Section: Miscellaneous

Original Research Article

TO STUDY THE FEASIBILITY OF ULTRASOUND GUIDED PERCUTANEOUS DRAINAGE OF BREAST ABSCESS AND ITS COMPARSION WITH INCISION AND DRAINAGE

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ABSTRACT

Background: Breast abscesses are a common clinical problem, especially among lactating women, traditionally managed by incision and drainage. However, this approach often results in prolonged healing, scar formation, and higher recurrence rates. Ultrasound-guided percutaneous drainage has emerged as a minimally invasive alternative, offering potential benefits in terms of reduced morbidity, faster recovery, and better cosmetic outcomes. The aim is to assess the feasibility, effectiveness, and outcomes of ultrasound-guided percutaneous drainage of breast abscesses and to compare it with conventional incision and drainage.

Materials and Methods: This prospective study was conducted at the Department of Surgery and Radio Diagnosis, Sardar Vallabh Bhai Patel Hospital, Meerut, from May 2021 to October 2022. Fifty patients with breast abscesses were randomly divided into two groups of 25 each. One group underwent ultrasound-guided percutaneous drainage with repeated aspiration, while the other group was treated with conventional incision and drainage. All patients underwent relevant clinical and radiological assessments, and treatment outcomes were compared in terms of healing duration, recurrence, complications, scar formation, number of hospital visits, and need for hospital stay.

Results: The majority of patients were in the 15–35 years age group, with lactational abscesses being predominant in both groups. The average amount of pus drained was comparable between the groups. Staphylococcus aureus was isolated in 40% of cases, showing maximum sensitivity to Amoxycillin-Clavulanic acid. All patients in the ultrasound group were managed with local anaesthesia, whereas 32% of the incision and drainage group required general anaesthesia or intercostal block. The ultrasound-guided group had a significantly shorter healing duration (7.16 days vs. 19.08 days, $p < 0.001$), no visible scar formation, and a lower recurrence rate (8% vs. 28%). Subareolar abscesses showed a particularly high recurrence rate in the incision and drainage group. Complications were fewer and less severe in the ultrasound group.

Conclusion: Ultrasound-guided percutaneous drainage is a safe, effective, and minimally invasive first-line treatment for breast abscesses, providing faster healing, excellent cosmetic outcomes, and fewer recurrences. This approach should be preferred wherever facilities and expertise are available, especially in cases of subareolar abscesses, where conventional methods are associated with higher complications and recurrence rates.

Keywords: Breast Abscess, Ultrasound-Guided Aspiration, Incision and Drainage, Minimally Invasive, Recurrence.

INTRODUCTION

The breast, particularly during lactation, is one of the most frequent sites for abscess formation. Breast abscesses represent a significant cause of morbidity among women, especially lactating mothers, where milk stasis and bacterial invasion create an ideal environment for infection and subsequent abscess formation. The occurrence of breast abscesses is not a new clinical challenge; they have been recognized and treated for centuries. However, the approach to management has evolved considerably over time, particularly in the context of modern advancements and shifting societal preferences toward less invasive treatment options. Historically, the diagnosis of a breast abscess has been straightforward, typically based on clinical evaluation supplemented by imaging modalities when required. Nevertheless, the paradigm of treatment has undergone critical reevaluation, driven by increasing patient awareness, cosmetic considerations, and the desire for minimally invasive interventions.[1]

In the past, the standard treatment for breast abscesses primarily involved surgical incision and drainage, a method that, while effective, often left noticeable scars and necessitated prolonged healing times. Additionally, the procedure typically required hospitalization, administration of general anesthesia, and sometimes resulted in interruption of breastfeeding, which could have both psychological and nutritional implications for the mother and the infant.[2] The emerging emphasis on body image, combined with the drive for faster recovery and reduced hospital stays, has led clinicians to explore alternative therapeutic strategies that align better with patients' expectations and modern healthcare standards.[3]

