Comparative study between surgical drainage of acute lactational breast abscess and ultrasound-guided needle aspiration and/or drainage

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Background
Management of breast abscess involves incision and drainage; however, this is associated with need for general anesthesia, prolonged healing time, regular dressing, difficulty in breastfeeding, and possible unsatisfactory cosmetic outcomes. Ultrasound-guided aspiration has been used successfully and is associated with less recurrence, excellent cosmetic results, and less costs.
Patients and methods
This study was conducted in the Department of General Surgery in Kasr Al-Ainy Hospital from August 2019 to March 2020. Patients admitted to the hospital with acute lactational breast abscess and met the inclusion criteria were the candidates of this study. A total of 48 female patients with acute lactational breast abscess between 18 and 50 years of age were included. The patients were randomized into group A (ultrasound-guided needle aspiration) and group B (incision and surgical drainage). The patients were followed up for 1 month after complete resolution.
Results
The mean age of patients in group A was 29.79 years and in group B was 29.04 years, the mean intervention time was 18.05 min in group A and 12.92 min in group B, and the healing time was less in group A (mean=11.6) than group B (mean=22.21). The pain was less in group A than group B in the second and third day postoperatively. All the patients were satisfied with the cosmetic results in group A, whereas in group B, only 54% of the patients were satisfied with the cosmetic outcome. Recurrence was found in two (11.8%) patients in group A, with a success rate of 70%, whereas in group B, the success rate was 100%, with no recurrence.
Conclusion
Ultrasound-guided needle aspiration could be an effective alternative to incision and surgical drainage in selected cases with acceptable success rate, less healing time, less postintervention pain, better cosmetic outcome, and without the need for general anesthesia.

Keywords:
acute lactational breast abscess, incision, surgical drainage, ultrasound-guided needle aspiration

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Introduction

Mastitis is a relatively common breast condition. It can affect patients at any time but predominates in women during the breastfeeding period [1]. It is defined as inflammation of the breast with or without infection [1].

Mastitis with infection may be lactational (puerperal) or nonlactational (e.g. duct ectasia). The causes of noninfectious mastitis include idiopathic granulomatous inflammation and other inflammatory conditions (e.g. foreign body reaction). Timely management of mastitis with antibiotics can help avoid complications [2].

A breast abscess is a localized collection of purulent material within the breast, which can be a complication of mastitis. Breast abscesses most commonly affect women aged between 18 and 45 years. In women of reproductive age, these are predominantly lactational but nonlactational abscesses are also seen in premenopausal older women [3]. Nonlactational abscesses are more common in obese patients and smokers than in the general population [4]. In Egypt,

these patients may be reviewed in a variety of health care settings including general practice, emergency department, or surgical clinic. Early referrals are essential to prevent progression into severe infection and even sepsis.

Treatment regimens generally include antibiotics, and for breast abscesses, incision and surgical drainage. As effectiveness of ultrasound-guided drainage becomes more popular, it has reduced the need for open incision and surgical drainage, even for large abscesses [5]. The predominance of *Staphylococcus aureus* allows a rational choice of antibiotic without having to wait for the results of bacteriological culture [6].

Traditionally, the management of breast abscess involves incision and drainage; however, this is associated with need for general anesthesia, prolonged healing time, regular dressing, difficulty in breastfeeding, and possible unsatisfactory cosmetic outcomes [7]. Even with the aggressive approach of incision and drainage combined with the use of antibiotics, the breast abscess recurrence rate is reported to be between 10 and 38% [8]. Breast abscesses can be treated by repeated needle aspiration with or without ultrasound guidance [9,10]. Ultrasound has been shown to be useful in the diagnosis of breast abscesses and guiding needle placement during aspiration, and also it enables visualization of multiple abscess loculation and is thus useful in needle aspiration of breast abscesses [11]. This procedure has been used successfully and is associated with less recurrence, excellent cosmetic results, and less costs [12].

Patients and methods

This study was conducted on 48 patients from August 1, 2019 to March 1, 2020 after being approved by the regional ethical committee.

