

ORIGINAL ARTICLE

Preservation of Würinger's septum during surgeries for women with breast hypertrophy and women with early breast cancer: intra-operative identification of the septum and post-operative outcomes

Ola Aladdin Muhammad Omar¹, Samy Mohammad Osman², Ahmed Mohamed Zidan³ and Osama Abdullah AbdulRaheem⁴

- 1- General Surgery department, faculty of medicine- Aswan University
- 2- General Surgery department, faculty of medicine - Assuit University
- 3- General Surgery department, faculty of medicine - Benha University
- 4- General surgery department, faculty of medicine - Suhag University

ABSTRACT

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*Corresponding author:

Ola Aladdin Omar
dr.ola.aladdin@aswu.edu.eg.

Tel: 00201019209200

Email:
dr.ola.aladdin@aswu.edu.eg.

Background Würinger's septum is a horizontal neurovascular bundle that provides nerve supply to the nipple-areola complex. The septum preservation has been studied in the literature in the context of surgical management of breast hypertrophy to maintain the nipple-areola complex (NAC) sensation. **Objective:** To evaluate operative experience of preserving the Würinger's septum. And to evaluate the postoperative patients' satisfaction **Methodology:** This study was conducted on 30 women who were scheduled for oncoplastic breast surgery or breast reduction. Preservation of the septum was achieved by careful dissection and gentle manoeuvres. At 3-month postoperative, questionnaire was given to the patients to assess the postoperative satisfaction. **Results:** This study was conducted on 30 women who underwent breast surgery for breast hypertrophy ($n=20$) and early-stage breast cancer ($n=10$); six women with breast hypertrophy, and four women without hypertrophy. The postoperative patients' questionnaire at 3 months postoperatively most women had tendency to accept their breast shapes without braces ($n=28$, 93.4%) and with braces ($n=29$, 96.7%). Two (6.7%) women were found to have partial NAC loss at 3-month postoperative, none of them were among the cases of women with bilateral breast hypertrophy. **Conclusions:** Preserving the Würinger's septum in surgeries for early-stage breast cancer and in breast hypertrophy is non-time consuming surgery and it maintains NAC vascularity and sensation.

INTRODUCTION

The description of breast gross anatomy has gone into a deeper level as there are some anatomical details that need to be considered to achieve the ultimate goals, regarding post-operative patient satisfaction and quality of life, in different breast surgeries (1, 2).

The neurovascular supply of the nipple runs along a well-defined, coherent fibrous sling that shows a regular and predictable location. It models the breast and carries the weight of the breast by constant fibrous structures. It is composed of a horizontal septum, which originates at the inferior border of the pectoral fascia along the 5th rib and traverses the breast to the middle of the nipple (3).

This septum was first described by Würinger and Colleagues, in the 1990s as a horizontal neurovascular ligamentous system of the breast at the level of the fifth rib to deliver nerve and vessels to the nipple- areola complex which added new aspects of the topographical anatomy of the mammary gland regarding its neurovascular supply along a regular ligamentous suspension (4).

The current surgical practice in breast surgeries aims at achieving the utmost high levels of patient satisfaction by minimizing the surgical trauma and improving the quality of life for patients with surgical breast problems and this can be done through avoiding injury to the vital blood supply of the breast and the nipple-areolar complex (NAC) sensation (5, 6).

That is why The perspective of breast surgeries has changed a lot since the identification of Würinger's septum, and what was once the standard in the surgical practice has changed to newer techniques with intentions to preserve this septum as possible as it can be (7)

With the variety of the septum-based techniques used in different breast surgeries, none of the techniques is superior to others. The choice of technique should be individualized to each patient and the preference of the surgeon and to achieve higher levels of patient satisfaction. For this reason, various modifications were introduced by different authors to improve many of these techniques and serve the main goals of modern surgical views (8).

There is a lack of evidence on the outcome of preserving the Würinger's septum in oncoplastic breast surgery (9). While patients' safety and optimum tumour excision is the top priority, postoperative NAC sensation and breast shape is important for the patients' satisfaction(9).

Aim of the work

The aims of this study were to

- 1- Evaluate the operative experience of preserving the Würinger's septum during surgeries for women with breast hypertrophy and women with early breast cancer regarding intraoperative identification of the septum and operative time.
- 2- Assess the postoperative NAC sensation and patients' satisfaction.