The integration of ultrasonography into the diagnostic and therapeutic arsenal for breast abscesses represents a significant advancement. Ultrasonography, due to its real-time imaging capability, non-invasiveness, and widespread availability, has become the diagnostic modality of choice in the evaluation of breast abscesses. It not only facilitates prompt diagnosis but also plays a crucial role in guiding minimally invasive interventions such as percutaneous needle aspiration or catheter drainage. These ultrasound-guided procedures have gained considerable traction because they aim to effectively treat the abscess while preserving the aesthetic integrity of the breast, minimizing pain, and often allowing patients to continue breastfeeding.[4]

Despite the promising nature of ultrasound-guided percutaneous drainage, it is evident that this modality has not yet fully supplanted the conventional incision and drainage procedure in routine clinical practice. Several factors contribute to this hesitation. There is still a degree of skepticism regarding the completeness of abscess evacuation, the possibility of recurrence, and the overall success rate when compared to the time-tested surgical method. Moreover, a notable lack of large-scale, randomized clinical trials and long-term follow-up data has somewhat hindered the widespread acceptance of this minimally invasive approach. Much of the current literature is derived from limited studies with relatively small patient cohorts, thereby restricting the establishment of definitive clinical guidelines.[5]

Another consideration in the management of breast abscesses is the concern regarding antibiotic penetration into the abscess cavity, especially when opting for less invasive treatments. In cases of extensive infection or when multiple loculations are present, percutaneous drainage may require multiple sessions or adjunctive procedures, raising questions about its efficiency compared to traditional methods. Additionally, the technical expertise required to perform ultrasound-guided drainage effectively may not be universally available, particularly in resource-limited settings. This logistical constraint further contributes to the reliance on surgical incision and drainage in many healthcare facilities.[6]

Nevertheless, the patient-centric advantages of ultrasound-guided percutaneous drainage cannot be overlooked. The procedure is typically performed on an outpatient basis, reduces the need for general anesthesia, and is associated with minimal discomfort and rapid return to daily activities. From a psychological perspective, preserving the cosmetic appearance of the breast and maintaining the ability to breastfeed are highly valued by patients, contributing to better overall satisfaction with care. These benefits underscore the necessity for more comprehensive studies to compare the efficacy, safety, and recurrence rates of ultrasound-guided drainage versus conventional surgical drainage in the management of breast abscesses.

MATERIALS AND METHODS

The proposed study was conducted in the Department of Surgery & Radio Diagnosis, Sardar Vallabh Bhai Patel Hospital, Meerut, during the period of May 2021 to October 2022. The study included a total of 50 patients who were randomly divided into two groups of 25 each. One group underwent ultrasound-guided aspiration, and the other group underwent incision and drainage. Patients were selected from both Outpatient Department (OPD) and Emergency Department.

Selection of Patient

Patients of all age groups were included in the study. After obtaining informed consent, patients were subjected to routine investigations, which included Hemoglobin (Hb), Total Leukocyte Count (TLC), Differential Leukocyte Count (DLC), Blood Sugar levels, Bleeding Time (BT), Clotting Time (CT), Prothrombin Time (PT), along with a thorough clinical history. Clinical history encompassed obstetric history, menstrual history, family history, lactational history, and socio-economic status. Only

those patients presenting with breast abscesses without skin involvement were considered eligible for ultrasound-guided aspiration.

Methodology: On the day of admission, an ultrasound examination was conducted, and the abscess was drained percutaneously under local anesthesia using a 16/18-gauge needle, continuing until the loculi of the abscess collapsed. In cases of large, multiloculated abscesses, continuous drainage using a pigtail catheter was employed, followed by saline irrigation, or separate aspiration of each loculus was performed. The pus obtained was sent to the Department of Microbiology for culture and sensitivity testing for both aerobic and anaerobic organisms, as well as Gram staining.

After aspiration, the abscess cavity was irrigated with normal saline and betadine solution until the effluent was clear. All patients were started on Amoxicillin/Clavulanic Acid 625 mg orally every 8 hours for a duration of 72 hours. Antibiotics were subsequently adjusted based on the results of the culture and sensitivity reports.

