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Original Research Article

A comparative study on ultrasound guided percutaneous aspiration versus incision and drainage in the management of small breast abscesses

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ABSTRACT

Background: A breast abscess is either lactational or non-lactational with the former being more common. Lactational breast abscess is more common in younger age and primipara. It occurs mostly during the first 6 weeks of lactation. A non-lactating breast abscess is usually secondary to diabetes, tuberculosis, smoking, or an underlying breast pathology. Traditional treatment of breast abscess is by incision & drainage. It causes a lot of psychological pressure on already stressed lactating mothers. Recent trends for the treatment of small breast abscesses favor minimally invasive procedure using needle aspiration under USG guidance with adjuvant antibiotics. It is now the preferred mode of treatment for small breast abscess over open surgical incision and drainage.
Methods: A comparative prospective study of 50 cases of small breast abscesses less than 5cm was done using both surgery and aspiration. 25 cases were studied in each group. Follow up was done and results were tabulated.
Results: Aspiration shows better results. It has the advantage of treatment under local anesthesia as a day case. Recovery (92%) is as good as open surgery. Healing is without a scar and does not need painful dressings. The drawbacks are sometimes it needs repeated aspirations and not suitable for large abscesses.
Conclusions: Aspiration under ultrasonographic guidance should be first line of treatment for small (<5cm) breast abscesses.

Keywords: Incision and drainage, aspiration, ultrasonogram

INTRODUCTION

Lactational breast abscess

Breast abscessis a complication of lactational mastitis in parous women. The incidence of breast abscesses ranges from 0.4 to 11% of lactating mothers.[1] During pregnancy, the lactiferous ducts undergo epidermalization and keratin production may cause ductal obstruction. Risk factors for the development of mastitis are milk stasis due to duct blockage, associated cracked, sore nipples, and infrequent breast feeding. Bacteria enter through a cracked nipple and proliferate in stagnant milk, a good culture for their growth. This leads to initial mastitis and later abscess formation. Breast infections are commonly seen during the first 6 weeks of lactation. High incidence in primipara is due to maternal inexperience, poor feeding techniques, and poor attachment by the baby.[2] It can develop during weaning due to nipple trauma by the baby's teeth. A breast abscess is associated with poor breast-feeding techniques, poor maternal hygiene, lower standards of living, and delay in antibiotic administration.[3] The let-down reflex is a mechanism by which the mother actively expels the milk in response to the suckling. It is mediated by Oxytocin and inhibited by pain, and fear.[4] The early postpartum engorgement of the breast is secondary to poor let-down reflex.[5]S.Aureus is

the most common infecting organism during lactation. Other infective organisms include streptococci and Staphylococcus epidermidis.[6]The incidence of mastitis is more than the breast abscess. Fulton reported the incidence of 14% mastitis and 8.9% of breast abscess.[7] The breast abscess is more common in primipara than those suckled a baby.[7] This is due to the previous experience of lactation, early lactation, and attachment. The majority of the patients are younger age group mostly from 15-38 yrs.[8] Allen suggests that the development of mastitis is secondary to hormonal induced changes in pregnancy.[9]He also demonstrated cyclic development of breasts with increased vascularity associated with the menstrual cycle. This explains the occurrence of breast abscesses in non-pregnant women.[9] Non lactational breast abscesses are classified as central and peripheral. Central abscess present in the areola secondary to periductal mastitis. They are usually associated with duct ectasia. Commonly seen in young or premenopausal women. Smoking, obesity and nipple piercing are major causative factors. Nipple piercing can cause persistent and recurrent infections.[7] Bilateral abscess is seen in nearly 25% of these patients. They present as a tender lump. Abscesses are limited to the peri areolar area because the lobular buds are blocked. *S. aureus* is the major infective organism but mixed anaerobic organisms may also be present. Recurrences occur in 25%-40% of women, with the formation of cutaneous fistulas· Peripheral breast infections: It is less common than a central infection, mostly affecting older women. The peripheral infection is associated with diabetes, rheumatoid arthritis, steroid treatment, trauma, tuberculosis, and malignancy. It can be seen in the postoperative or post–radiation therapy period. These patients develop multiple and recurrent abscesses.[7]

Presentation

Symptoms of breast infection include pain, fever, redness, induration, and local raise of temperature. Clinical suspicion of an abscess or mastitis needs evaluation with USG.