Methods

This was a prospective non-comparative study conducted on 30 female patients who were scheduled for breast surgery at the General Surgery Department at Banha University Hospitals between March 2019 and June 2021. Thorough history, examination and investigations were performed for all women admitted for breast surgery.

The study participants were selected if they were diagnosed with breast cancer and/ or unilateral breast hypertrophy and scheduled for surgical operation. Specific inclusion criteria for women with breast hypertrophy were breast size (bra cup size B or above) and moderate or large and ptotic breast (type II-III ptotic breasts or pseudoptosis). Specific inclusion criteria for women with breast cancer were unilateral lesions, with or without breast hypertrophy, at any quadrant, stage I-II, and T1-T2 node positive.

General exclusion criteria were cigarette smoking, small sized breast in cases of breast hypertrophy (less than cup B), history of previously treated ipsilateral breast cancer. Specific exclusion criteria for women with breast cancer were T3 and T4 breast cancer, evidence of distant metastasis, previously irradiated breast, contraindication for adjuvant radiotherapy, lesions located less than 1.5 cm or involving the nipple and areola, diffuse micro-calcification, multicentric breast cancer in more than one quadrant of the breast on mammography, inflammatory tumors, patients demanding mastectomy for fear of local recurrence.

The surgical procedure

For women with breast hypertrophy, the breast landmarks were marked preoperatively. De-epithelization of the preoperatively marked skin area on the lower breast pole was done using a scalpel measuring 15. A transverse incision was performed 2cm above the inframammary line and dissected until the loose areolar tissue layers overlying the pectoral fascia is reached. Dissection was continued bluntly through this layer cranially until the resistance of the Würinger's septum was felt at level of approximately 5th rib. The glandular resections from the superior and inferior poles are made in full-thickness fashion over the pectoralis fascia. The wedge resections on both sides of the pedicle tissues should be in partial thickness so that sufficient tissue remains at the base, thus protecting the central pedicle's vascular continuity with the breast septum and to create a mobile central pillar that advanced easily to the new areola site. Then, after dissecting the central and surrounding flaps to the surface pectoral fascia of the pectoral major muscle, leaving well-vascularized flaps; the septum was visualized showing the blood vessels running towards the nipple. With this maneuver, the blood and nerve supply of the residual breast tissue and the NAC were maintained by preserving the Würinger's septum.

For women with early breast cancer, preoperative markings were done, then a circum-areolar incision was done according to the site of the lump, followed by dissection till reaching the lump using electric cautery with caution to preserve the perforators as much as possible till reaching the pectoral fascia to visualize the neurovascular bundle of Würinger's septum anywhere near the level of 4th-5th rib. Then, lumpectomy was done as usual with proper safety margins.

Patients were subjected to clinical examination at 2 weeks to assess wound healing, NAC viability and sensation, then at 3 months for completion of NAC sensation assessment. All patients were instructed to self-referral to the hospital at any time if they experienced any of the followings: wound dehiscence, wound bleeding, breast hematoma, breast hotness and/or

tenderness or any wound alarming symptoms. At 3 months postoperative, all patients were given a breast questionnaire as well to evaluate their satisfaction.

Ethical approval

Informed consent was obtained from all patients after providing information about the purposes, risks, and alternative procedures. The institutional review board, Faculty of Medicine, Banha University approved the research project under code: (024/2019).

Statistical analysis

All statistical analyses were carried out using the R Studio© software (The R Foundation, Vienna, Austria) version 1.0.153, which uses the R programming language for statistical computing (10). Statistical analysis of the data was sought in two steps: descriptive statistics, and inferential statistics. Continuously variable indices are presented as either mean with standard deviation or as median with interquartile range (IQR), as distribution demands.

Results

The study included 30 (6%) patients out of 507 women who attended the breast clinic at Banha university hospitals between 2019 – 2021. The process of patients' selection is presented in (Figure 1). The demographic characteristics of the study participants are presented in Table 1. In our study, the mean age of the patients was 43.6 ± 7.76 , and the mean BMI was 34.8 ± 2.4 . The majority of the patients were married ($n=27$, 90%), parous ($n=23$, 79.7%), and had breastfed ($n=23$, 79.7%). As regards the clinical characteristics (Table 1), the majority of the patients were normotensive and euglycemic, with only 8 patients (26.7%) were hypertensive, and 6 patients (20%) were diabetic. Twenty-three (76.7%) patients were on hormonal contraception.

