

Comparison of Outcome of Incision & Drainage versus Ultrasound Guided Multiple Needle Aspirations in the Management of Breast Abscess

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ABSTRACT

Background: Breast abscess is commonly managed by incision and drainage, although ultrasound-guided needle aspiration offers a less invasive alternative.

Objective: To compare treatment success and recurrence rates between incision and drainage and ultrasound-guided multiple needle aspiration under antibiotic cover in patients with breast abscess.

Methodology: The study was a randomized controlled trial conducted in the Department of General Surgery, Combined Military Hospital, Muzaffarabad from 16th June to 16th December 2024. 140 female patients aged 20–60 years, suffering from breast abscesses were randomly divided into 2 groups of 70. Group A was treated with ultrasound guided multiple needle aspirations with antibiotics while Group B was treated with conventional incision and drainage with antibiotics. Patients were followed for two weeks and the outcome of treatment and recurrence was documented. Data were analyzed using SPSS version 23.0 and $p \leq 0.05$ was considered statistically significant.

Results: Treatment success was achieved in 64 (91.4%) patients in Group A compared with 54 (77.1%) in Group B ($p=0.020$). Recurrence occurred in 6 (8.6%) patients receiving ultrasound-guided aspiration compared with 16 (22.9%) undergoing incision and drainage ($p=0.020$). Among patients with abscesses measuring 1–4 cm, treatment success was 52 (91.2%) in Group A versus 39 (70.9%) in Group B, while recurrence was 5 (8.8%) versus 16 (29.1%), respectively ($p=0.006$). Significant differences were also observed among patients aged 20–40 years, with abscess duration of 1–4 weeks, BMI ≤ 25 kg/m², and those without comorbidity.

Conclusion: Ultrasound-guided multiple needle aspiration resulted in higher treatment success and lower recurrence than incision and drainage and may represent an effective minimally invasive treatment option for appropriately selected breast abscesses.

Keywords: Breast abscess; ultrasound-guided aspiration; needle aspiration; incision and drainage; treatment success; recurrence; minimally invasive treatment

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1. INTRODUCTION

Breast abscess is a focal area of infection with the accumulation of infected breast tissue fluid, which is the most common complication of bacterial infection [1]. It can happen in lactating or non-lactating women and manifest as breast pain, swelling, erythema, tenderness, fever, and a palpable mass [2]. In addition to lactational breast abscesses, non-lactational abscesses can occur in association with various conditions, including smoking, diabetes mellitus, obesity and underlying ductal disease [3]. Ultrasonography is helpful when an abscess is suspected, to determine the size and extent of the abscess, and to help distinguish abscess from mastitis or other breast lesions. Poor diagnosis and/or treatment can lead to chronic infection, re-infection, tissue damage and long-term symptoms [4].

Breast abscess has been classically treated with incision and drainage (I&D) with suitable antibiotic treatment as needed [5]. I&D is used to directly evacuate purulent material and is an established method of treatment which may still be used in suitable cases, especially for large, multiloculated or otherwise unsuitable abscesses [6]. But surgical drainage will involve an incision and will lead to a longer recovery period, scarring, and pain after surgery [5].

Also, in lactating women, surgical treatment can impede breast-feeding and could have a higher treatment-related morbidity rate than minimally invasive treatment [7]. This has led to a rising trend in the alternative treatment of selected breast abscesses by percutaneous aspiration [8].

Needle aspiration under ultrasound guidance is an incisionless method that allows the exact localization and removal of the cavity of the abscess without incisions [4]. The use of ultrasound is helpful for needle placement and for determining the size of the remaining abscess cavity after aspiration [9]. Complete resolution may not occur after the first procedure and repeated aspiration may be performed in patients where complete resolution was not achieved, especially in patients with residual or recurrent collections [7]. Aspiration with ultrasound guidance has been reported as a successful treatment for breast abscesses, and has been shown to have several benefits, including decreased tissue trauma, cosmetic appearance and a faster recovery than surgery, [10] and has been integrated into the practice of breast cancer.