The study included all female patients who came to the emergency department or the outpatient clinic of Kasr Al-Ainy Hospital diagnosed with acute lactational breast abscess.

Inclusion criteria

(1) Any lactating women diagnosed with acute breast abscess between the age 18 and 50 years were included.

Exclusion criteria

The following were the exclusion criteria:

(1) Breast abscess in nonlactating women.
(2) Immunocompromised patients.
(3) Recurrent or chronic breast abscess.
(4) Necrotic skin overlying abscess.
(5) Patients with a history of penicillin allergy.
(6) Ruptured abscess.
(7) Suspicious lesion or malignancy, especially inflammatory carcinoma of the breast.
(8) Breast abscess more than 10 cm in diameter.

Clinical diagnosis was made based on the presence of breast pain, swelling, and/or fever and incidence of a fluctuant and tender breast swelling (Fig. 1).

Patients who met the inclusion criteria were informed about this study, and a full written and oral consent was taken to enroll them into this study. Patients were randomly divided into group A (ultrasound-guided needle aspiration) and group B (incision and surgical drainage) by using the lottery method.

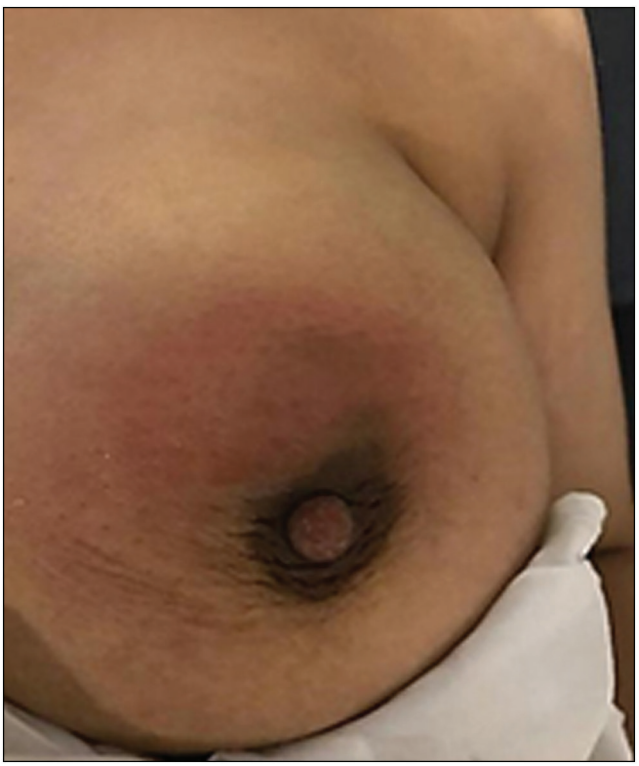
The patients diagnosed clinically were subjected to ultrasound scan (high-frequency linear transducer of 7.5 MHz) in the radiology department (Fig. 2).

Management

Patients in the incision and drainage group were admitted in the ward and prepared for surgery under general anesthesia after routine preoperative laboratory workup (CBC, INR, ALT, AST, and creatinine).

In the operation theater, the patient was positioned supine, and the breast was swabbed using 7% betadine

Figure 1

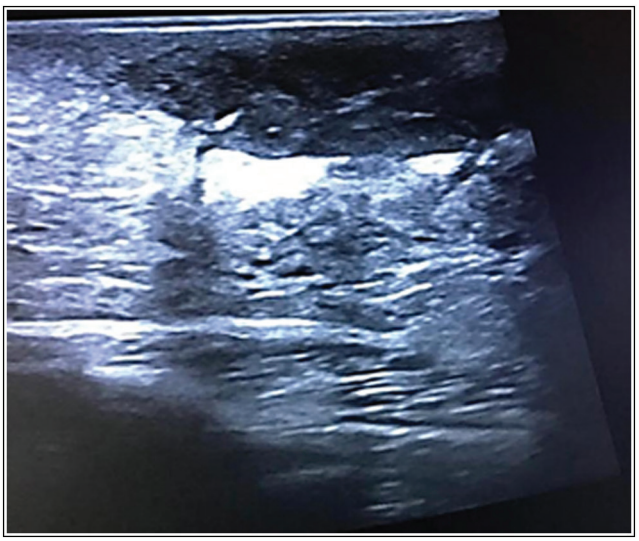


Lactational breast abscess.