Ultrasonogram (USG)

It is the investigation of choice for the diagnosis of breast abscess/mastitis. USG is also useful for a guided procedure that has high accuracy rates.[10] On USG mastitis appears as an ill-defined area of altered echotexture with increased echogenicity of infiltrated and inflamed fat lobules, hypoechoic areas in the glandular parenchyma, and associated skin oedema.[11] USG features of a breast abscess include hypoechoic collection with no vascularity andacoustic enhancement and an echogenic periphery with increased vascularity.[11] The volume of the abscess is calculated using the formula D1×D2×D3×0.52. D is the diameter of the collectionin centimeters, and the result is a volume in milliliters.[11] Mammography is rarely indicated or useful in puerperal breast abscesses. Mammography is recommended in women over 30 years to exclude malignancy in non-lactational abscesses. Mammography should also be considered in breast-feeding women when the clinical course is prolonged.[11]

Management

At present treatment of breast infections involve a multidisciplinary team. Antibiotics: Mastitis is treated with beta lactamase resistant penicillins and cephalexins with analgesics. Surgery: till recent I&D under general anesthesiawas considered as the gold standard. The wounds heal quickly with low recurrence rates, but with scarring and poor cosmesis. Regular painful dressings are needed. Non-lactational abscesses have a higher rate of recurrence (28%) and may require multiple drainage procedures.[12] An obstructed or duct ectasia may need excision.[13] Complications of surgery include pain, cutaneous fistulas, reoperation, and nipple inversion. Need for general anesthesia, daily painful dressings, difficulty in breast feeding, prolonged healing time, and post-op scarring or keloids make surgery less desirable.[14]

Percutaneous abscess drainage

First-line treatment for small breast abscesses is currently needle aspiration with antibiotics.[15] It is indicated inbreast abscess <5 cm. Local anesthesia is used for the procedure. A 14-18 gauge needle is used as the pus is viscous. ASP is as effective as I & D with recovery rates of 97% of lactational and 81% of non-lactational abscesses.[16] Repeated ASP is advised at 2-3 days intervals until clinical symptoms or USG show improvement. Choosing appropriate antibiotic coverage is important.[16] ASP with USG guidance gives better results than blind aspiration. Christensen et al reported a 96.6% success rate in treating puerperal abscesses (86/89) with a single US-guided aspiration procedure and 80.6% (50/62) for nonpuerperal abscesses.[16] The mean number of follow-up ASP was four (range1-10) for women with puerperal abscesses and three (range 1-7) for women with nonpuerperal abscesses.[16] Best results were achieved in lactational abscesses that measure less than 3 cm. Nonpuerperal periareolar lesions are the most difficult to treat. Recurrence is more common in smokers, obese women, and blacks.[17] Karstrup et al proposed percutaneous drainage of abscesses with US guidance in 1990.[8] Early studies of ASP used indwelling catheters for all abscesses. Later, indwelling catheters were reserved for treatment of abscesses larger than 3 cm. Mean catheter times within the breast were 4-6.4 days (range, 1-25 days) for puerperal abscesses.[16] A review of data recommended that indwelling catheters be avoided because the success rate of repeated ASP is similar to catheter drainage.[16] There is additional risk of cutaneous fistulas and patient discomfort.[16] Saline lavage is recommended when dealing with larger collections.[8] Leborgne and Leborgne injected cephalosporin into abscess cavities measuring more than 25 mm in diameter, with simultaneous oral antibiotics.[18] They successfully

treated 27 of 29 abscesses (93%).[18] Imperiale et al administered 40-160 mg of gentamicin into the abscess cavities in 26 patients of nonpuerperal abscess.[19] They reported a 96% (25/26) success rate. Though it suggests a benefit to local antibiotics, the level of scientific evidence available is scanty. Few women will need I & D after the failure of 3-5 attempts of ASP. Abscesses of size >3 cm are more difficult to treat and associated with an approximately 50% rate of failure with aspiration.[16] Late presentation is associated with larger abscesses and was associated with ASP failure.[16] For recurrent central nonpuerperal abscesses, excision of retro areolar ducts may be needed.[16] Patients with large breast abscesses or signs of sepsis should be considered for admission to the hospital. They need I & D and intravenous antibiotics.

Objectives

USG guided percutaneous aspiration and I&D in the management of breast abscess were studied in terms of resolution of abscess and improvement of symptoms, recurrence, time of healing, number of hospital visits, complications milk fistula, non healing, scarring etc.

METHODS

This is a prospective randomized study conducted in Dr. PSIMS and RF from June 2018 to May 2021. Approval from ethical committee of the institute is taken. 50 patients were randomly grouped into 2 groups of 25 each. Group A patients were managed by ultrasound-guided needle aspiration under local anesthesia using a16G needle. Group B patients were managed by incision and drainage of breast abscess. Informed consent was taken from all patients for inclusion in the study.