Treatment for these abscesses with I&D versus ultrasound-guided aspiration has shown to be more or less effective depending on abscess size, location, complexity, and patient characteristics [5]. Comparative clinical data have shown that either method can resolve breast abscesses, though breast abscesses may need to be repeated aspirated or further drained via surgery in some cases of aspiration [10]. The clinical resolution, treatment failure, requirement for further procedures, recurrence, healing time, and complications of treatment are among the outcomes that are relevant to the treatment decision [6]. Hence, in patients with breast abscess, comparison of incision and drainage to ultrasound guided multiple needle aspirations under antibiotic cover is a clinically relevant basis for the evaluation of these two treatment modalities.

Research Objective

To compare the outcomes (in terms of success rate and recurrence) of incision & drainage versus ultrasound-guided multiple needle aspiration under antibiotic cover in patients with breast abscess at a tertiary care hospital.

2. MATERIALS AND METHODS

Study Design and Settings

This study was conducted as a randomized controlled trial to compare the results of ultrasound-guided multiple needle aspiration with incision and drainage in patients with breast abscess. The study was carried out in Department of General Surgery at Combined Military Hospital (CMH), Muzaffarabad.

Duration of Study

This study lasted for six months from 16 June 2024 to 16 December 2024.

Samples size and Technique

Sample size was determined using the formula for sample size from the World Health Organization, with 18% and 3% proportions of the two treatment groups, 90% power of the test, and 5% level of significance. The number of samples calculated was set at 140 patients, 70 in each group [11]. Consecutive sampling (or non-probability sampling) was employed. Patients who presented during the study period and met the inclusion criteria were consecutively and continuously included in the study until the required sample size was reached.

Inclusion and Exclusion Criteria

Female patients aged from 20-60 years having breast abscess as per the operational definition were included. Those who had been diagnosed with breast abscess for 1 week and of > 1cm size, measured with a measuring tape, were included. Patients were excluded from the study if they had a family history of breast malignancy, or if the mammogram showed any form of breast malignancy and the breast lump was hard, longstanding, and/or had palpable axillary lymph nodes. Patients with recurrent breast abscess, active pulmonary tuberculosis or tuberculous cervical lymphadenopathy and impending necrosis of the overlying breast skin were also excluded. Additionally, patients with an INR >1.5, immunocompromised patients, and patients with chronic renal failure based on history and serum creatinine levels >1.5 mg/dL were excluded.

Data Collection Method

Following ethical approval, a total of 140 patients were enrolled in the study after taking informed written consent from them who came to the Surgery Out Patient Department (SOP) and Emergency (EM) of CMH Muzaffarabad for the study. Random allocation was carried out as each participant was asked to choose one of 140 mixed slips, 70 of which indicated "A" and 70 indicated "B", and each was allocated to one of the two treatment groups. Multiple needle aspiration was performed under local anaesthetic in repeated cases as needed in the patients from Group A with antibiotic cover given as oral Co- Amoxiclav 1 g twice daily for a maximum of 14 days. In Group B, the incision and drainage was performed under general anaesthesia. Treatment was given based on the prescription of ciprofloxacin 500mg twice daily and diclofenac sodium (Denizen DS) twice daily for 10 days in both groups. All procedures were performed by the researcher. Patients were followed for two weeks and treatment success and recurrence were evaluated based on the following predetermined operational definitions and documented on a structured proforma.

Data Analysis Procedure

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The data were inputted and analyzed by SPSS version 23.0. The mean and standard deviation were used to present the quantitative variables (age, duration of breast abscess, size of breast abscess, and body mass index (BMI)). Qualitative variables such as marital status, lactation status, comorbidities, treatment success and recurrence were expressed in frequencies and percentages. The success of treatment and the recurrence rates of the two groups were compared using the Chi-square test; $p \leq 0.05$ was taken as being significant. Stratification was used to control for potential modifiers: age, lactation status, duration and size of the abscess, BMI and presence of comorbid conditions, which were then tested for their effect on treatment outcome by using post-stratification Chi-square tests. A p-value of ≤ 0.05 was taken as statistically significant.

