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# Conventional Surgical Drainage versus Surgical Percutaneous Tube Drainage with Saline Irrigation for Breast Abscess

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## Abstract:

**Background:** Managing breast abscesses poses clinical challenges, prompting a spectrum of treatment options. aimed to evaluate and compare the efficacy, complications and overall outcomes between the invasive technique of conventional incision and drainage (I&D) and the minimally invasive procedure involving percutaneous drain placement in the management of breast abscesses. **Methods:** This prospective randomized comparative study was carried out on 52 participants recruited from surgery department at Benha University hospital and Benha Teaching hospital. The patient was divided into 2 equal groups: Group A: patients underwent for percutaneous placement of two tubes drain and irrigation by saline as a breast access management. Group B: patients underwent for I&D as breast access management. **Results:** In group B, there were significantly higher compared to group A regarding hospital stay (P<0.001). Minimal scar formation was significantly lower in group B compared to group A while ugly scar was significantly lower in group A compared to group B(P<0.001). Continuation of breast feeding was significantly higher in group A compared to group B (P= 0.002). Moreover, healing time was significantly faster in group A compared to group B (P< 0.001). The recurrence rate was insignificantly different between both groups; however, it was lower in group A compared to group B. Group A showed significantly better cosmetic satisfaction compared to group B (P=0.022). **Conclusion:** Percutaneous Tube Drainage with Saline Irrigation could be an effective alternative to incision and surgical drainage in selected cases with acceptable success rate, less healing time, less post intervention pain, better cosmetic outcome.

**Keywords:** Conventional Surgical Drainage, Surgical Percutaneous Tube Drainage, Saline Irrigation, Breast Abscess.

## Introduction

A multifaceted clinical situation is presented by breast abscesses, which are defined by the accumulation of fluid within the breast and contained by a pyogenic membrane [(1)]. These abscesses manifest either intrinsically from breast tissue infections or extrinsically due to neighboring structure infections [(2)].Their intrinsic nature further categorizes them into locational or non-locational origins [(3)]. Mastitis, a complication often associated with breastfeeding, disproportionately affects primiparous women [(4)]. Within lactational mastitis cases, the reported incidence of subsequent breast abscesses ranges between 4.8% and 11% [(5)].

Managing breast abscesses poses clinical challenges, prompting a spectrum of treatment options. Initial measures involve antibiotics, analgesics, breast support, and local heat application [(6)]. However, as abscess formation progresses, the need for drainage becomes imperative [(4)]. Traditional treatment methods involve incision and drainage (I&D), preferably employed in cases of skin necrosis or evident pus discharge but fraught with limitations when the skin remains intact [(7)].

In recent years, a shift towards minimally invasive techniques has emerged. This transition involves percutaneous tube drain placement with saline irrigation, offering reducing post operative pain and cosmetic benefits compared to conventional I&D methods [(8)]. Aligning with contemporary surgical philosophies, these minimally invasive approaches aim to optimize outcomes while minimizing patient discomfort and aesthetic concerns [(9)].

Nevertheless, conventional I&D techniques present drawbacks, including heightened pain, delayed healing, and prolonged breastfeeding cessation. Considering the demographic primarily affected, predominantly young women, scar formation stands as a significant concern, urging exploration into alternative, less invasive methods [(10)].

In an effort to evaluate and contrast the efficacy, complications, and overall outcomes of the conventional I&D technique and the minimally invasive procedure that entails the implantation of a percutaneous drain in the treatment of breast abscesses, this investigation was conducted.

## Patients and methods

This prospective randomized comparative study was carried out on 52 participants recruited from surgery department at Benha University Hospitals and Benha Teaching Hospital from April of 2024 to April of 2025.

The patients provided written consent that was informed. The purpose of the study was explained to each patient, and they were assigned a secret code number. The research was conducted with the approval of the Research Ethics Committee at the Faculty of Medicine at Benha University **Approval code:** MS 10-4-2024.