Inclusion criteria

Breast abscess cases both lactating and non-lactating with less than 5 cm on ultrasonogram were included.

Exclusion criteria

Immuno-compromised patients with diabetes, renal failure, on steroid therapy, patients of suspected tuberculosis or malignancy of the breast, recurrent breast abscess, patients with necrosis of skin overlying breast and large breast abscesses >5cm were excluded from the study.

Procedure

50 cases of breast abscess were studied. The diagnosis and size of abscess cavity was confirmed by USG. Group A patients underwent ultrasound-guided needle aspiration with 2% lignocaine local anesthesia. Aspiration was done using a 16 G needle and a 20 ml syringe until there was no residual pus, as confirmed by ultrasonography. Tab Coamoxiclav625mg TID and tablet paracetamol 650mg TID was prescribed for five days. Group B patients underwent I and D under general or local anesthesia. The wound was packed and a breast binder was applied. The patient was prescribed with same medicine as group A and the daily dressings were advised. Breast support was advised in both groups. All the patients were encouraged to continue breast feeding or regular breast emptying. Follow up was done twice or thrice a week up to complete healing. Group A patients were reassessed with USG. Repeated needle aspirations were done for residual abscess for a maximum of three times. If the abscess did not resolve by this time, it was considered as a treatment failure, and the patient was subjected to incision and drainage. Complete resolution of breast abscess was defined as clinically a healed wound at the site of the surgery, and USG suggesting the complete absence of fluid collection, normal breast glandular structure without edema. Breast abscess resolution was assessed at the last visit (usually day 30). The results were compared and analyzed using Chi square test (SPSS 23.0 software)

RESULTS

Age: The two groups are comparable for age distribution. The maximum numbers of patients in both groups were between the 15-25 years age group. The mean age of occurrence of breast abscess in both study groups is comparable with a p value of 0.396 which is statistically not significant. Non-lactational breast abscesses were in the age group of 30+ years (Table 2).

Table 1: Age.

Age group (years)	Group A (N=25)	Group B (N=25)	P value
15-25	20	17	0.396
26-35	4	8	
36-45	1	-	
Mean age	23.3 6±5.14	24.44±3.65	

Parity: It is observed that 32 (64%) were primipara, and 14 (28%) were multipara. 4 (8%) cases were non-lactational. The two groups are compared for parity and are found to be comparable (Table 2). Time of presentation: In group A, 18 (72%) patients had an abscess in the first six weeks postpartum and 23 (92%) patients in total developed breast abscess within 12 weeks postpartum, 17 patients out of these 23 patients were primipara indicating early presentation in primiparous. In group B 14 (56%) patients had an abscess within the first six weeks postpartum and 22 (88%) patients in total developed breast abscess within 12 weeks postpartum, 15 out of these 22 were primipara again indicating early presentation in primiparous.

Table 2: Parity.

Parity	Group A (N=25)	Group B (N=25)
Primipara	17	15
Multipara	6	8
Non lactational	2	2

Table 3: Time of presentation.

Presentation time (weeks)	Group A (N=25)	Group B (N=25)	Total N (%)	P value
<6	18	14	32 (64)	0.951
6-12	5	8	13 (26)	
>12	2	3	5 (10)	
Mean value	6.68±2.28	6.64±2.32	50 (100)	

Table 4: Clinical features.

Clinical features	Group A (N=25)	Group B (N=25)	Total
Fever	12	11	23 (46)
Pain/tenderness	25	25	50 (100)
Skin erythema	17	16	33 (66)
Lump/induration	25	25	50 (100)
Fluctuation	12	12	24 (48)
Axillary lymph nodes	2	2	4 (8)
Fissured nipple	8	4	12 (24)
Retracted nipple	1	1	2 (4)