3. RESULTS

Table I shows that the baseline characteristics were broadly comparable between the two groups. The mean age was 37.99 ± 9.92 years in Group A and 37.23 ± 8.99 years in Group B, while mean abscess duration was 3.50 ± 1.68 and 3.76 ± 1.59 weeks, respectively. Mean abscess size was 3.11 ± 1.30 cm in Group A and 3.31 ± 1.28 cm in Group B, with similar mean BMI values of 25.20 ± 3.10 and 25.29 ± 3.09 kg/m². Most patients were married, and lactation status was nearly equally distributed between groups. Hypertension and diabetes were the main reported comorbidities, while approximately two-thirds of patients in each group had no comorbidity.

Table I. Baseline demographic and clinical characteristics of patients in both groups

Variable	Category	Group A (n=70)	Group B (n=70)
Age (years)	Mean $\pm$ SD	37.99 ± 9.92	37.23 ± 8.99
Duration of abscess (weeks)	Mean $\pm$ SD	3.50 ± 1.68	3.76 ± 1.59
Size of abscess (cm)	Mean $\pm$ SD	3.11 ± 1.30	3.31 ± 1.28
BMI (kg/m ²)	Mean $\pm$ SD	25.20 ± 3.10	25.29 ± 3.09
Marital status	Married	62 (88.6%)	65 (92.9%)
	Unmarried	8 (11.4%)	5 (7.1%)
Lactation	Yes	37 (52.9%)	34 (48.6%)
	No	33 (47.1%)	36 (51.4%)
Comorbidity	Hypertension	11 (15.7%)	15 (21.4%)
	Diabetes	11 (15.7%)	8 (11.4%)
	None	48 (68.6%)	47 (67.1%)

Recurrence was significantly lower in Group A than Group B, occurring in 6 (8.6%) versus 16 (22.9%) patients, respectively ($p=0.020$). Treatment success was correspondingly higher in Group A (64, 91.4%) than Group B (54, 77.1%), with a statistically significant difference ($p=0.020$), shown in table 2.

Table 2. Recurrence and treatment success in both groups

Outcome	Response	Group A (n=70)	Group B (n=70)	p-value
Recurrence	Yes	6 (8.6%)	16 (22.9%)	0.020
	No	64 (91.4%)	54 (77.1%)	
	Total	70 (100%)	70 (100%)	
Treatment success	Yes	64 (91.4%)	54 (77.1%)	0.020
	No	6 (8.6%)	16 (22.9%)	
	Total	70 (100%)	70 (100%)	

Recurrence was significantly lower in Group A among patients aged 20–40 years (7.3% vs. 24.4%, $p=0.032$), with abscess duration of 1–4 weeks (6.2% vs. 22.7%, $p=0.023$), abscess size of 1–4 cm (8.8% vs. 29.1%, $p=0.006$), and BMI ≤ 25 kg/m² (7.5% vs. 24.4%, $p=0.036$), shown in table 3. Among patients without comorbidities, recurrence was also lower in Group A (6.2% vs. 21.3%, $p=0.033$). Other comparisons were not statistically significant ($p>0.05$).

Table 3. Stratification of recurrence according to age, lactation, duration, abscess size, and BMI in both groups

Variable	Category	Group	Recurrence: Yes, n (%)	Recurrence: No, n (%)	p-value
Age (years)	20–40	A	3 (7.3%)	38 (92.7%)	0.032
		B	11 (24.4%)	34 (75.6%)	
	41–60	A	3 (10.3%)	26 (89.7%)	0.319
		B	5 (20.0%)	20 (80.0%)	
Lactation	Yes	A	4 (10.8%)	33 (89.2%)	0.088

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Duration of abscess	No	B	9 (26.5%)	25 (73.5%)	0.099
		A	2 (6.1%)	31 (93.9%)	
		B	7 (19.4%)	29 (80.6%)	
	1–4 weeks	A	3 (6.2%)	45 (93.8%)	0.023
		B	10 (22.7%)	34 (77.3%)	
	>4 weeks	A	3 (13.6%)	19 (86.4%)	0.404
		B	6 (23.1%)	20 (76.9%)	
Abscess size	1–4 cm	A	5 (8.8%)	52 (91.2%)	0.006
		B	16 (29.1%)	39 (70.9%)	
	>4 cm	A	1 (7.7%)	12 (92.3%)	0.274
		B	0 (0.0%)	15 (100%)	
BMI (kg/m ²)	≤25	A	3 (7.5%)	37 (92.5%)	0.036
		B	11 (24.4%)	34 (75.6%)	
	>25	A	3 (10.0%)	27 (90.0%)	0.295
		B	5 (20.0%)	20 (80.0%)	
Comorbidity	Hypertension	A	2 (18.2%)	9 (81.8%)	0.612
		B	4 (26.7%)	11 (73.3%)	
	Diabetes	A	1 (9.1%)	10 (90.9%)	0.348
		B	2 (25.0%)	6 (75.0%)	
	None	A	3 (6.2%)	45 (93.8%)	0.033
		B	10 (21.3%)	37 (78.7%)	