**Inclusion criteria were** breast abscess cavity of any size and women of any age.

**Exclusion criteria were** women with clinical suspicion of malignancy and pregnant women.

**Grouping:**

Patients were selected and divided into two equal groups: **Group A (n=26):** patients underwent for percutaneous placement of two tubes drain and irrigation by saline as a breast access management. **Group B (n=26):** patients underwent for I&D as a breast access management.

Each case that was examined underwent the subsequent procedures **: Detailed history taking, including** [personal history (personal data as age), present history (complaint, history of present illness), past history (Chronic medical disorders and past surgical history)]. **Full clinical examination: General examination including [**vital signs (Blood pressure, temperature, heart rate), breast examination including (inspection, palpation, assessment of lymph nodes), nipple examination]. **Routine laboratory**

**investigations [**complete blood count, coagulation profile, random blood glucose level, and urine analysis, C-Reactive Protein (CRP), pus culture and sensitivity, ECG for cardiac and high-risk patients].

**Ultrasonography evaluation:** The primary imaging modality for the assessment of a suspected breast abscess. It aids in the identification of fluid collections and the differentiation of abscesses from other masses. Mammography is less frequently employed in acute contexts; however, it may be contemplated in specific circumstances, particularly when malignancy is suspected.

**Biopsy:** Biopsy is indicated in:[suspicion of Malignancy, non-resolving or recurrent abscesses, unclear diagnosis]. Biopsy is not indicated in: [Typical acute breast abscess, clear response to treatment, no suspicion of malignancy or systemic disease].

**Percutaneous 2 tubes drainage with saline irrigation:**

The patient was placed supine; part was cleaned and draped. The Ultrasonologist does localization of breast abscess Entry and exit point was marked in the longest axis of abscess, the entry point being superior and exit inferior. Under general anesthesia a local infiltration with 0.5% lignocaine local anesthesia at the entry and exit point 5 mm incision given at the entry point. 18Fr trocar was inserted at the entry point, and it traversed diagonally through the entire unilocular cavity or multiple loculi in a multilocular cavity and came out at the exit point. The tube drain was introduced guided by US through a small incision about 5mm on the pointed part of the breast abscess, and another one introduced inferior also guided by US through a small incision in the most dependant part of the abscess. Fistula probe was attached and advanced into the abscess cavity. Inside the abscess cavity, the fistula probe was dislodged from the drain and was used to break the loculi. Pus was aspirated through the tube, and a sample was sent for culture and sensitivity test. After that, the cavity was irrigated with normal saline and betadine using the superior drain and excreted through the inferior drain. The drains were fixed with silk 2-0 suture. The drain was removed when <10 mL pus/24 h, and on ultrasound sonography (USG), there was no residual pus collection. After removing the drain, the patient was followed up for 6 months.

**Conventional surgical drainage:**

For each operation, Encor implemented its 7-gauge VABB system. Real-time ultrasound guidance was achieved by employing high-resolution linear array transducers that operated at 7.5 MHz in the implementation of a Chison Q6 ultrasound system. The patients were subsequently stabilized in a supine position following the sterilization and draping of the affected region. Under general anesthesia, a combination of 0.5% lidocaine, 1:200,000 epinephrine, and 80-100 ml of normal saline solution was used to administer local anesthesia. A clean cut was made at the access site using the blade. After draining, a portion of the pus was sent for bacteriological culture. If there were any septa between abscesses, they were opened using artery forceps or a little finger inserted through the incision. The full drainage was confirmed with a sonographic rescan that ran both horizontally and vertically. 100-250 mL of normal saline solution was used to irrigate the previous abscess cavity in order to remove cellular debris and surface pathogens. The next step is to insert a pack into the remaining cavity through the incision. The surface microorganisms or tissue were eradicated by irrigating the previous abscess cavity with normal saline on a daily basis after the pack was removed.

**Pharmacologic administration and supportive measures:**

The patients were kept under observation for a few hours and then discharged on Tab. Amoxicillin + Clavulanic acid TDS × 5 days, along with Tab. Clindamycin TDS

× 5 days. Tab. Diclofenac was given as required . The antibiotic regimen may be modified in accordance with the sputum culture and sensitivity report, if necessary. In addition, the significance of appropriate nutrition, sufficient fluids, and adequate rest was raised.