Out of 50 patients, 32 presented with a breast abscess within six weeks and 45 (90%) out of 50 within 12 weeks. The two groups are comparable for the time of presentation of breast abscess, p value is 0.951 not significant (Table 3). Clinical features: All the patients presented with a painful and tender lump in the involved breast. Erythema of the skin was present in 33 patients. Twenty-three patients had complaints of fever. Breast abscess was fluctuant on palpation in 24 patients, while two patients had enlarged ipsilateral lymph nodes. The fissure was observed on the nipple in 12 patients, while two patients had retracted nipples. Both the groups are similar in comparing the incidence of various symptoms (Table 4). Ultrasound finding: ultrasound was performed to assess the size of the breast abscess. The groups are comparable based on the of the size of the abscess with a p value of 0.376, their sizes are not significant (Table 5). Time was taken: the average time taken for the procedure in Group A was 25.56±5.22 min that is significantly less than the average time taken in Group B, which is 43.44±8.51 min which is significant statistically with a p value 0.000. This is due to induction of anesthesia and surgical procedure with post-operative cavity packing and dressing (Table 6). Number of USG guided aspirations: in Group A, 9 patients showed resolution of the abscess on a single aspiration, while 10 patients required two aspirations. 4 patients needed three aspirations for resolution, and 1 patient was not resolved even after three aspirations and hence was treated by Incision and Drainage. 1 patient had recurrence after 1month and was considered as aspiration failure and treated with I and D. She has a non-lactational breast abscess (Table 7). Duration of healing: duration of healing was considered as the time between the day of the operation and complete resolution of symptoms. The mean duration of healing in Group A is 14.44±4.28 days, which is considerably low as compared to Group B, which is 24.68±5.07 days with a p value of 0.000 showing a significant difference. 3/25 (12%) of cases in group B needed a secondary suturing for closure of the wound (Table 8). Numbers of hospital visits: the average numbers of visits are much higher in group B with 8.72±1.54 as compared to 3.96±0.97 visits in group A. This is due to the need for wound dressings p value is 0.00 which is statistically significant (Table 9).

Table 5: Size on USG.

Size (cm)	Group A (N=25)	Group B (N=25)	Total	P value
<3	9	11	20 (40)	0.396
3-4	13	11	24 (48)	
4-5	3	3	6 (12)	

Table 6: Time of procedure.

Groups	Average time taken during the procedure (minutes)	P value
Group A	25.56±5.22	0.000
Group B	43.44±8.51	

DISCUSSION

Traditionally the treatment of breast abscess has been I&D. ASP with USG is another emerging treatment option for small breast abscesses. The present prospective study involved 50 lactating women with a breast abscess, who were randomly assigned into two groups of treatment with USG guided aspiration or I and D. Age Incidence: 74% of the patients were in the age group of 15-25 years. The mean age was 24.16years (24.16±3.48) years in group A and (25.52±3.87) years in Group B indicating the involvement of young patients. In Kandi et al study the mean age was 25.37±6.70 years in aspirated group and 27.57±9.82years in the I and D group.[3] Patil et al studied 100 patients and the mean age was 24.5 years in the ASP group and 30.3 years in the I and D group, indicating the involvement of young patients.[20] This finding of involvement of young patients is similar to the finding in various other studies.

Table 7: Number of aspirations.

Number of aspirations	Frequency (N=25)	%
One	9	36
Two	10	40
Three	4	16
Failure	2	8

Table 8: Duration of healing.

Group	Average duration of healing (days)	P value
Group A	14.44±4.28	0.000
Group B	24.68±5.07	

Parity: 32 (64%) patients were primipara, while only 14 (28%) were multipara. Increasing parity lowers the incidence of breast abscess due to the previous experience of lactation, early start of lactation. Ulitzsch et al showed 28/43 patients (65%) with abscesses were primipara, and 15 (35%) were multipara.[21] Presentation: The majority of abscess developed early in puerperium. 54% by 6 weeks and 80% by 12 weeks. The early presentation of breast abscess is attributed to the poor attachment of the baby, injury to the nipple, and poor hygiene. These findings are similar with the study of Ulitzsch et al with the diagnosis of the abscess at 5.4 weeks (range 1-12 weeks).[21] Fulton et al reported 20% of the patients presented with a breast abscess after 12 weeks.[7] Size of breast abscess on USG: In our study the abscess ranged from one cm to five cm (average size 3.27 cm) which correlated with the findings of Christensen et al (3.5 cm), and Chandika et al (3.49 cm).[14,16] Hook et al concluded that abscess greater than three cm size required I & D as the definitive treatment, while ASP is the only palliative in these patients. Erylmiz et al concluded that puerperal abscesses smaller than five cm could be successfully treated with aspiration in majority of the cases.[22,23] Kumar et al concluded that the smaller the abscesses, the better is the outcome and lower is the recurrence rate following the aspiration.[24] In our study, abscesses up to 5 cm were treated with ultrasound-guided needle aspiration which was similar to the finding of Dixon et al. who had shown that even large breast abscesses could be effectively treated by repeated aspiration.[25] Number of USG guided aspirations: 9/25 patients (36%) had shown resolution of the abscess on a single aspiration, 10 (40%) patients required two aspirations, and 4 patients (16%) needed three aspirations for resolution with an overall success rate of 92%. Abscess in 2 patients (8%) was not resolved even after three aspirations and was treated by I&D. The study by Sarhan et al showed cure rate with one aspiration in 53.4% of patients, two aspirations in 21% of patients, and three aspirations in 18.6% patients while there was a failure in 7% patients.[26]

Table 9: Number of hospital visits.