Treatment success was significantly higher in Group A among patients aged 20–40 years (92.7% vs. 75.6%, $p=0.032$), with abscess duration of 1–4 weeks (93.8% vs. 77.3%, $p=0.023$), abscess size of 1–4 cm (91.2% vs. 70.9%, $p=0.006$), and BMI ≤ 25 kg/m² (92.5% vs. 75.6%, $p=0.036$), shown in table 4. Among patients without comorbidities, success was also higher in Group A (93.8% vs. 78.7%, $p=0.033$). Other comparisons were not statistically significant ($p>0.05$).

Table 4. Stratification of treatment success according to age, lactation, duration, abscess size, BMI, and comorbidities in both groups

Variable	Category	Group	Success: Yes, n (%)	Success: No, n (%)	p-value
Age (years)	20–40	A	38 (92.7%)	3 (7.3%)	0.032
		B	34 (75.6%)	11 (24.4%)	
	41–60	A	26 (89.7%)	3 (10.3%)	0.319
		B	20 (80.0%)	5 (20.0%)	
Lactation	Yes	A	33 (89.2%)	4 (10.8%)	0.088
		B	25 (73.5%)	9 (26.5%)	
	No	A	31 (93.9%)	2 (6.1%)	0.099
		B	29 (80.6%)	7 (19.4%)	
Duration of abscess	1–4 weeks	A	45 (93.8%)	3 (6.2%)	0.023
		B	34 (77.3%)	10 (22.7%)	
	>4 weeks	A	19 (86.4%)	3 (13.6%)	0.404
		B	20 (76.9%)	6 (23.1%)	
Abscess size	1–4 cm	A	52 (91.2%)	5 (8.8%)	0.006
		B	39 (70.9%)	16 (29.1%)	
	>4 cm	A	12 (92.3%)	1 (7.7%)	0.274
		B	15 (100%)	0 (0.0%)	
BMI (kg/m ²)	≤25	A	37 (92.5%)	3 (7.5%)	0.036
		B	34 (75.6%)	11 (24.4%)	
	>25	A	27 (90.0%)	3 (10.0%)	0.295
		B	20 (80.0%)	5 (20.0%)	
Comorbidity	Hypertension	A	9 (81.8%)	2 (18.2%)	0.612
		B	11 (73.3%)	4 (26.7%)	
	Diabetes	A	10 (90.9%)	1 (9.1%)	0.348
		B	6 (75.0%)	2 (25.0%)	
	None	A	45 (93.8%)	3 (6.2%)	0.033
		B	37 (78.7%)	10 (21.3%)	

Note: Data are presented as frequency and percentage. A = ultrasound-guided multiple needle aspiration; B = incision and drainage. $p \leq 0.05$ was considered statistically significant.

4. DISCUSSION

There were no statistically significant differences between the ultrasound-guided multiple needle aspiration (Group A) and incision and drainage (I&D; Group B) treatment success rates (91.4% vs. 77.1%, respectively; $p=0.020$). These results are similar to those of the randomized trial where ultrasound-guided aspiration was shown to heal in 93.3% of patients versus 76.6% for I&D ($p=0.033$) [12]. The antibiotic coverage and local anesthesia used for aspiration in their study were also similar to the current study.

The recurrence rate of the abscesses, defined as the proportion that recurred in each group, was 8.6% in Group A, and 22.9% in Group B ($p=0.020$) with fewer recurrent abscesses after repeated ultrasound-guided aspiration. However, the findings do not align with a previous meta-analysis conducted by Zhou et al. (2023), which combined the results of nine randomized controlled trials (RCTs) with 703 patients, that failed to show a statistically significant difference between needle aspiration and I&D for recurrence (RR=0.68, 95% CI 0.35–1.30; $p=0.241$) [13]. The difference might be due to the different selection of patients, the different aspiration protocols, the different nature of the abscesses, follow-up duration and repeated aspiration in the current study.