(Table 2) summarize the preoperative diagnosis of the study participants. In our study, two-thirds of the patient were admitted for surgical management of bilateral breast hypertrophy ($n=20$, 67.7%). Ten (33.3%) women were due to have surgery for early breast cancer; of whom, six (2%) had moderate to large ptotic breasts, and four (1.3%) of them had breast size less than cup B.

In our study, most of the tumors were on the left side ($n=6$, 60%), upper outer quadrants ($n=4$, 40%), and of stage II disease ($n=6$, 60%). The majority of the breast cancer cases were of intraductal carcinoma (IDC) type ($n= 9$, 90%). The mean tumor size was 2.5 ± 1.3 cm.

The overall time taken to identify and isolate Würinger's septum was 31.7 ± 1.4 minutes, while the overall operative time 80.3 ± 24.7 minutes. The longest operative time was that of women with breast cancer and with breast hypertrophy ($n=6$, 20%), as the septum identification time was 31.6 ± 1.4 minutes, while the total operative time was 83.7 ± 3.8 minutes (Table 3).

As shown from the majority of the patients had gone through uneventful postoperative period (Table 4). Three (10%) patients had haematoma, two (6.7%) had wound dehiscence, and one (3.3%) had wound infection. Surgical revision for wound healing complications was required in five patients (16.7%).

At two weeks postoperative, at the first clinical follow up visit, there was no reported cases of total NAC loss. However, three (10%) women were found to have partial NAC loss. The NAC assessment at two weeks postoperative is summarized in (Table 5).

As shown from (**Table 6**), at three months postoperatively, the NAC sensation was reassessed in the second follow up and it was preserved in most of the patients as we did not find any cases with changed NAC sensation among women with bilateral breast hypertrophy; only two (10%) out of the three women who have had partially lost their NAC sensation didn't fully recover their NAC sensation. However, one patient of those three patients fully recovered her NAC sensation at three months postoperative.

Table 7 summarizes the outcome of the postoperative patients' questionnaire at 3 months postoperatively. Most women had tendency to accept their breasts shape without braces ($n=28$, 93.4%) and breasts shapes with braces ($n=29$, 96.7%). All women accepted their breasts size. One woman (3.3%) disliked the shape of the scar, and two women (1%) disliked the nipple sensation.

Discussion

This was a prospective observational study of 30 women who underwent breast surgery between 2019 – 2021, for breast hypertrophy ($n=20$) and early-stage breast cancer ($n=10$), six women with breast hypertrophy, and four women without hypertrophy, using the central pedicle technique with preservation of Würinger's septum. The overall operative time 80.3 ± 24.7 minutes for all patients. At two weeks postoperative, three (10%) women were found to have partial NAC loss. At three months postoperative, the NAC sensation was reassessed in the second follow up and it was preserved in most of the patients; only two (10%) out of the three women who have had partially lost their NAC sensation did not fully recover their NAC sensation. The postoperative patients' questionnaire at 3 months postoperatively most women had tendency to accept their breasts shape without braces ($n=28$, 93.4%) and showed that breasts shapes with braces ($n=29$, 96.7%). All women accepted their breasts size. One woman (3.3%) disliked the shape of the scar, and two women (6.7%) disliked the nipple sensation.

Our results regarding early breast cancer patients showed that the mean (\pm SD) operative time for women without hypertrophy and in those with hypertrophy was $60.3 (\pm 3.77)$ and $83.7 (\pm 3.8)$, respectively. The time taken to identify and isolate Würinger's septum was 31.7 ± 1.4 minutes. We used visual identification of the septum based on its anatomical position. Kelemen *et al* conducted a single-institutional, retrospective cohort study between February 2011 and January 2017 using a prospective database of 190 stage 0-III breast cancer patients at the National Institute of Oncology, Hungary. They aimed to facilitate the acceptance of the Würinger's septum preservation through the acceptance of the central pedicled therapeutic mammoplasty technique as a standard volume-displacement level II oncoplastic breast-conservative surgery (OBCS) by reporting its safety and repeatability. They included patients who underwent therapeutic modified wide pattern oncoplastic breast conservative surgery with immediate or delayed contralateral summarization. The mean operative time in cases without contralateral summarization was 69 minutes (range: 42-102) with sentinel lymph node biopsy or axillary lymph node dissection. (11).