solution. A skin depth incision was made over the most pointing area, and artery forceps were used to reach the abscess cavity. Initial pus was swabbed with a sterile pus swab, which was sent for culture and sensitivity. The pus was then evacuated and loculi broken down digitally, and then the wound was packed with sterile gauze. After recovery, the patient was transferred back to ward.

Postoperatively, the patient was put on analgesics and antibiotics, diclofenac 75 mg intramuscular followed by 50 mg orally was given for 3 days, as well as amoxicillin/clavulanic acid 1 g/12 hourly for 7 days.

Figure 2



Ultrasound shows abscess cavity.

All patients were discharged home on the same day to undergo daily wound dressing until the wound heals. Patients whose culture and sensitivity results showed resistance to amoxicillin were excluded from the study, and the antibiotic treatment was changed accordingly. The healing time was calculated when the wound showed complete healing. Complete resolution (healing time) was defined as complete improvement of clinical symptoms and signs.

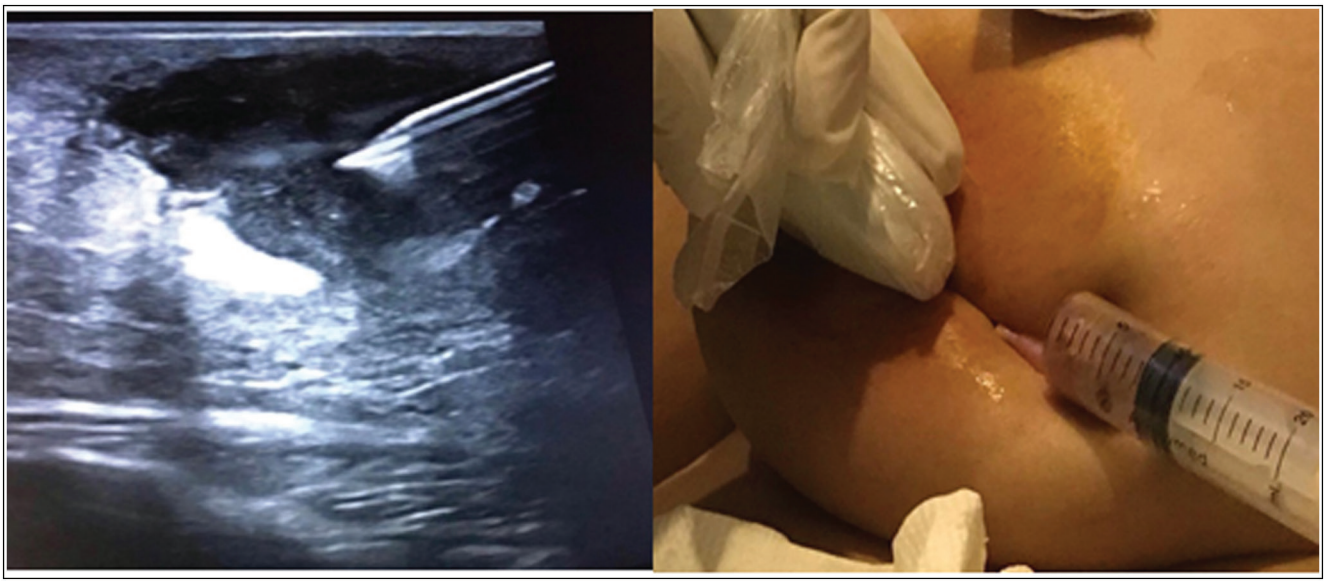
Patients in the needle aspiration group were managed in the Department of Radiology (ultrasound room) as outpatient cases. Under aseptic condition, a small area of skin adjacent to the abscess was anesthetized by 1% lignocaine. Aspiration was done under ultrasound guidance using a 16 G needle and a 20-ml syringe (Fig. 3).

