

DRAINAGE OF BREAST ABSCESES BY CONVENTIONAL INCISION AND DRAINAGE VERSUS ULTRASOUND-GUIDED NEEDLE ASPIRATION/REASPIRATION IN A TERTIARY HEALTH CARE CENTRE

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ABSTRACT

Background: Breast abscesses require timely treatment to prevent complications and preserve breastfeeding. Incision and drainage (I&D) is effective but invasive, whereas ultrasound-guided needle aspiration (USG-NA) offers a minimally invasive alternative. **Aim and Objectives:** To compare I&D with USG-NA in the management of breast abscesses. **Materials and Methods:** This prospective randomized controlled trial included 52 patients with clinically and ultrasonographically confirmed breast abscesses at a tertiary care teaching hospital over one year. Eligible patients aged >12 years with primary breast abscesses were consecutively enrolled and randomized to I&D or USG-NA. Recurrent, chronic, and tuberculous abscesses were excluded. Outcomes included postoperative pain, residual abscess, recurrence, cosmetic outcome, abscess resolution, and complications. Statistical significance was set at $p < 0.05$. **Results:** Baseline characteristics were comparable between groups (all $p > 0.05$). Recurrence was numerically higher with USG-NA than I&D (69.2% vs. 53.8%), but the difference was not significant ($p = 0.392$). Cosmetic outcomes numerically favoured USG-NA (46.2% vs. 26.9%), without statistical significance ($p = 0.259$). Postoperative pain was significantly higher in the I&D group ($p < 0.0001$). Hospital stay ($p = 0.160$), residual abscess ($p = 1.000$), complications ($p = 0.535$), and abscess resolution time ($p = 0.177$) showed no significant differences. **Conclusion:** USG-NA was associated with significantly lower postoperative pain than I&D. Cosmetic outcomes favoured USG-NA, while recurrence was numerically higher, although neither difference was statistically significant. USG-NA may be considered a minimally invasive option for selected patients prioritizing comfort and cosmetic preservation.

INTRODUCTION

Breast abscess is a localized collection of pus within breast parenchyma caused by bacterial infection. It is observed in women during lactation and is also reported in non-lactating women and in men, where it may develop as a sequela of mastitis.^[1] Clinical features include breast pain, swelling, erythema, induration, fever, cellulitis, and systemic infection. Inadequate treatment results in chronic abscess and recurrence. Breastfeeding cessation occurs in affected lactating women. Psychological distress is reported.^[2] Management includes incision and drainage with evacuation of purulent material and

drain placement when indicated.^[3] Reported complications include cutaneous scarring, secondary wound infection, delayed healing, prolonged hospitalization, and recurrence due to incomplete evacuation or obstruction of the cavity.^[4] Deep-seated abscess presents technical difficulty with open surgical approach

Ultrasound-guided needle aspiration (USG-NA) is a minimally invasive procedure for drainage of breast abscess. It is used for small and deep-seated collections. The technique involves percutaneous needle insertion into the abscess cavity under real-time ultrasonographic guidance with aspiration of purulent material. Ultrasound guidance enables

accurate localization and reduces procedural injury. The procedure is performed in an outpatient setting. Reported outcomes include reduced postoperative pain, shorter recovery period, and minimal scarring.^[5] Studies report comparable rates of abscess resolution and recurrence between USG-NA and incision and drainage.^[6]

Uniform treatment guidelines are not established for selection between USG-NA and incision and drainage. Treatment decisions usually follow practical factors such as abscess size, site, severity, and what the patient prefers.^[7,8] Earlier studies have reported mixed results, and many of them were limited by small cohorts, short follow-up, or differences in how treatment success was defined. Clinicians often depend on their own experience, hospital practice, and case-specific findings when selecting a procedure.^[9] Therefore, the present study examines the outcomes of conventional I&D compared with USG-NA for managing breast abscesses in a tertiary care centre.