Patients were reassessed on the 3rd, 5th, and 7th days after the procedure, with evaluations carried out both clinically and radiologically. The clinical assessment included subjective features such as the presence or absence of fever and pain, and objective features like the size of induration and the presence of overlying skin edema. Radiological evaluation using ultrasound focused on measuring the size of the abscess cavity, identifying the presence of loculations, and determining the size of individual loculi. In cases where the abscess persisted on the 3rd or 5th day, guided aspiration and saline irrigation were repeated, and antibiotics were modified from the 3rd day onwards based on the culture and sensitivity reports. Patients were further evaluated on the 7th day. Failure of treatment was defined by the persistence or increase in abscess size even after three guided aspiration attempts within 7 days, continuous aspiration of pus on the 7th day, sustained systemic and local symptoms, or the persistent presence of pathogens after 5 days of treatment. Patients who failed to respond to guided aspiration were managed with incision and drainage, and the number of such failures was recorded. The criteria for cure included the absence of both local and systemic clinical features, the absence of pathogens on the 5th day of culture and sensitivity testing, and no pus collection detected on ultrasound examination. In the second group, patients who provided informed consent underwent incision and drainage under local or general anesthesia, followed by irrigation of the cavity and packing with betadine-soaked gauze. Daily dressings were performed, and patients were reassessed on the 7th day, with subsequent weekly evaluations until the wound completely healed. Antibiotics were administered for 7 days in this group.

RESULTS

[Table 1] Age Distribution, Site Distribution, and Lactational Status

In the present study, age distribution revealed that the majority of patients belonged to the 15–35 years age group. In the ultrasound-guided aspiration group, 9 patients (36%) were between 15–25 years, 14 patients (56%) were between 26–35 years, while only 1 patient (4%) was in the 36–45 years age bracket, and 1 patient (4%) was above 46 years. Comparatively, in the incision and drainage group, 13 patients (52%) were aged between 15–25 years, 10 patients (40%) between 26–35 years, and 2 patients (8%) between 36–45 years, with no patients above 46 years. These results suggest that breast abscesses are more prevalent among younger women, particularly during their reproductive years.

Site distribution analysis showed that in the ultrasound-guided aspiration group, 14 cases (56%) involved the right breast and 11 cases (44%) involved the left breast. Similarly, in the incision and drainage group, right breast involvement was slightly higher with 18 cases (72%) compared to 7 cases (28%) of left breast involvement. Thus, the right breast appeared marginally more prone to abscess formation in both groups.

Regarding lactational status, 17 patients (68%) in the ultrasound group were lactating, whereas 16 patients (64%) were lactating in the incision and drainage group. Non-lactational abscesses accounted for 8 cases (32%) in the ultrasound group and 9 cases (36%) in the incision and drainage group. This confirms that lactational abscesses remain the predominant cause of breast abscesses in the study population.

[Table 2] Amount of Pus Drained

The average amount of pus drained in the ultrasound-guided aspiration group was 58.48 mL, while the incision and drainage group showed a slightly higher average of 63.32 mL. Although the volume of pus was marginally more in the incision and drainage group, the difference was not clinically significant. Both groups had comparable abscess sizes, indicating that the extent of pus collection was similar, and did not affect the choice of treatment modality significantly.

[Table 3] Distribution of Pathogens and Antibiotic Sensitivity Pattern

Microbiological evaluation of pus samples revealed that Staphylococcus aureus was isolated in 20 cases, accounting for 40% of the total, while 30 cases (60%) showed sterile culture with no microbial growth. This indicates that a considerable proportion of abscesses, particularly in their early stages, may present as sterile due to prior antibiotic use or limitations in culture techniques.

Among the culture-positive cases, antibiotic sensitivity testing demonstrated that Amoxycillin with Clavulanic acid was effective in 12 cases (60%), Ciprofloxacin in 7 cases (35%), and Cloxacillin in 1

case (5%). These findings support the continued empirical use of Amoxycillin-Clavulanic acid as a first-line treatment, while highlighting the need for culture-guided antibiotic adjustments where necessary.