Additionally, in a prospective study of Talaat *et al* which included 15 patients aiming to clinically assess the centro-lateral oncoplastic technique for both inner quadrants of breast cancer regarding oncological safety and patient satisfaction. They included only female patients with unilateral invasive breast cancer at upper and lower medial quadrants from 18 to 60 years old and T1-T2 node positive patients. They reported that “the operative duration of our study was long at first (155 minutes) but with progression of our study and as we build up more experience the operating time was reduced to (90 minutes)” (12).

Furthermore, in a prospective study of Kishk *et al* included 30 patients experiencing macromastia who visited the outpatient clinic of Department of Plastic Surgery, Menoufia University Hospital, from April 2015 to December 2016, and they had undergone septum-based reduction mammoplasty based on Würinger's septum. Overall, 16 (53%) medial and 14 (47%) lateral septum-based pedicles were designed according to each patient characteristics. The mean operative time in reduction mammoplasty alone, which was performed in 18 (60%), was 101 min, with range of 85–119 min (13).

In our study, the first postoperative visit was at two weeks postoperative, there was no reported cases of total NAC loss. However, three (10%) women were found to have partial NAC loss. At three months postoperatively, the NAC sensation was reassessed in the second follow up visit and it was preserved in most of the patients; only two (10%) out of the three women who have had partially lost their NAC sensation did not fully recover their NAC sensation. As regards the outcome of the postoperative patients' questionnaire at 3 months postoperatively, most women had tendency to accept their breasts shape without braces ($n=28$, 93.4%) and breasts shapes with braces ($n=29$, 96.7%). All women accepted their breasts size. One woman (3.3%) disliked the shape of the scar, and three women (1%) disliked the nipple sensation.

Talaat *et al* evaluated the cosmetic outcome using a scoring system for the breast appearance. They failed to report whether the scoring system was evaluated by the surgeons or the patients. They also did not report the components of their scoring system. Nevertheless, they reported that “we were able to conduct an excellent cosmetic outcome for a relatively large tumor excisions with 66% of the cases (10 patients) falling in excellent and very good score groups with mean cosmetic outcome score 4.26/5”. Another 20% (3 cases) which fall in good and fair score groups as those two patients noticed asymmetry of the two breasts in front of the mirror as they refused bilateral breast reduction mastopexy. None of our cases have had a poor or an ugly score. However, in their study they failed to report the postoperative NAC assessment and sensation (12).

In another prospective study of Kim *et al*, which was conducted on 56 women (a total of 112 breasts) at Inha University School of Medicine, Incheon, South Korea, between January 2001 and 2011. They aimed to create more conical breast shape and long-lasting better projection using central pedicle and thus preserving the Würinger's septum for women requesting cosmetic breast surgery. They did not report the operative time. The sensitivity of the nipple was unchanged in all patients. None of the patients developed late nipple retraction (14).

Furthermore, Kisk *et al* found decrease in touch sensation of the nipple in the first 3 months postoperatively in both medial and lateral septum-based cases. It improved to 75% (of the preoperative nipple sensation) in medial septum-based cases and 95% in lateral septum-based cases at 6 months postoperatively, with significant difference in favor of the lateral septum pedicle (13).

The findings of Kisk *et al*, support the impact of dissecting the Würinger's in the postoperative impaired NAC sensation. In comparison with our study, unlike Kisk *et al*, we completely preserved the septum, and we did not find any case with changed NAC sensation among women with breast reduction at three months postoperatively(13).

Kisk *et al* also performed a patient satisfaction questionnaire. Every patient (6 months postoperatively) was asked to answer a patient satisfaction questionnaire and give a score from 1

(very disappointed) to 10 (very pleased) regarding each of the following item: the new breast size, breast shape, breast symmetry, scars, nipple sensation, symptom relief, bra and clothing fitting, esthetic results, and overall satisfaction (**13**). This revealed high overall satisfaction rate up to 89%. In agreement with our results, the 28 (93.4%) women accepted their breast without braces and 29 (96.7%) accepted their breast shapes with braces.

The majority of the patients in our study had gone through uneventful postoperative period. Three (10%) patients had haematoma, two (6.7%) had wound dehiscence, and one (3.3%) had wound infection. Surgical revision for wound healing complications was required in five patients (16.7%).