Initial aspirated pus was sent for culture and sensitivity. Aspiration was repeated until there is no significant residual pus. In case of where there was residual pus, a pig tail drain was applied.

After the procedure, the patient was discharged immediately on antibiotics and analgesics, diclofenac 75 mg intramuscular followed by 50 mg orally for 3 days, as well as amoxicillin/clavulanic acid 1 g 12 hourly for 7 days. Similarly, patients whose culture and sensitivity results showed resistance to amoxicillin were excluded from the study and the antibiotic treatment was changed accordingly.

In both groups, patients were advised to resume breastfeeding on both breasts as soon as possible as they could tolerate the pain.

Figure 3



Ultrasound-guided needle aspiration of lactational breast abscess.

All patients were followed up at the outpatient clinics on days 3 and 7 until complete resolution of the abscess and then for 1 month after complete resolution.

At every follow-up, clinical assessment of symptoms and signs was done to assess resolution of the abscess, and if there was no clinical improvement, ultrasound scan was done to detect any residual pus collection.

In the situation where clinical symptoms and signs might persist in case of ultrasound-guided needle aspiration, reaspiration was tried, and if it persisted for 2 weeks from the first attempt, it was considered treatment failure (incomplete resolution) and hence converted to the traditional incision and surgical drainage.

In both groups, patients were followed up to 1 month after complete resolution; if the patient presented with the same symptoms and signs after previous complete resolution, it was considered recurrence.

After complete wound healing, all patients were asked about their satisfaction regarding the cosmetic results after the procedure using a simple questionnaire where the patient was either satisfied or dissatisfied with the final wound appearance.

Statistical analysis

Data were coded and entered using the Statistical Package for the Social Sciences (SPSS), version 26 (IBM Corp., Armonk, New York, USA). Data were summarized using mean and SD for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were done using unpaired *t* test. For comparing categorical data, χ^2 test was performed. Exact test was used instead when the expected frequency was less than 5 [13]. *P* values less than 0.05 were considered as statistically significant.

Results

This prospective randomized study included 48 female patients presented with acute lactational breast abscess recruited from the outpatient clinic and emergency department who were randomly divided into two groups.

There was no statistically significant difference regarding age between both groups, with a mean age of 29.79 ± 6.35 and 29.04 ± 6.07 years in group A and group B, respectively (*P*=0.678).

The technique of ultrasound-guided aspiration was a little bit time consuming and showed more intervention time than surgical drainage, as shown in Table 1 and Fig. 4.

After surgical drainage, more time is needed for wound to heal and for complete improvement of clinical symptoms and signs than ultrasound-guided drainage. The mean time needed for complete healing in group A was 11.16 ± 2.01, whereas in group B was 22.21 ± 3.12 (Table 2 and Fig. 5).

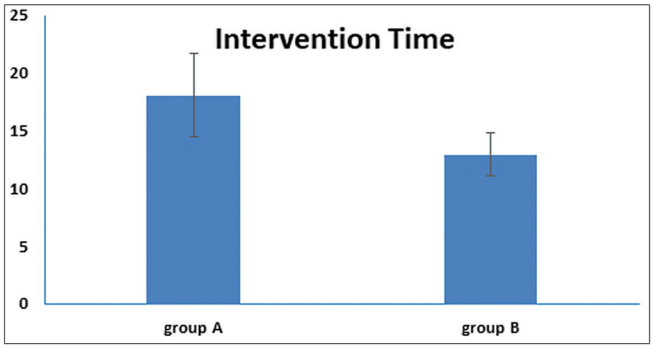
(1) The postoperative pain was assessed after intervention on day 1, day 2, and day 3 using the verbal numerical rating scale:
   (a) The pain was moderate to severe on day 1 after intervention in both groups with mean±SD of 7.47 ± 0.84 in group A and 8.08 ± 0.88 in group B.
   (b) On day 2, the pain was moderate in group A, with mean±SD of 5.63 ± 0.9, and was moderate to severe in group B, with mean±SD of 7.33 ± 0.82.
   (c) Lastly, on day 3, the pain was mild to moderate in group A, with mean±SD of 4.89 ± 1.05, and was moderate in group B, with mean±SD of 6.58 ± 0.93.
   (d) These results show that pain was almost equal on day 1, whereas it was less in group A than group B on day 2 and day 3 (Fig. 6 and Table 3).