[Table 4] Type of Anaesthesia Used

The type of anaesthesia varied significantly between the groups. In the incision and drainage group, 4 patients (16%) required general anaesthesia, 17 patients (68%) underwent the procedure under local infiltration, and 4 patients (16%) received an intercostal block. Conversely, all 25 patients (100%) in the ultrasound-guided aspiration group were managed with local infiltration alone, without the need for general anaesthesia or intercostal blocks. This reflects the minimally invasive nature of ultrasound-guided aspiration, making it a more comfortable and safer procedure, especially for patients unsuitable for general anaesthesia.

[Table 5] Healing Duration, Scar Formation, and Recurrence

The average duration of healing in the ultrasound-guided aspiration group was significantly shorter at 7.16 days compared to 19.08 days in the incision and drainage group. Statistical analysis ($t_{48} = 4.091$, $p < 0.001$) confirmed that this difference was highly significant, indicating faster recovery with ultrasound-guided aspiration.

Scar formation differed dramatically between groups. None of the patients in the ultrasound group developed any scar, whereas patients in the incision and drainage group had scar lengths averaging 1.96 cm, with scar sizes ranging from 1 to 4 cm. The cosmetic advantage of ultrasound-guided aspiration is therefore evident.

Recurrence rates were also favorable for the ultrasound group, with only 2 patients (8%) experiencing recurrent abscesses compared to 7 patients (28%) in the incision and drainage group. Subareolar abscesses accounted for 4 of the 7 recurrences (57%) in the incision and drainage group, highlighting a higher recurrence risk associated with this anatomical location.

[Table 6] Complications

Complication rates were generally low across both groups, but the patterns varied. In the ultrasound-guided aspiration group, 2 patients developed milk fistulas, while there were no cases of mamillary fistulas or scarred nipple-areolar complexes. Conversely, in the incision and drainage group, no milk fistulas were reported, but 2 patients developed mamillary fistulas. Importantly, neither group reported scarred nipple-areolar complexes. Overall, the complication profile favored the ultrasound-guided group, with fewer and less invasive complications compared to the surgical drainage group.

Table 1: Age Distribution, Site Distribution, and Lactational Status

Parameter	Ultrasound Aspiration Group (n = 25)	Incision & Drainage Group (n = 25)
Age Distribution		
15 – 25 years	9	13
26 – 35 years	14	10
36 – 45 years	1	2
> 46 years	1	0
Site Distribution		
Right Breast	14	18
Left Breast	11	7
Lactational Status		
Lactational	17	16
Non-Lactational	8	9

Table 2: Amount of Pus Drained

Parameter	Ultrasound Aspiration Group	Incision & Drainage Group
Amount of Pus Drained (Average)	58.48 mL	63.32 mL

Table 3: Distribution of Pathogens and Antibiotic Sensitivity Pattern

Parameter	Number of Cases	Percentage
Pathogen Distribution		
Staphylococcus Aureus	20	40%
Sterile (No growth)	30	60%
Antibiotic Sensitivity Pattern (Out of 20 positive cases)		
Amoxycillin + Clavulanic Acid	12	60%
Ciprofloxacin	7	35%
Cloxacillin	1	5%

Table 4: Type of Anaesthesia Used

Group	General Anaesthesia	Local Infiltration	Intercostal Block
Incision and Drainage Group	4	17	4
Ultrasound Group	0	25	0

Table 5: Healing Duration, Scar Formation, and Recurrence

Parameter	Ultrasound Group	Incision & Drainage Group
Average Duration of Healing	7.16 days	19.08 days
Average Length of Scar	Nil	1.96 cm
Recurrence (Number of Cases)	2 (8%)	7 (28%)

Table 6: Complications

Group	Milk Fistula	Mamillary Fistula	Scarred Nipple Areolar Complex
Ultrasound Group	2	0	0
Incision and Drainage Group	0	2	0

DISCUSSION

Percutaneous drainage of abscess cavity under image control is a well-established procedure, especially for anatomical sites where open surgery is likely to be associated with morbidity. Multiple loculations and multiple abscess sites were traditionally considered relative contraindications, but this limitation has been convincingly overcome by the use of multiple punctures or multiple catheters, achieving equal efficacy. Incision and drainage remain the standard treatment for breast abscesses; however, incision with primary suturing is gradually gaining acceptance and is currently being practiced. Although this form of treatment provides early healing compared to conventional incision and drainage, a linear scar is still unavoidable. Furthermore, a higher recurrence rate of up to 24% has been noted in some studies.[7]