Kim *et al* reported that complications were identified in 10 patients (17.9%) which included minor delayed healing in three patients that healed well after minor revision; focal hematoma in two patients that was evacuated; and seroma in two patients that was resolved spontaneously; and hypertrophic scarring of the areola in three patients. There were no major wound complications, such as flap necrosis (**14**).

Furthermore, in the study of Kisk *et al* which included 30 patients experiencing macromastia who visited the outpatient clinic of Department of Plastic Surgery, Menoufia University Hospital, from April 2015 to December 2016, and they underwent septum-based reduction mammoplasty based on Würinger's septum. Overall, 16 medial and 14 lateral septum-based pedicles were designed according to each patient characteristics (**13**). In this study, touch sensation of the nipple was impaired in the early postoperative period (3 months) which then improved to a comparable degree to the preoperative sensation over 6 months postoperatively. In the lateral septum cases, it reached 95% of the normal, and in medial septum cases, it reached up to 75% of the normal (**13**).

In a study by Hamdi *et al*, nipple sensation after lateral mammoplasty was markedly decreased in the first 3 months postoperatively with improvement within 6 months. They compared sensation after lateral septum pedicle to superior and inferior pedicle reduction, with results in favor of the lateral septum pedicle. This can be explained by preservation of the deep and superficial branches of lateral cutaneous nerve of 4th intercostal nerve (the lateral limb of Würinger's septum) (**15**).

Conclusion

Preserving the Würinger's septum in surgeries for early-stage breast cancer and in breast hypertrophy is non-time consuming surgery and it maintains NAC vascularity and sensation. It does not compromise the post-operative patients' satisfaction. Preserving the Würinger's septum in breast conserving surgeries should be considered while planning the operative procedure for each patient.

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Table 1: Demographic characteristics of the study participants, n=30

	n(%)
Age in year, mean (\pm SD)	43.6 (7.76)
BMI, mean (\pm SD)	34.8 (2.4)
Marital status	
Married	27 (90%)
Unmarried	3 (10%)
Parity	
Nullipara	7 (23.3%)
Parous	23 (79.7%)
Breastfeeding	
No	7 (23.3%)
Yes	23 (79.7%)
Hypertension	8 (26.7%)
Diabetes Mellites	6 (20%)
On hormonal contraceptive	23 (76.7%)

SD=Standard deviation

Table 2: Preoperative diagnosis of the study participants, n=30.

	n(%)
Early breast cancer in moderate to large ptotic breasts	6 (2%)
Early breast cancer in patients less than cup B breasts	4 (1.3%)
Breast hypertrophy	20 (67.7%)

Table 3: Septum identification time and total operative time stratified by the preoperative diagnosis, n=30

	Septum identification time in minutes, mean (\pm SD)	Total operative time in minutes, mean (\pm SD)
Early breast cancer without hypertrophy	20.42 (\pm 1.43)	60.3 (\pm 3.77)
Early breast cancer with hypertrophy	31.6 (\pm 1.43)	83.7 (\pm 3.8)
Breast hypertrophy	31.34 (\pm 1.19)	107 (\pm 11.5)
Overall	31.73 (\pm 1.4)	80.27 (\pm 24.4)

SD=Standard deviation

Table 4: Wound healing complications ($n=30$)

Wound healing complications	<i>n</i> (%)
No	24 (80%)
Hematoma	3 (10%)
Wound dehiscence	2 (6.7%)
Wound infection	1 (3.3%)
Surgical revision for wound complications	
No	25 (83.3%)
Yes	5 (16.7%)

Table 5: Postoperative NAC assessment of the study participants at 2 weeks postoperatively, $n=30$

	<i>n</i> (%)
Partial NAC loss	
No	27 (90%)
Yes	3 (10%)
Total NAC loss	
No	30 (100%)
Yes	0 (0%)

NAC=Nipple areola complex

Table 6: NAC sensation 3 months postoperative, $n=30$

	<i>n</i> (%)
NAC sensation	
Retained	28 (93.4%)
Lost	2 (6.7%)