Group	Number of visits	P value
Group A	3-6 (3.96±0.97)	<0.005
Group B	6-11 (8.72±1.54)	

The overall success rate is 93%. In our series 77.8% (7/9) of patients with abscesses less than 3cm needed a single aspiration and the remaining 2 cases (22.2%) needed 2 aspirations. 2/13 (15.4%) of patients with abscess size of 3-4 cm needed 1 aspiration and 8/13 (61.5%) needed 2 aspirations. 4 cases needed 3 aspirations. All 3 abscess 4-5 cm needed 3 aspirations out of which 2 cases (66.6%) not resolved were considered as a failure and treated with I & D. The number of ASPs increases with the size of the abscess. The procedure time: There was significant difference in time taken for the procedure with 24.12 min for ASP and 41.6 min for I & D. Surgery under GA requires hospital admission. ASP patients need less procedure time with no hospital admission. Duration of healing: average time to complete healing is 11.48 days in group A and 21.12 days in group B with a significant difference. The longer duration of healing in group B is due to healing of the open wound, which required daily dressings. Saleem et al calculated the average duration of healing in the ASP group as five days, and 21 days in I & D.[27] All studies show wound healing is rapid by ASP as compared to I&D, and our study also show similar results. Scar: all the patients in the I & D group had scar of 3 to 5 cm (av 3.7 cm). The scar is a major concern for the young women. Numbers of hospital visits: The average numbers of the visits were higher (10.12) in Group B as compared to Group A (4.6). The regular need for the painful dressing of the open surgical wound an effect on the patient psychology and economy. Study by Saleem et al state that the number of hospital visits is significantly higher in I&D group as compared to ASP.[27] Complications- One non-lactational breast abscess in group A patient developed recurrent breast abscess in the same breast after six weeks of complete resolution of breast abscess, while there was no recurrence in group B. This patient with recurrent breast abscess was treated with I & D. The overall cure rate of breast abscess in group A was 92% and was 100% in the case of Group B. Elagili et al noted a success rate of 83.3% with the USG aspiration of breast abscess.[28]

Pawar Dahiphale et al reported a 90% cure rate with ASP.[29] Chandika et al observed a cure rate of 100% in both groups.[14] Kandi et al observed a cure rate of 88.57% in ASP, whereas the cure rate was 93.44% in the incision and drainage group.[3] Recurrence in non-lactational abscess was 25% (1/4). Breast emptying plays a major role in treatment but is often ignored. Breast should be emptied by feeding or manual expression. Regular emptying and breast support are essential part of treatment.

Limitations

This is a single institutional study with limited follow up of 1 month. Recurrences are known to happen even after 6 months. Majority of cases are lactational with small number of non-lactational cases. Repeated ASP can be done up to 5 times but limited to 3 times only.

CONCLUSION

There are a number of factors to consider when treating breast abscesses nonsurgically. Treatment methods vary on the stage of Breast infection. Early ultrasound evaluation of a breast infection helps to differentiate between cellulitis, mastitis, and abscess formation. Cellulitis and mastitis are treated with antibiotics, analgesics, breast support and periodic breast emptying. Larger breast abscess >5cm, with features of sepsis and those presenting late need surgery with I & D. For small (<5cm) abscess aspiration under ultrasound guidance rather than blindly has significant advantages. Best results are achieved with US guidance and with repeat aspirations performed as necessary until complete resolution. Majority of abscesses heal with one or two aspirations. The procedure is done under local anesthesia as a day case. No messy painful dressings are needed. Healing is faster without a scar. All these are beneficial to a stressed lactating mother with no additional psychological stress. Surgical incision-drainage is no longer the recommended first-line treatment now, as used previously, and non-surgical management of breast abscess is an established first option for the treatment of breast abscess.

Recommendations

This study recommends serial aspiration under ultrasound guidance, in combination with appropriate antibiotic therapy, can be safely employed as the first-line approach to small breast abscess management. Incision and drainage under general anesthesia should be reserved for large abscesses and those fail to respond to repeated aspiration.

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