Aim

This study aimed to compare I&D with USG-NA/re-aspiration (under antibiotic coverage) in the management of breast abscess with respect to residual abscess, recurrence, and clinical outcomes based on functional and cosmetic criteria.

MATERIALS AND METHODS

This prospective, randomized controlled trial included 52 patients with a clinical diagnosis of breast abscess and was conducted in the Department of General Surgery, Government Thiruvannamalai Medical College and Hospital, during the study period from April 2023 to 2024. Ethical approval was granted by the Institutional Ethics Committee (16/2023/IEC), and written informed consent was obtained from all participants before enrolment. The flow of participants through screening, eligibility assessment, randomization, follow-up, and analysis is shown in Figure 1.

Inclusion Criteria

Patients older than 12 years with a clinical diagnosis of breast abscess, confirmed through history, physical examination, and ultrasound, were eligible for inclusion. Only those who provided written informed consent were enrolled.

Exclusion Criteria

Patients with breast abscesses caused by conditions such as tuberculosis, recurrent or chronic breast abscesses, who refused to participate were excluded.

Sample size justification

A total of 52 patients were enrolled consecutively during the one-year study period, including all eligible and consenting patients presenting to the surgical outpatient or emergency unit. No formal a priori power calculation was performed; the sample size was based on the number of eligible patients recruited during the study period.

Methods

All procedures were performed by surgeons trained in breast abscess management according to institutional protocol. Ultrasound-guided procedures used a linear high-frequency probe. Post-procedure antibiotics and analgesics followed the same regimen in both groups. Patients were allocated into two groups by computer-generated randomization table. Baseline variables including age and abscess size were distributed equally between groups.

Group 1 underwent incision and drainage, and general anaesthesia was administered. A stab incision was performed with an 11-blade at the point of maximal fluctuation. Purulent material was drained and the cavity was explored. A wick gauze dressing was inserted to ensure continued drainage and prevent re-accumulation. Post-procedural management included systemic antibiotics, analgesic therapy, and clinical monitoring for complications.

Group 2 underwent ultrasound-guided needle aspiration following administration of local anaesthesia. A 16-gauge needle was inserted into the abscess cavity under real-time ultrasonographic guidance. Purulent material was aspirated completely, a compressive dressing was applied, and clinical review was performed on day 7 and day 14. Re-accumulation was managed by repeat aspiration under ultrasound guidance. Antibiotics and analgesics were administered as standard treatment. Clinical data were recorded in a structured case record form. Variables included demographic details, clinical history, examination findings, ultrasound confirmation, and procedure performed. Post-procedure complications and follow-up findings were documented. Follow-up assessment on day 7 and day 14 included evaluation of erythema, swelling, tenderness, and fever. Resolution was assessed clinically and by ultrasound for residual collection. Wound complications and infection were recorded. Recurrence was managed by repeat aspiration or incision and drainage according to protocol.

Outcome assessment was carried out by clinicians who were not involved in the procedures to limit observer bias. All assessors used a standard clinical and ultrasonographic protocol. Residual abscess referred to any collection still present on examination or ultrasound during follow-up. Recurrence referred to re-accumulation of pus requiring intervention within 30 days. Cosmetic outcome was graded on a three-point scale (good, fair, poor). Functional outcome was based on return to routine activities, including breastfeeding. Pain was measured using a 10-point Visual Analogue Scale (VAS).

The primary outcomes were residual abscess, recurrence, and functional and cosmetic results. Secondary outcomes included postoperative complications and patient satisfaction with the aesthetic and overall outcome.

Statistical analysis

Data were analysed using statistical software. Descriptive statistics (mean, standard deviation) were

used for demographic characteristics. For categorical data, the chi-square test was used to compare the two groups. The continuous data were analysed using t-tests for normally distributed variables and Mann-Whitney U tests for non-normally distributed data. A p-value of <0.05 was considered significant. Normality of continuous variables was assessed using the Shapiro–Wilk test. Statistical analysis was performed using SPSS software (v26). All analyses followed a complete-case approach as no missing data occurred.