**Evaluation & follow-up:**

For the purpose of postoperative evaluation, the blood test and breast ultrasonography were repeated for a period of three days until comprehensive resolution. Pain was evaluated using a Numeric Rating Scale (NRS) both during the dressing's application and postoperatively. The pain index was documented using the NRS [(11)], from 0 to 10, where 0 represents no discomfort and 10 represents the most severe possible agony. Moreover, in order to offer additional insights into patient experiences, patient satisfaction levels were assessed using a Likert scale [(12)].

**Statistical analysis**

We used SPSS v26 (IBM Inc., Armonk, NY, USA) for our statistical reporting and analysis. Our quantitative data was described using the mean and standard deviation (SD). An isolated Student's t-test was implemented to evaluate the two groups. The dependent variable groups are connected through the analysis of variance (ANOVA) with repeated measures, which tests this property in a variety of methods. The qualitative variables were assessed using Fisher's exact test or a Chi-square test, and the results were presented as frequencies and percentages. The two-tailed P value was considered significant in the statistical analysis when it was less than 0.05.

## Results

**Figure 1** shows 78 patients were assessed for eligibility, 19 patients did not meet the criteria and 7 patients refused to participate in the study. The remaining 52 patients were randomly allocated into two equal groups (26 patients in each). All allocated patients were followed-up and analyzed statistically.

The baseline characteristics were insignificantly different between both groups. There was an insignificant difference between both groups, regarding duration of symptoms, inverted and damaged nipples, fever and breast redness and swelling. The abscess cavity, size of abscess under USG and side of abscess were insignificantly different between both groups. Regarding the surgical data, the volume of drained pus was significantly higher in group A compared to group B (P<0.001). There was insignificant difference between both groups regarding to operation time and sustained or massive hemorrhage. **Table 1**

Postoperative pain was significantly lower in group A compared to group B (P=0.020), while preoperative pain was insignificantly different between both groups. NRS postoperatively, at day 1 and 2 was significantly lower in group A compared to group B (P<0.05), with insignificant difference between both groups regarding preoperative NRS. **Table 2**

In group B, there was significantly higher compared to group A regarding to the duration of drainage(P<0.001). There was insignificant difference between both groups according to culture organism and duration of antibiotics. **Table 3**

Regarding the outcome, the hospital stay was significantly shorter in group A compared to group B (P<0.001). Minimal scar formation was significantly higher in group A compared to group B while ugly scar was significantly higher in group B compared to group A (P<0.001). Continuation of breast feeding was significantly higher in group A compared to group B (P= 0.002). Moreover, healing time was significantly faster in group A compared to group B (P< 0.001). The recurrence rate was insignificantly different between both groups; however, in group A compared to group B there was lower. Group A showed significantly better cosmetic satisfaction compared to group B (P=0.022). **Table 4**