Table 1 Comparison between the two groups in relation to the intervention time/minute

	Intervention time/minute	
	Group A	Group B
Mean±SD	18.05 ± 3.61	12.92 ± 1.86
Minimum–maximum	13–25	10–16
P value	<0.001	

P value was statistically significant between two groups (<0.001).

Figure 4



Comparison between the two groups in relation to the intervention time/minute.

N.B: *P* value was statistically significant between two groups with respect to second day (<0.001) and third day (<0.001).

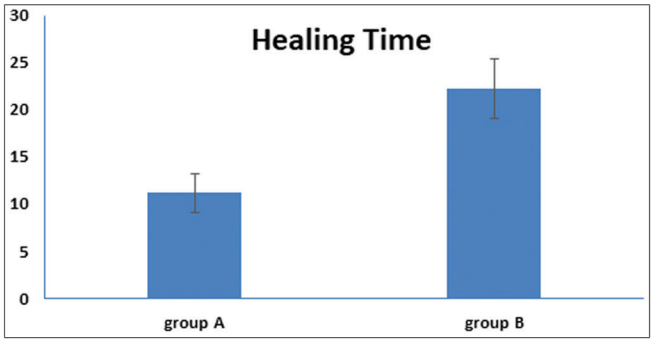
Regarding recurrent cases during the follow-up period after complete resolution, only two cases showed recurrence in the ultrasound-guided group, whereas no recurrence was detected in the surgical drainage group during the follow-up period (Table 4).

Table 2 Comparison between the two groups in relation to the healing time

	Healing time	
	Group A	Group B
Mean±SD	11.16±2.01	22.21±3.12
Minimum–maximum	8–15	17–30
P value	<0.001	

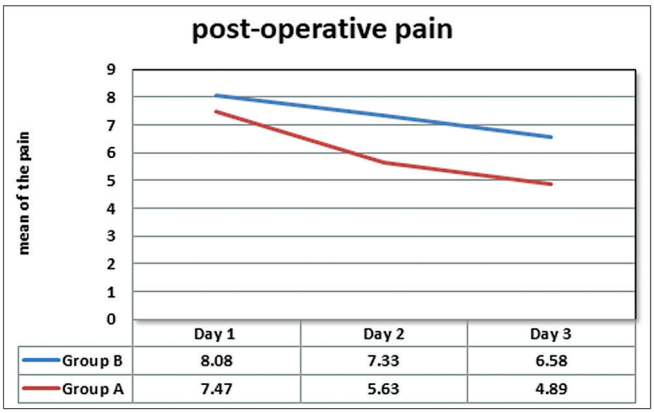
P value was statistically significant between two groups (<0.001).

Figure 5



Comparison between the two groups in relation to the healing time.

Figure 6



Comparison between the two groups in relation to the postoperative pain on the first, second, and third day.

The technique for ultrasound-guided aspiration (group A) showed a failure rate of 29.2% (seven cases), where five cases showed failure of aspiration owing to thick pus, multiloculation, or noncooperative patients and two cases showed incomplete resolution of symptoms and signs after aspiration (Table 5, Fig. 7).

Regarding the cosmetic results after complete resolution, all patients in group A were satisfied, whereas only 13 (54%) patients were satisfied in group B (Fig. 8).

