer had lower incidence of seroma, reduced number of times seroma was aspirated and lower quantity/volume of seroma aspirated. The reduced number of times seroma was aspirated and lower volume of seroma aspirated were statistically significant. The lower incidence of seroma formation was not statistically significant, but clinically relevant. Flap fixation significantly prolonged duration of surgery.

RECOMMENDATION

It is the author's opinion that flap fixation could be used as an option alone or in combination with other methods to reduce the incidence of seroma

and the associated morbidity post modified radical mastectomy for breast cancer.

ACKNOWLEDGEMENT

My sincere gratitude to Prof Osime for his mentorship role in this study.

REFERENCES

- Aitken D, Minton P (1983). Complications associated with mastectomy. *Surg Clinics North Am*; 63(6); 1331-1349.
- Archampong E, Naaeder S, Ugwu B, editors (2015). *Baja's principles and practice of surgery including pathology in the tropics*. 5th ed. India. Repro India Ltd. 250, 505-524
- De Rooij L, Kuijk S, Granzier R, Hintzen M et al (2021). Reducing seroma formation and its sequelae after mastectomy by closure of the dead space: a multi-center, double-blind randomized controlled trial (SAM-trial). *Ann Surg Oncol*; 28(5):2599-2608. doi.org/10.1245/s10434-020-09225-8
- Brunicardi F, Anderson D, Billiar T, Dunn D et al, editors (2015). *Schwartz's principles of surgery*. 10th ed. New York. McGraw-Hill Education; 516-555
- Cirolla V (2006). Breast anatomy. *Rev Surg*. 161-2.
- Classe J, Berchery D, Champion L, Pioud R et al (2006). Randomized clinical trial comparing axillary padding with closed suction drainage for the axillary wound after lymphadenectomy for breast cancer. *Br J Surg*; 93(7):820-824.
- Erhabor O, Abdulrahman Y, Retsky M, Forget P et al (2016, 2018). Breast cancer in Nigeria diagnosis management and challenges. Author house, UK, Res. Gate:16.
- Garzali I, El-Yakub A, Sheshe A (2020). Factors affecting seroma formation after mastectomy among West African patients: a single center experience in North West Nigeria. *PAMJ Clin Med*; 3 (174). doi: 10.11604/pamj-cm.2020.3.174.24567
- Garzali I, El-Yakub A, Sheshe A (2019). Effect of flap-fixation on seroma formation after mastectomy among African patients: a single centre randomized study. *Arch Int Surg*. 9(3):73.
- General information-UBTH (2023) [internet]. <https://ubth.org/general-information/#About>.
- Keyes L, Bray H, Charles S (2015). Basting the axillary flap for wounds of radical mastectomy. *Ama arch surg*. 992:446-51.
- Lasebikan N (2018). University of Nigeria Teaching Hospital breast cancer management protocol; (1):35-52.
- Mannu G, Qurihi K, Carey F, Ahmad A, et al (2015). Quilting after mastectomy significantly reduces seroma formation. *South Afr J Surg*; 53(2):50-54. doi:10.7196/sajsnew.7864
- Mukundkumar P (2019). Introduction of a new staging system of breast cancer for Radiologists: an emphasis on the prognostic stage. *Korean J Radiol*; 20(1):69-82. doi.org/10.3348/kjr.2018.0231
- Nadkarni M, Rangole A, Sharma R, Rohini V et al (2007). Influence of surgical technique on axillary seroma formation: a randomized study. *ANZ J Surg*; 77(5):385-389. doi: 10.1111/j.1445-2197.2007.04067.x
- Najeeb E, Rashid R, Zaffar S (2019). Effect of flap fixation technique in modified radical mastectomy on incidence of postoperative seroma formation. *J Coll Physicians Surg Pakistan*; 29(5):410-413.
- Olaogun J, Omotayo J, Ige J, Abidemi E et al (2020). Socio-demographic, pattern of presentation and management outcome of breast cancer in a semi-urban tertiary health institution. *Pan Afr Med J*. 36(363):1-0.
- Ogundiran T, Ayandipo O, Ademola A, Adebamowo C (2013). Mastectomy for management of breast cancer in Ibadan, Nigeria. *BMC Surg*. 13(1).
- Qvamme G, Axelsson C, Lanng C, Mortensen M et al (2015). Randomized clinical trial of prevention of seroma formation after mastectomy by local methylprednisolone injection. *Br J Surg*; 102(10):1195-1203.
- Rick A, Mamta K, Ogoro C, Jackisch C et al (2019). Breast cancer: treating breast cancer. American cancer society. 1-120.
- Sultan A, El-Wahab A, Hussain M (2019). The value of mastectomy flap fixation on seroma formation after mastectomy. *Egypt J Hosp Med*. 76(5):4144-4147.
- Thomas G, Orr Jr (1951). Incision and method of wound closure at radical mastectomy. *Ann Surg*. 565-566.
- Timothy H, Jeremy B, Sally D, Elouise B et al, editors (2010). *Last's anatomy, regional and applied*. 12th ed. India: Churchill Livingstone Elsevier. 10.
- Townsend C, Evers B, Beauchamp R, Mattox K, editors (2017). *Sabiston textbook of surgery; the biological basis of modern*

- surgical practice*. 20th ed. Philadelphia. Elsevier Inc; 824-884.
- Turner H, Benson J, Winters Z (2014). Techniques in the prevention and management of seromas after breast surgery. *Futur Oncol*; 10(6):1049-1063. doi: 10.2217/fon.13.257
- Van Bastelaar J, Beckers A, Snoeijs M, Geerard B et al (2016). Flap fixation reduces seroma in patients undergoing mastectomy: A significant implication for clinical practice. *World J Surg Oncol*; 14(1):1-5. doi.org/10.1186/s12957-016-0830-8
- Velotti N, Limite G, Vitiello A, Berardi G et al (2021). Flap fixation in preventing seroma formation after mastectomy: an updated meta-analysis. *Updates surg*. 73(4):1307-3714. doi.org/10.1007/s13304-021-01049-9
- Williams D. Bonita B (2006). *Basic biostatistics: concept and tools*. 2nd ed, Switzerland WHO 63 - 82.