RESULTS

A total of 52 patients presenting with breast abscess during the study period were screened and all fulfilled the eligibility criteria. No patients were excluded. All 52 participants were randomised equally into two groups (26 in Group 1 and 26 in Group 2) and completed follow-up. No dropouts or protocol deviations occurred (Figure 1).

Baseline characteristics such as age distribution ($p = 0.184$), parity ($p = 0.153$), lactation status ($p = 0.521$), and side involved ($p = 1.000$) were similar between the two groups, with no significant differences ($p > 0.05$). Residual abscess formation ($p = 1.000$) and complications ($p = 0.535$) did not differ significantly between the groups ($p > 0.05$). Culture patterns showed a mix of *E. coli*, *Klebsiella*, Methicillin-resistant *Staphylococcus aureus* (MRSA), and no-growth isolates in both groups, with significant differences ($p = 0.035$). Recurrence was higher in Group 2 (69.2%) compared to Group 1 (53.8%), but the difference was not statistically significant ($p = 0.392$). Cosmetic results favoured Group 2, with 12 (46.2%) achieving good cosmetic outcomes, compared to 7 (26.9%) in Group 1 ($p = 0.259$). [Table 1]

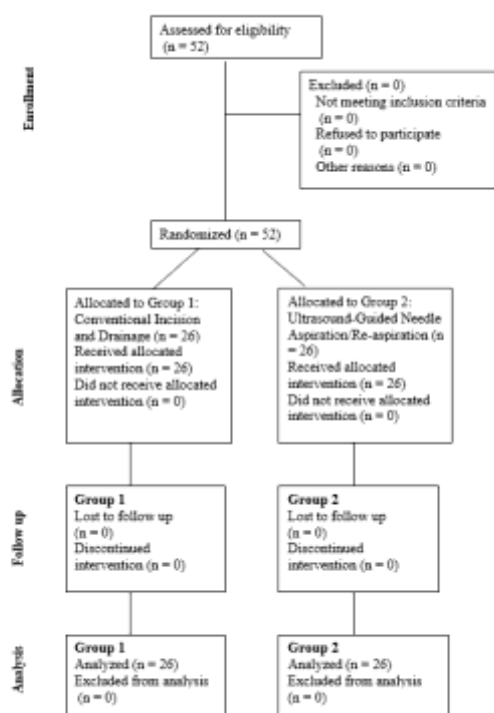


Figure 1: CONSORT flow diagram

Table 1: Comparison of baseline characteristics, culture patterns, and outcome variables between the two groups

Category	Sub-category	Group 1	Group 2	P value
Age group in years	< 25	7 (26.9%)	6 (23.1%)	0.184
	26 – 40	10 (38.5%)	16 (61.5%)	
	> 40	9 (34.6%)	4 (15.4%)	
Parity	P0	6 (23.1%)	10 (38.5%)	0.153
	P1L1	6 (23.1%)	6 (23.1%)	
	P2L2	3 (11.5%)	6 (23.1%)	
	P3L3	11 (42.3%)	4 (15.4%)	
Lactating	Yes	18 (69.2%)	21 (80.8%)	0.521
	No	8 (30.8%)	5 (19.2%)	
Side	Left	14 (53.8%)	15 (57.7%)	1.000
	Right	12 (46.2%)	11 (42.3%)	
Residual collection	Yes	15 (57.7%)	14 (56%)	1.000
	No	11 (42.3%)	12 (44%)	
Culture	<i>E. coli</i>	6 (23.1%)	10 (38.5%)	0.035
	<i>Klebsiella</i>	7 (26.9%)	2 (7.7%)	
	MRSA	7 (26.9%)	2 (7.7%)	
	No Growth	6 (23.1%)	12 (46.2%)	
Recurrence	Yes	14 (53.8%)	18 (69.2%)	0.392
	No	12 (46.2%)	8 (30.8%)	
Complications	Sinus formation	14 (53.8%)	10 (38.5%)	0.535
	Reinfection	5 (19.2%)	7 (26.9%)	
	None	7 (26.9%)	9 (34.6%)	
Cosmetic Results	Good	7 (26.9%)	12 (46.2%)	0.259