NAC=Nipple areola complex

Table 7: Summary of patients' questionnaire at three months, $n=30$

	<i>n</i> (%)
Breast shape without braces, $n=30$	
Disliked	1 (3.3%)
Borderline	1 (3.3%)
Accepted	28 (93.4%)
Breast shape with braces, $n=30$	
Disliked	0 (0%)
Borderline	1 (3.3%)
Accepted	29 (96.7%)
Breast size, $n=30$	
Disliked	0 (0%)
Borderline	0 (0%)
Accepted	30 (0%)
Scar appearance, $n=30$	
Disliked	1 (3.3%)
Borderline	2 (6.7%)
Accepted	27 (90%)
Nipple sensation, $n=30$	
Disliked	2 (6.7%)
Borderline	0
Accepted	28 (93.4%)

Disliked=VAS score 0-3, Borderline=VAS score 4-6, Accepted=VAS score 7-10 VAS= visual analogue scale

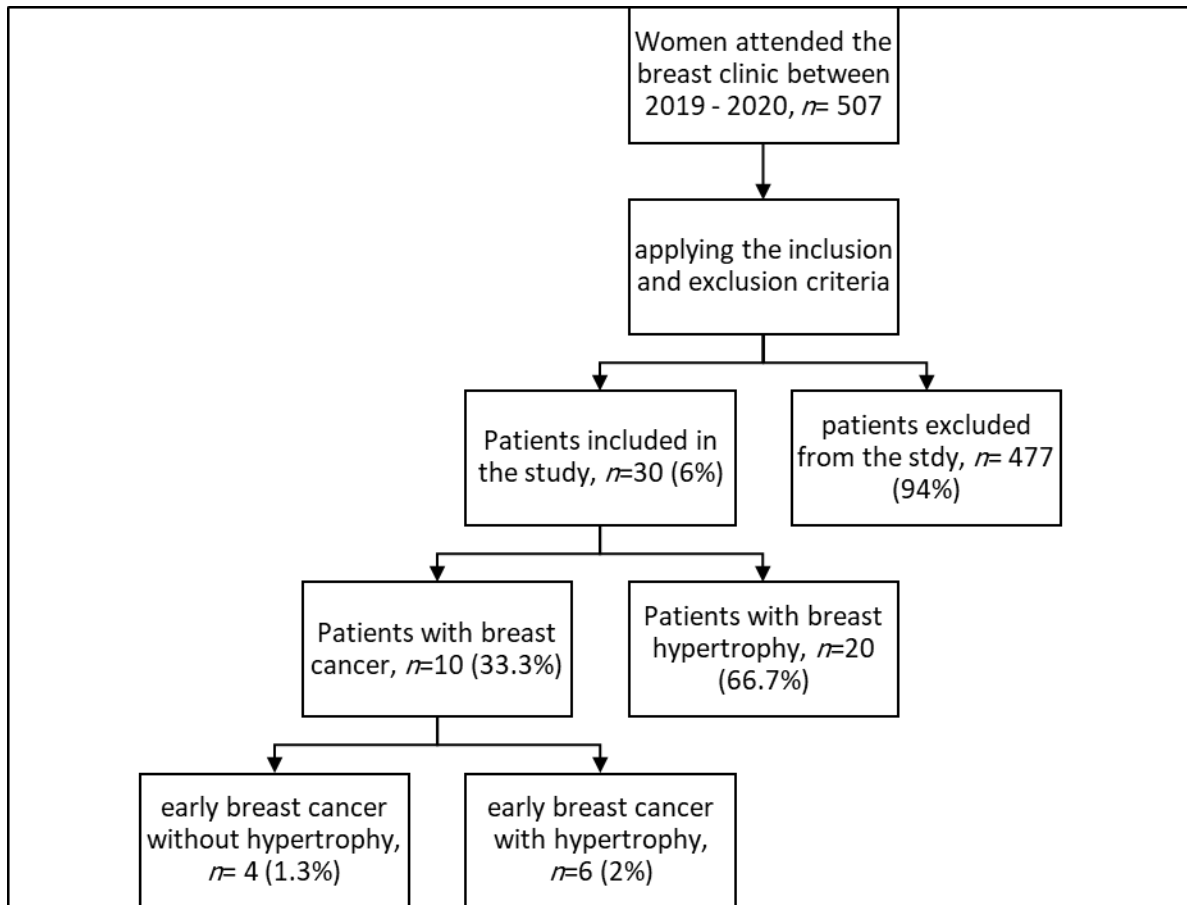


Figure 1: Flowchart showing the process of patients' selection