**Table 1:** Baseline characteristics, symptoms, clinical data of abscess and surgical data of the studied groups

| | | | Group A (n=26) | Group B (n=26) | P-value |
|---|---|---|---|---|---|
| Age (years) | | | 28.65± 7.06 | 28.27± 6.36 | 0.837 |
| Weight (kg) | | | 75.96± 10.71 | 73.38± 12.78 | 0.434 |
| Height (m) | | | 1.66± 0.04 | 1.66± 0.05 | 0.950 |
| BMI (kg/m$^2$) | | | 27.72± 4.38 | 26.68± 4.56 | 0.409 |
| Residence | | **Urban** | 12(46.15%) | 14(53.85%) | 0.555 |
| | | **Rural** | 14(53.85%) | 12(46.15%) | |
| symptoms | **Duration of symptoms (days)** | | 9.85 ± 3.37 | 10.62 ± 3.07 | 0.394 |
| | **Nipples** | **Inverted nipples** | 4 (15.38%) | 7 (26.92%) | 0.308 |
| | | **Damaged nipples** | 3 (11.54%) | 5 (19.23%) | 0.703 |
| | **Fever** | | 10 (38.46%) | 8 (30.77%) | 0.560 |
| | **Breast redness and swelling** | | 22 (84.62%) | 24 (92.31%) | 0.668 |
| Clinical data of abscess | **Abscess cavity** | **Single** | 15 (57.69%) | 17 (65.38%) | 0.569 |
| | | **Multiple** | 11 (42.31%) | 9 (34.62%) | |
| | **Size of abscess under USG (cm)** | **< 3 cm** | 3 (11.54%) | 4 (15.38%) | 0.668 |
| | | **3-5 cm** | 5 (19.23%) | 8 (30.77%) | |
| | | **> 5 cm** | 18 (69.23%) | 14 (53.85%) | |
| | **Side of abscess** | **Right** | 14 (53.85%) | 10 (38.46%) | 0.513 |
| | | **Left** | 11 (42.31%) | 16 (61.54%) | |
| | | **Bilateral** | 1 (3.85%) | 0 (0%) | |
| Surgical data | **Operation time (min)** | | 40.42 ± 6.09 | 38.54 ± 6.47 | 0.285 |
| | **Sustained or massive haemorrhage** | | 0 (0%) | 0 (0%) | --- |
| | **Volume of drained pus (ml)** | | 233.23 ± 38.23 | 138.04 ± 49.17 | **<0.001*** |

Data are presented as mean ± SD or frequency (%), BMI: Body mass index *: statistically significant different as p value <0.05

**Table 2:** Pain and NRS of the studied groups

| | | Group A (n=26) | Group B (n=26) | P-value |
|---|---|---|---|---|
| Pain | **Preoperative** | 25 (96.15%) | 25 (96.15%) | 1.00 |
| | **Postoperative** | 5 (19.23%) | 13 (50%) | **0.020*** |
| NRS | **Preoperative** | 7.83 ± 0.78 | 7.96 ± 0.82 | 0.584 |
| | **Postoperative** | 2.7 ± 1.22 | 3.7 ± 1.89 | **0.039*** |
| | **Day 1** | 1.43 ± 1.12 | 3.09 ± 0.73 | **<0.001*** |
| | **Day 2** | 0.78 ± 0.6 | 1.83 ± 0.94 | **<0.001*** |

Data are presented as mean ± SD or frequency (%), NRS: Numeric Rating Scale, *: statistically significant different as p value <0.05.

**Table 3:** Postoperative data of the studied groups

| | | Group A (n=26) | Group B (n=26) | P-value |
|---|---|---|---|---|
| Duration of drainage (days) | | 4.35 ± 1.23 | 7.83 ± 2.17 | **<0.001*** |
| Culture organism | **Staphylococcus aureus** | 18 (69.23%) | 16 (61.54%) | 0.758 |
| | **MRSA** | 6 (23.08%) | 5 (19.23%) | |
| | **Coagulase-negative Staphylococcus** | 1 (3.85%) | 2 (7.69%) | |
| | **Pseudomonas aeruginosa** | 1 (3.85%) | 2 (7.69%) | |
| | **Proteus mirabilis** | 0 (0%) | 1 (3.85%) | |
| Duration of antibiotics (days) | | 7.09± 2.13 | 6± 2.22 | 0.097 |

Data are presented as mean ± SD or frequency (%), MRSA: methicillin-resistant Staphylococcus aureus, *: statistically significant different as p value <0.05.

**Table 4:** Outcome and cosmetic satisfaction of the studied groups

| | | Group A (n=26) | Group B (n=26) | P-value |
|---|---|---|---|---|
| Hospital stays (hr.) | | 1.43 ± 0.51 | 3.48 ± 0.51 | **<0.001*** |
| Scar formation | **Minimal Scar** | 24 (92.31%) | 12 (46.15%) | **<0.001*** |
| | **Ugly scar** | 2 (7.69%) | 14 (53.85%) | |
| Continuation of breast feeding | | 22 (84.62%) | 10 (38.46%) | **0.002*** |
| Recurrence rate | | 1 (4.35%) | 4 (17.39%) | 0.350 |
| Healing time (days) | **1-5 days** | 10 (43.48%) | 2 (8.7%) | **<0.001*** |
| | **6-10 days** | 13 (56.52%) | 4 (17.39%) | |
| | **11-15 days** | 3 (13.04%) | 13 (56.52%) | |
| | **16-30 days** | 0 (0%) | 7 (30.43%) | |
| Cosmetic satisfaction | **Very dissatisfied** | 0 (0%) | 0 (0%) | **0.022*** |
| | **Dissatisfied** | 3 (11.54%) | 8 (30.77%) | |
| | **Neutral** | 10 (38.46%) | 13 (50%) | |
| | **Satisfied** | 15 (57.69%) | 5 (19.23%) | |
| | **Very satisfied** | 0 (0%) | 0 (0%) | |