	Fair	11 (42.3%)	10 (38.5%)
	Poor	8 (30.8%)	4 (15.4%)

Duration of symptoms was significantly higher in Group 1 ($p < 0.0001$). Size ($p = 0.194$), volume ($p = 0.974$), abscess resolution time ($p = 0.177$), and follow-up duration ($p = 0.685$) did not differ

significantly between the two groups ($p > 0.05$). Pain score was significantly higher in Group 1 ($p < 0.0001$), while hospital stay did not differ significantly ($p = 0.160$). [Table 2]

Table 2: Comparison of clinical parameters between the two groups (mean $\pm$ SD)

Category	Group 1	Group 2	P value
Duration of symptoms	8.33 $\pm$ 3.12	4.69 $\pm$ 1.51	<0.0001
Size	4.95 $\pm$ 1.34	4.40 $\pm$ 1.66	0.194
Volume	32.40 $\pm$ 9.70	32.30 $\pm$ 12.74	0.974
Abscess resolution	10.65 $\pm$ 3.01	9.58 $\pm$ 2.62	0.177
Pain score	9.58 $\pm$ 2.62	5.12 $\pm$ 2.17	<0.0001
Hospital stays	3.42 $\pm$ 1.63	2.79 $\pm$ 1.56	0.160
Follow up	4.92 $\pm$ 1.74	5.12 $\pm$ 1.80	0.685

DISCUSSION

This study compared I&D with USG-NA in the management of breast abscesses. USG-NA demonstrated lower postoperative pain scores compared with incision and drainage. Cosmetic outcomes showed a numerical advantage in the USG-NA group without statistical significance. Recurrence was numerically higher in the USG-NA group, although the difference did not reach statistical significance. Duration of hospital stay and time to abscess resolution did not differ between groups. Rates of residual collection and procedure-related complications were similar. Bhat et al. reported the mean duration of illness (10.36 $\pm$ 2.50 vs 8.06 $\pm$ 2.83 days; $p = 0.012$) was longer and greater scarring in the incision and drainage group (15.0% vs 3.4%; $p = 0.002$) and higher fistulisation (8.3% vs 0%; $p = 0.024$), compared to USG-guided aspiration group.^[10]

Similarly, Pal et al., reported lower post-procedural pain in the USG-NA and reported no difference in hospital stay and abscess resolution between USG-guided needle aspiration and surgical drainage. Residual collection and complication rates were also similar in both studies. Also, they reported better cosmetic outcomes with USG-NA due to higher scar formation in the surgical drainage group (0 vs 16; $p < 0.0001$), whereas our study showed only a non-significant numerical advantage in cosmetic results (good: 26.9% vs 46.2%; $p = 0.259$).^[11] Similarly, Agarwal et al., reported higher post-operative pain in the incision and drainage group, where 64% of patients had a VAS score of 6, while 78% of patients in the USG-guided aspiration group had a VAS score of 0.^[12] In another study by, Kasabe and Shetty, reported higher postoperative pain in the incision and drainage group, where 83.33% of patients experienced moderate to severe pain, while 100% of patients in the aspiration group had only mild pain.^[13] These studies documented lower postoperative discomfort and earlier return to routine activity following aspiration when compared with incision and drainage. The observed reduction in pain scores

with USG-NA is consistent with minimally invasive access and limited tissue manipulation.