Discussion

The breast is one of the women's secondary sex organs. Therefore, care should be taken in case of breast disease to ensure good cosmoses and maintain appearance and function [14]. Despite breast abscess becoming less common in developed countries, owing to improved maternal hygiene, nutrition, standard of living, and early use of antibiotics, breast abscess remains a problem among women in developing countries [14]. Treatment of breast abscess traditionally has been incision and surgical drainage; however, this has been found to be associated with possible unsatisfactory cosmetic outcome, difficult in breastfeeding, need of general anesthesia, prolonged healing time, and regular dressing. Repeated aspiration with or without ultrasound guidance has been found to be another treatment option for breast abscess, and this has been reported to be associated with less recurrence, excellent cosmetic results, and less costs [8].

This study was conducted to determine if ultrasound-guided needle aspiration is a feasible alternative treatment option for breast abscess.

In 2019, Randhawa *et al.* [5] conducted a study on 70 patients, where the mean age was calculated as 29.74 years in group A (ultrasound-guided aspiration) and 31.40 years in group B (incisional and surgical

Table 3 Comparison between the two groups in relation to the postoperative pain on the first, second, and third day

	Postoperative pain					
	Group A			Group B		
Postoperative day	First	Second	Third	First	Second	Third
Mean±SD	7.47±0.84	5.63±0.90	4.89±1.05	8.08±0.88	7.33±0.82	6.58±0.93
Minimum–maximum	6–9	4–7	3–7	5–9	6–9	5–9
P value	1st		2nd		3rd	
	0.027		<0.001		<0.001	

Table 4 Comparison between the two groups in relation to the recurrence rate

	Recurrence			
	Group A		Group B	
	Yes	No	Yes	no
Count	2	15	0	24
Percentage	11.8	88.2	0	100
P value	0.166			

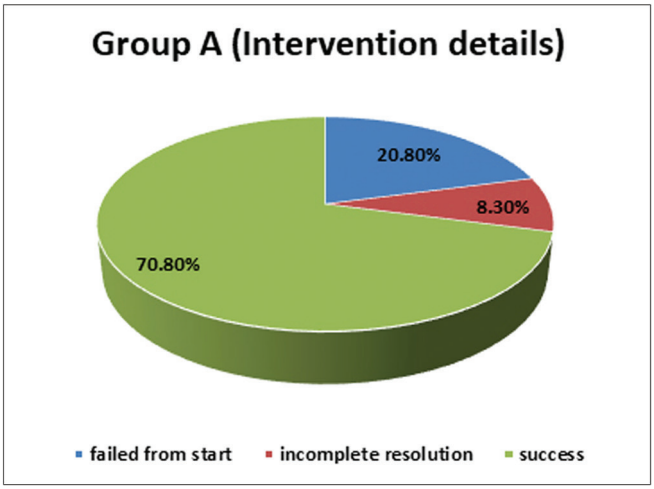
P value was statistically nonsignificant between the two groups (0.166). In group A, the total number of cases were 17 after excluding the failed cases.

Table 5 Comparison between the two groups in relation to the success rate

	Group A			Group B	
	Failed		Success	Failed	Success
Count	7		17	0	24
	5 (failed from the start)	2 (incomplete resolution)			
Percent	29.2		70.8	0	100
P value	0.009				

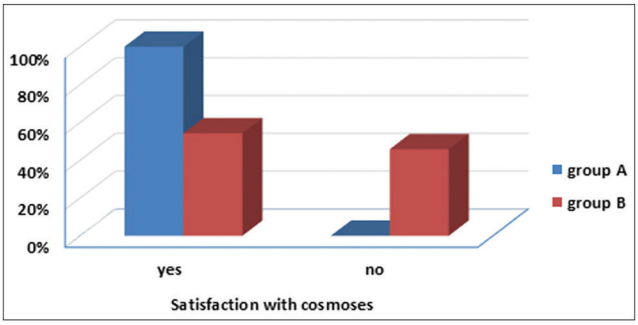
P value was statistically significant between the two groups (0.009).