The stratified analysis further showed that recurrence was significantly lower with aspiration among patients aged 20–40 years (7.3% vs. 24.4%, $p=0.032$), those with abscess duration of 1–4 weeks (6.2% vs. 22.7%, $p=0.023$), abscess size of 1–4 cm (8.8% vs. 29.1%, $p=0.006$), and BMI ≤ 25 kg/m² (7.5% vs. 24.4%, $p=0.036$). This was also true in patients who did not have comorbidity (6.2% versus 21.3%, $p=0.033$). The greater effect seen in small abscesses is clinically plausible because aspiration of selected, contained abscesses may be more applicable than that of larger-volume or multicompartmental abscesses or collections, which contemporary evidence suggests are best suited to surgical drainage [14].

Treatment success was similar. Among patients aged 20–40 years, success was 92.7% with aspiration versus 75.6% with I&D ($p=0.032$); for abscesses lasting 1–4 weeks, it was 93.8% versus 77.3% ($p=0.023$); for abscesses measuring 1–4 cm, 91.2% versus 70.9% ($p=0.006$); and for BMI ≤ 25 kg/m², 92.5% versus 75.6% ($p=0.036$). The results are similar to previous studies that reported faster healing time, fewer residual abscesses, and less post-aspiration recurrence when using ultrasound-guided aspiration compared with I&D. A two-week follow up study by their group showed no recurrence after aspiration versus 28% after I&D ($p=0.012$) [15,16].

Our results were also consistent with the overall evidence in favor of minimally invasive drainage. However, in a randomized trial of treatment failure and recurrence, there was no significant difference between ultrasound guided aspiration and I&D, but in this trial, aspiration resulted in significantly shorter healing time, less postoperative pain, better scar outcomes, and greater continuation of breastfeeding [17]. Therefore, the improvement in success seen in our study should be viewed as a success of our patient population and repeated-aspiration technique, and not as a definitive improvement in the success of aspiration in all breast abscesses.

The results of the present study indicate that the treatment success rate was higher with ultrasound-guided multiple needle aspirations than with I&D (91.4% vs. 77.1%) and had fewer recurrences (8.6% vs. 22.9%) during the period of the study. Results are in favor of aspiration as a safe and effective alternative treatment for breast abscesses of appropriate size and complexity, especially smaller, uncomplicated breast abscesses. However, the 2-week follow-up period and single-center study design restrict the ability to assess for longer term recurrence and generalizability. Larger multicenter randomized trials with longer follow-up and more uniform criteria for abscess size and complexity would be helpful to determine those who benefit the most from repeated UGA.

5. STRENGTHS AND LIMITATIONS

The strength of this study is based on the randomized controlled design and the equal allocation of 140 patients to the two treatment groups, which included the same antibiotic cover, and direct comparison of UG-MNA with conventional I&D. Both primary endpoints, treatment success and recurrence, were also evaluated, and stratified analyses conducted by clinically relevant factors such as age, lactation status, abscess duration, abscess size, BMI, and presence of a comorbidity. The study has some limitations, however. It was done at a single tertiary care hospital in a relatively small sample size of 140 patients, potentially restricting the generalizability of the findings. Long-term assessment of recurrence was limited to only the follow-up period of two weeks. Further, non-probability consecutive sampling could have resulted in selection bias and detailed microbiological characteristics and antimicrobial susceptibility patterns of the abscesses were not described in this study. The fact that the patients were not blinded with any type of goggles, and that no longer term patient reported outcomes such as pain, cosmetic satisfaction, and breastfeeding continuation were reported also effect the comprehensiveness of the comparison.

6. CONCLUSION

The use of ultrasound-guided multiple needle aspiration was associated with improved treatment and remission rates than the use of conventional incision and drainage in women with breast abscesses. Larger multicenter studies with longer follow-up periods are warranted to confirm the long-term efficacy and widespread use of repeated ultrasound-guided needle

aspiration in suitably selected patients

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