Data are presented as mean ± SD or frequency (%), *: statistically significant different as p value <0.05

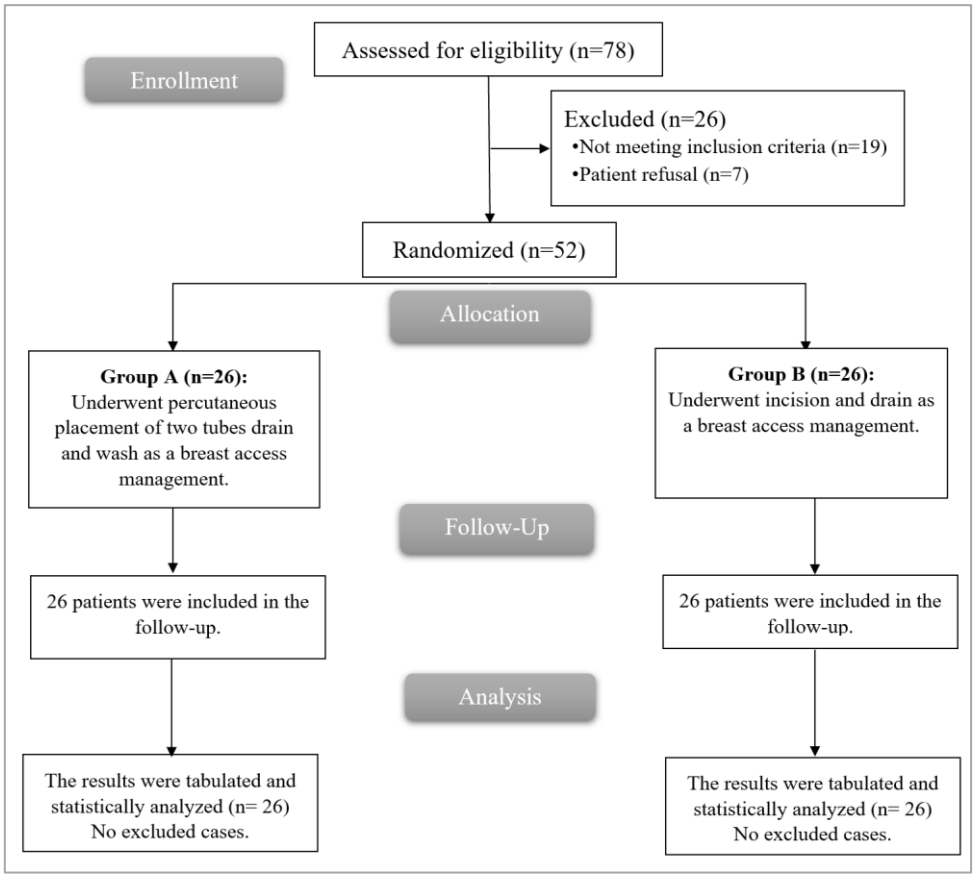


**Figure 1:** CONSORT flowchart of the enrolled patients

## Discussion

An abscess in the breast is a pyogenic membrane-enclosed localized accumulation of purulent material [(13)].

Breast abscesses have traditionally been treated with I&D and antibiotic administration. Nevertheless, percutaneous tube drainage with saline irrigation using USG has become more prevalent in the treatment of large abscesses [(14)]. It may be necessary to perform I&D and wound debridement for superficial abscesses with epidermal necrosis.

Regarding the results, the baseline characteristics (age, weight, height, BMI and residence) were insignificantly different between both groups.