A retrospective review of these 50 patients revealed that 74% were in the 15 to 35 years age group, which corroborates previous studies showing the mean age to be approximately 22.3 years,[8] indicating that the disease predominantly affects women of childbearing age. Additionally, 48% of patients were primipara, suggesting that increased parity may serve as a relative protective factor against the development of breast abscesses. This aligns with previous figures indicating a 9:7 ratio favoring primipara over multipara.[9]

Lactation history was present in 66% of cases, supporting the hypothesis that milk stasis and carrier state of the infant play a key role in breast abscess development, as also noted in earlier studies,[10] which highlighted trauma, infection, and milk stasis as the three primary factors contributing to breast abscess formation.

In this study, the right breast was affected twice as frequently as the left. The inferolateral quadrant of the right breast was involved in 30% of cases, supporting the findings of previous studies 8 that trauma to the inferior lateral quadrant of the pendulous, lactating breast may be a significant etiological factor. The lateral dominance (right vs. left) may also correlate with the patient's handedness.

Subareolar abscesses contributed significantly to the total number of cases, accounting for 24% of the total. This finding contrasts with earlier studies that labeled subareolar abscess as an uncommon entity.[11] Furthermore, 90% of patients with subareolar abscesses were non-lactating, suggesting that these abscesses differ significantly from lactational infections. Multiple studies have described subareolar abscesses as associated with ductal abnormalities, such as squamous metaplasia of normally cuboidal ductal epithelium, keratin plugging, ductal dilatation, rupture, and subsequent periductal inflammation.

Most patients in this study were referred from the Department of Obstetrics and Gynecology, and the majority had received antibiotics prior to their surgical evaluation. Consequently, pus culture was sterile in 60% of cases, with Staphylococcus aureus isolated in the remaining 40%. These findings differ from earlier studies, which reported Staphylococcus aureus in 90% of lactational abscesses and 25% in non-lactational abscesses. Notably, no other organisms were isolated, even in subareolar abscesses where anaerobic bacteria have been implicated by other studies.[12]

The Staphylococcus aureus strains isolated in this study showed 60% sensitivity to Amoxycillin-Clavulanic acid, 35% to Ciprofloxacin, and 5% to Cloxacillin. All patients in the ultrasound group tolerated local infiltration with 2% lignocaine as anesthesia, as the procedure required only a 5 mm stab incision for drain placement. In contrast, 16% of patients in the incision and drainage group required general anesthesia, while another 16% underwent intercostal block anesthesia. Most of these patients had large pus collections exceeding 100 mL.

All patients in the ultrasound group were managed on an outpatient basis, while 8 patients (32%) in the incision and drainage group required inpatient care for durations ranging from 1 to 4 days. The recurrence rate was 8% in the ultrasound group, compared to 28% in the incision and drainage group—nearly three times higher. This higher recurrence in the incision and drainage group contradicts previous studies reporting a 4% recurrence rate for open drainage.[13] Possible reasons for this discrepancy include incomplete drainage, failure to break all loculations, or poor patient compliance.

Subareolar abscesses significantly contributed to the recurrence rate, with 80% of subareolar abscesses in the incision and drainage group recurring within 1 to 3 months. In contrast, the 8% recurrence rate in the ultrasound group aligned with figures from previous studies.[14] One of the main reasons for better outcomes in the ultrasound group was the ability to clearly visualize all fluid-filled areas and break loculi walls through repeated irrigation. Approximately 57% of recurrences in the incision and drainage

group were due to subareolar abscesses. In 3 patients, more than 2 recurrences occurred at the same site, leading to scarring of the nipple-areolar complex. All recurrent abscesses underwent further incision and drainage, with wounds packed using betadine gauze and allowed to heal by secondary intention.