Figure 7



Success rate in group A.

Figure 8



Comparison between the two groups in relation to satisfaction with cosmoses.

drainage). Comparison of the success rate was done, showing a success rate of 97.1% (*n*=34) in group A and 82.9% (*n*=29) in group B.

Randhawa *et al.* [5] found that the frequency of success rate of multiple aspirations under antibiotic cover in terms of early healing of breast abscess is significantly higher as compared with incision and drainage.

Ranjeesh and Kotha [15] conducted a study on 60 patients. The success rate was 83%. In group A (ultrasound-guided aspiration), 25 patients were treated successfully with ultrasound-guided needle aspiration. The mean time for healing was 11 days, and the longest was 23.5 days in a 5-cm abscess. This is an outpatient procedure and was cost-effective. Patient satisfaction was more in the aspiration group.

Group B patients underwent incision and drainage, but it was associated with cessation of breastfeeding, ugly scar, and prolonged healing times. The mean time of healing was 25.5 days.

Ranjeesh and Kotha [15] found that ultrasound needle aspiration in the management of uniloculated puerperal breast abscess is an effective method of treatment.

Javed *et al* [16] conducted another study on 60 female patients with breast abscess. The mean age of patients in group A (incision and surgical drainage) was 30.83 ± 5.67 years and in group B (multiple needle aspiration) was 31.53 ± 5.73 years.

Recurrence was found in seven (23.33%) patients in group A (incision and surgical drainage), whereas in 21 (70.0%) patients in group B (multiple needle aspiration), with *P* value of 0.000, which was statistically significant.

Javed *et al.* [16] observed that the recurrence rate was less after incision and drainage as compared with multiple needle aspirations for treating breast abscess.

Gandhi *et al.* [17] conducted a study on 130 female patient with breast abscess, and the mean age was 23.12. The healing rate of the two groups showed no statistically significant difference, and no recurrence was observed in the ultrasound-guided needle aspiration group, whereas the recurrence rate observed in the incision and drainage group was 3.1%.

Gandhi *et al.* [17] found that ultrasound-guided needle aspiration was highly accepted by all patients. It was more cost-effective than incision and drainage in the management of breast abscess. Therefore, ultrasound-guided needle aspiration is an effective treatment option for breast abscess.