Further, Pal and researchers [(15)] found that the age was statically indifferent between group A (30.34 ± 9.53 years) and group B (26.33 ± 7.16 years) (P=0.125).

Regarding symptoms of the patients, there was an insignificant difference between both groups, regarding duration of symptoms, inverted and damaged nipples, fever and breast redness and swelling.

In accordance with our results, Soni and colleagues[(16)] showed that in the percutaneous tube drainage group, 19 patients (63.33%) exhibited swelling in the right upper quadrant of the breast, while in the I&D group, this swelling was observed in 24 patients (80%).

Also, Pal and researchers [(15)] confirmed our results as they found that group of breast abscess underwent percutaneous tube drainage and group of underwent I&D for breast abscess were statically indifferent between duration of symptoms, pain, and lump (P=0.340, 1, 0.109 respectively), however the study disagreed to ours as they stated that fever was statically different between two groups (P=0.027).

Regarding the results, the abscess cavity, size of abscess under USG and side of abscess were insignificantly different between both groups.

Pal et al. [(15)] had similar results as they demonstrated that size of breast abscess and laterality of abscess were indifferent between group of breast abscess underwent percutaneous tube drainage and group underwent I&D for breast abscess.

The volume of drained pus was significantly higher in group A than in group B on the basis of the surgical data (P<0.001).Operation time and sustained or massive hemorrhage were insignificantly different between both groups.

Contrary, Rajkumar and others [(17)] indicated group A had a mean volume of drained pus of 77.32 cc, while Group B had a mean volume of drained pus of 90.59 cc.

Based on our findings, group A experienced significantly less postoperative pain than group B (P=0.020), The two groups did not differ significantly in terms of preoperative discomfort. However, the NRS was significantly lower in group A than in group B on the first and second postoperative days (P<0.05). Regarding preoperative NRS, the two groups did not differ significantly.

Furthermore, Fathy and colleagues [(18)] conducted that the pain was almost equal on day 1, whereas it was less in group A than group B on day 2 and day 3.

Our results (P<0.001) demonstrate that the drainage duration was significantly shorter in group A than in group B. The culture organism and duration of antibiotics were insignificant difference between both groups.

Moreover, Zhou others [(19)] In women with breast abscesses, the percutaneous tube drainage group was related to a shorter healing time (weighted mean differences = −11.02, 95% CI [−15.14, −6.90]; p < .001).

As for the outcome, the hospital stay was significantly shorter in group A than in

group B (P<0.001). Group A exhibited significantly more minimal scar formation than group B, while group B exhibited significantly more unsightly scars (P<0.001). Breastfeeding continuation rates in Group B were significantly lower than those in Group A (P=0.002). Furthermore, group B showed a significantly longer recuperation period than group A (P< 0.001). Nevertheless, group A experienced a lower recurrence rate than group B, despite the fact that the two groups were not significantly different. Additionally, Chroma et al. [(20)] I have been informed that the I&D procedure resulted in a prolonged hospital stay, the formation of a fistula, the cessation of breast feeding, the formation of unsightly lesions, and a high recurrence rate.

Our results state that Group A showed significantly better cosmetic satisfaction compared to group B (P=0.022).

Ghunaim and colleagues [(21)] observed that the level of contentment among patients in the percutaneous tube drainage group and the I&D group was significantly different. In a clinical study that compared the scars with the Manchester scar scale, the percutaneous tube drainage group demonstrated a lower mean score (P = 0.0008) than the I&D group. After three months, the patients in the percutaneous tube drainage group were exceedingly pleased with the aesthetic results of the treatment, as there were no breast deformations or visible lesions.

The limitations of the study were relatively small sample size inevitably lowered the statistical power of the analysis. Single-center study making the results less generalizable.

## Conclusion

Percutaneous Tube Drainage could be an effective alternative to incision and surgical drainage in selected cases with acceptable success rate, less healing time, less post intervention pain, better cosmetic outcome.

Therefore, further investigations with larger and stratified sample size are recommended for more accurate results. Multi-center study is recommended.

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**Conflicts of interest**

No conflicts of interest

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