In terms of complications, two patients (8%) in the ultrasound group developed milk fistulae on the 5th and 7th postoperative days. No such complications occurred in the incision and drainage group. Both milk fistula patients were treated with bromocriptine, leading to cessation of fistula output by the 3rd and 4th days, respectively.

In the incision and drainage group, two patients (8%) developed mamillary fistulae following drainage of subareolar abscesses. These patients experienced recurrent abscesses at the para-areolar region, with spontaneous ruptures. One patient underwent fistulotomy under general anesthesia, revealing a communication between the para-areolar opening and a lactiferous duct. This patient responded well post-surgery. The second patient developed another discharging para-areolar opening even after fistulotomy and subsequently underwent complete duct excision under general anesthesia. Postoperative recovery was uneventful, with no recurrence at 6-month follow-up.

All ultrasound group patients were managed as outpatients, reporting on alternate days for serial ultrasound evaluation of abscess size, clinical signs, symptoms, and drainage quality. Meticulous saline irrigation or repeated aspiration was performed on alternate days. The average number of hospital visits in this group was 6.6 (ranging from 3 to 9), with healing duration varying from 3 to 30 days (average 7.16 days). These results align with earlier studies reporting healing durations of 4 to 7 days.

Patients in the incision and drainage group required daily outpatient visits for dressing and packing, allowing wounds to heal by secondary intention. Total hospital visits ranged from 7 to 40, with a mean of 16.68. Healing duration ranged from 11 to 45 days, with an average of 19.08 days.

In terms of scarring, most ultrasound group patients had no visible or only barely perceptible scars. Conversely, most incision and drainage group patients developed scar marks ranging from 1 to 4 cm, with an average scar length of 1.96 cm.

CONCLUSION

In conclusion, it can be stated that ultrasound-guided percutaneous drainage represents a highly effective, minimally invasive first-line treatment option for breast abscesses, particularly in settings where the necessary facilities and expertise are available. The technique not only offers excellent cosmetic outcomes by avoiding scars but also significantly reduces healing time, recurrence rates, and the need for hospitalization, making it a patient-friendly and efficient alternative to conventional surgical methods.

REFERENCES

1. Haagensen CD. Diseases of the breast. 3rd ed. Philadelphia: Saunders; 1986. p. 384-393.
2. Precce PE. The breast. In: Cuschieri A, Giles OR, Moosa AR, editors. Essential Surgical Practice. Bristol: Wright; 1982. p. 811-831.
3. McGuinness FG, Musgrove GS. An epidemic of puerperal mastitis. Can Med Assoc J. 1952;67:20.
4. Colbeck JC. An extensive outbreak of staphylococcal infections in maternity units. Can Med Assoc J. 1949;61:557.
5. Marshall BR, Hepper JK, Zirbel CC. Sporadic puerperal mastitis: An infection that need not interrupt lactation. JAMA. 1975;233:1377.
6. Nieby JR, Spence MR, Parmley TH. Sporadic (non-epidemic) puerperal mastitis. J Reprod Med. 1978;20:97.
7. Gerzof SG, Johnson WC, Robbins AH, Nabseth DC. Expanded criteria for percutaneous abscess drainage. Arch Surg. 1985;120:227-232.
8. Dipple AL, Johnstone RA. Am J Obstet Gynecol. 1929;29:258.
9. Peckham CII. Bull Johns Hopkins Hosp. 1933;52:325.
10. Newton M, Newton NR. The let-down reflex in human lactation. J Pediatr. 1948;33:698.
11. Karstrup S, Nolsoe C, Brabrand K, Nielsen KR. Ultrasonically guided percutaneous drainage of breast abscesses. Acta Radiol. 1990;31:157-159.
12. Garg P, Rathee SK, Lal A. J Indian Med Assoc. 1997;95(11):584-585.
13. Applebaum RM. The modern management of successful breastfeeding. Pediatr Clin North Am. 1970;17:203-225.
14. Tan SM, Low SC. Breast abscesses in lactating women: Percutaneous treatment under ultrasound guidance. Aust N Z J Surg. 1998;68:423-424.