(1) In our study, the mean±SD age was 29.79 ± 6.35 years in group A and was 29.04 ± 6.07 years in group B, which is similar to the study by Randhawa *et al.* [5], where the mean age was 29.74 + 7.636 years in group A (ultrasound-guided aspiration) and 31.40 + 9.775 years in group B (incision and surgical drainage).
    According to Javed *et al.* [16], the mean age of patients in group A (incision and surgical drainage) was 30.83 ± 5.67 years and in group B (multiple needle aspiration) was 30.83 ± 5.67 years.
    However, according to Gandhi *et al.* [17], the mean age was 23.12 years.
(2) Regarding the intervention time, it was longer in group A (mean±SD=18.02 ± 3.61) than group B (mean±SD=12.92 ± 1.86).
    This was owing to repeated repositioning of the needle as to make sure there was no residual collection.
    Among other studies done, there was no link between ultrasound-guided needle aspiration and incision and surgical drainage with respect to the intervention time.
(3) Regarding the healing time, it was longer in group B (mean±SD=22.21 ± 3.12) than group A (mean±SD=11.16 ± 2.01).
    This was similar to the results of Ranjeesh and Kotha [15] , where the mean healing time in ultrasound-guided aspiration group was 11 days. However, in the incision and drainage group, the mean healing time was 25.5 days.
    Kaushal *et al.* [18] reported that the healing time was less in the ultrasound-guided aspiration group. However, Gandhi *et al.* [17] found that there was no difference in terms of healing rate of breast abscess between ultrasound-guided aspiration and surgical incision and drainage.
(4) The pain was assessed after intervention on day 1, day 2, and day 3 using the verbal numerical rating scale:
    (a) The pain was moderate to severe on day 1 after intervention in both groups, with mean±SD of 7.47 ± 0.84 in group A and 8.08 ± 0.88 in group B.
    (b) On day 2, the pain was moderate in group A, with mean±SD of 5.63 ± 0.9, and it was moderate to severe in group B, with mean±SD of 7.33 ± 0.82.
    (c) Lastly, on day 3, the pain was mild to moderate in group A, with mean±SD of 4.89 ± 1.05, and was moderate in group B, with mean±SD of 6.58 ± 0.93.
        (a) These results show that pain was almost equal on day one, whereas it was less in group A than group B on day 2 and day 3.
        (b) It was similar to the results of Dayal and Lal [14], where patients in the aspiration group had less pain compared with those in the incision and drainage group.
        (c) However, Ranjeesh and Kotha [15] found that all of the patients of group A were relieved from pain after aspiration but pain persisted with subsequent collection of pus during the next follow-up. In group B, patients were relieved of pain immediately after incision and drainage, but the pain was intolerable during dressing.
(5) Regarding satisfaction with cosmoses, 100% of patients treated with ultrasound-guided needle aspiration were highly acceptable of this modality, whereas in group A (incision and drainage), the percentage of patients satisfied with cosmoses was 54% owing to the circumareolar incision, which made the cosmetic outcome better.
    This was consistent with what other studies by Ranjeesh and Kotha[15], Chandika *et al.* [8], and Kaushal *et al.* [18] had reported, where 100% of patients treated with ultrasound-guided needle aspiration were highly acceptable of this modality, whereas all of the patients who underwent incision and drainage complained of an ugly scar.
(6) During this study, we assessed the recurrence rate in both groups for 1 month after complete resolution. Recurrence occurred in two cases in group A, with a percentage of 11.8%, whereas there was no recurrence in group B, with a statistically nonsignificant *P* value of 0.166.
    According to Javed *et al.* [16], recurrence was found in seven (23.33%) patients in group A (incision and surgical drainage) and in 21 (70.0%) patients in group B (multiple needle aspiration), with *P* value of 0.000, which was statistically significant.

Chandika *et al.* [8] and Gandhi *et al.* [17] reported that there was no recurrence observed in the ultrasound-guided needle aspiration group, whereas 3.1% in the incision and surgical drainage group.

(7) Regarding the success rate, it was less in group A (70.8%) than group B (100%).
   (a) The cases that failed using ultrasound-guided aspiration (seven cases, 29.2%) were divided in two groups:
   (1) Five cases failed from the start, owing to thick pus content (two cases), multiloculated abscess cavity (two cases), and intolerance of pain during aspiration even with local anesthesia (one case); all of them were converted to open incision and drainage.
   (2) The other group failed to achieve complete resolution (two cases). They were managed first by ultrasound-guided aspiration and then followed up for 2 weeks with another trial of reaspiration after 1 week from the first attempt. There was no improvement and eventually converted to incision and surgical drainage.

According to Kaushal *et al.* [18], the failure rate for ultrasound-guided aspiration was 17.14%.

Ranjeesh and Kotha [15] and Gandhi *et al.* [17] reported that the success rates of ultrasound-guided needle aspiration were 83 and 81.81%, respectively.

Chandika *et al.* [8] reported that the cure rate of ultrasound-guided needle aspiration was 93%.

There were two success cases treated with pig tail insertion because there was residual pus after needle aspiration.

According to Falco *et al* [19], ultrasound-guided catheter drainage was a safe, well-tolerated, procedure, allowing women not to interrupt lactation with great advantages for both the mother and the child.

We recommend further studies to compare between ultrasound-guided needle aspiration and percutaneous catheter drainage separately.

Conclusion

Ultrasound-guided needle aspiration could be an effective alternative to incision and surgical drainage in selected cases with acceptable success rate, less healing time, less postintervention pain, better cosmetic outcome, and without the need for general anesthesia.

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Nil.

Conflicts of interest

The authors declare that there is no conflict of interest or financial ties to disclose.

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