The difference in cosmetic outcome in the present study did not reach statistical significance. Needle-based drainage involves limited tissue dissection and reduced cutaneous disruption. Group 2 showed a higher recurrence rate in our study. Ghunaim et al., reported incomplete drainage with ultrasound-guided aspiration in large or multiloculated abscesses.^[3] The difference in recurrence between groups in the present study did not reach statistical significance. Variation may relate to abscess size, loculation, or procedural factors. Incomplete evacuation remains a consideration in complex collections managed by aspiration. Incision and drainage provide wide cavity exposure and dependent drainage. Recurrence occurred in both groups, with a higher numerical rate in Group 2. Similarly, Kasabe and Shetty reported recurrence rate was lower in the aspiration group (0%) compared to 20% in the incision and drainage group.^[13]

Lower pain scores in Group 2 indicate percutaneous access without surgical incision and limited tissue manipulation. Cosmetic assessment showed fewer visible scars in the aspiration group. Absence of incision eliminates cutaneous scar formation associated with open drainage. Reported variability in recurrence across studies corresponds to differences in abscess dimensions, presence of septations, needle gauge, drainage technique, and operator proficiency.

Agarwal et al. reported longer resolution time in the incision and drainage group (58% requiring 11–15 days) compared to the USG aspiration group (48% resolving within 1–5 days).^[12] Mean resolution time in the present study was higher in Group 1 compared with Group 2, with no statistical significance. This suggests that USG-NA does not necessarily accelerate abscess resolution but may offer patient-centred advantages such as reduced pain and earlier return to routine functioning.

Postoperative complications in this study showed no significant differences between the two groups, with both experiencing risks such as sinus formation and reinfection. Previous comparative studies have

reported higher post-operative pain scores in patients undergoing incision and drainage compared to ultrasound-guided aspiration. Sinus formation and delayed wound healing were described with open drainage. Similarly, Kasabe and Shetty reported higher complications rate after incision and drainage (83.33%) compared to aspiration (6.66%; $p < 0.0001$).^[13] The present data show comparable overall complication rates between procedures. Procedure selection requires assessment of abscess characteristics and patient factors.

Microbiological culture distribution differed significantly between groups; however, this variation did not influence clinical outcomes. Isolates included *Escherichia coli*, *Klebsiella* species, methicillin-resistant *Staphylococcus aureus*, and sterile cultures in both groups. Nayyar et al. reported similar pathogen distribution across drainage modalities.¹ The drainage technique does not determine bacterial spectrum. Both procedures achieve infection control across diverse organisms.

Economic evaluation and feasibility influence procedural choice. Published data demonstrate lower overall treatment cost with ultrasound-guided aspiration, attributed to shorter hospitalization and lower complication rates.^[3,14,15] In the present study, duration of hospital stay showed no significant difference between groups. Percutaneous aspiration is suitable for outpatient care and for resource-limited settings with ultrasound access. Incision and drainage remains the standard approach for large or multiloculated collections and in institutions without imaging support. Ultrasound-guided aspiration serves as a first-line intervention in selected uncomplicated abscesses. Incision and drainage ensures complete evacuation in large, complex, or septated collections. Incorporation of image-guided drainage into routine surgical practice may decrease operative burden and preserve breast tissue integrity. Pain scores were lower with ultrasound-guided aspiration. Cosmetic outcome, recurrence rate, and duration of recovery did not demonstrate statistical significance between groups. The higher recurrence rate observed in the aspiration group indicates the importance of case selection based on abscess size and loculation. Open drainage remains indicated for extensive disease. Ultrasound-guided aspiration is appropriate for small, unilocular abscesses in patients preferring a minimally invasive approach without skin incision.

Future studies require longer follow-up, stratification according to abscess size and internal architecture, and standardized aspiration techniques. Comparative trials assessing catheter drainage, adjunct antimicrobial regimens, and contrast-enhanced ultrasonography may further optimize management protocols.

CONCLUSION

Both incision and drainage and USG-NA achieved abscess resolution. USG-NA was associated with significantly lower postoperative pain, while cosmetic outcomes and duration of recovery numerically favoured aspiration without significant differences. Recurrence was numerically higher with USG-NA but was not significant. USG-NA may be considered a minimally invasive option for selected patients, particularly those prioritising reduced postoperative discomfort and cosmetic preservation.

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