

The Mammotome biopsy system is an effective treatment strategy for breast abscess

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Abstract

BACKGROUND: Although most breast abscesses can be treated with the current first-line treatment of antibiotics by needle aspiration, the therapeutic duration is lengthy and recurrences often occur. Therefore, we aimed to investigate the clinical efficacy of the Mammotome biopsy system (Johnson & Johnson Corp., New Brunswick, NJ) in a cohort of patients with breast abscesses.

METHODS: Forty lactating and 30 nonlactating breast abscess patients with unfavorable outcomes with antibiotic treatment and/or needle aspiration failure were recruited and treated with the Mammotome biopsy system.

RESULTS: Skin inflammation of all patients disappeared within 6 days with no recurrence. The clinical outcomes in patients with an abscess size ≤ 3.5 cm was significantly better than those with an abscess size > 3.5 cm ($P = .025$).

CONCLUSIONS: The Mammotome biopsy system, an effective treatment strategy that is minimally invasive and less damaging, in combination with appropriate antibiotic therapy can be used safely as the first-line approach to breast abscess management.

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A breast abscess, a painful infection caused by bacteria, is an accumulation of pus in a localized area of the breast and frequently develops as a result of inadequately treated infectious mastitis.¹ Breast abscesses can affect women who are between 18 and 50 years of age. When a woman is breast-feeding, an infection may be introduced as a result of bacteria entering the breast tissue or because of a blocked milk duct that causes mastitis (inflammation of the breast). If it is not properly treated, a breast infection will lead to the development of an abscess. Mastitis typically affects around 1 woman in

10 who are breast-feeding. A breast abscess is a relatively rare (5% to 11%) but serious complication of mastitis that may occur during breast-feeding, particularly in primiparous women. Sometimes abscesses can be clinically difficult to detect and distinguish from mastitis especially when the abscess is small in size or when it is localized deeply within the breast. The bacterium that most frequently induces breast abscess is *Staphylococcus aureus*, which enters the breast tissue through a milk duct or a crack in the nipple. Primiparous women, mothers with recent mastitis, mothers over 30 years of age, and those giving birth postmaturely may be more likely to develop breast abscess during lactation than other populations.^{2,3} The diagnosis of a breast abscess is made by a physical examination, ultrasound, signs, and symptoms (such as fever, chills, malaise, recent or recurrent mastitis, pain, erythema, and firmness over an area of the breast). A breast abscess in lactating

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women is a potentially significant health issue and may lead to the termination of breast-feeding.⁴

Pus removal is the basic principle of medical intervention once a breast abscess is formed. Until the last decade, the recommended treatment for a breast abscess was a surgical incision and drainage.⁵⁻⁷ Currently, surgical treatment is typically reserved for recurrent or extremely large abscesses because it requires a breast or general surgeon, general anesthesia, and a long healing time and may cause unpleasant scarring.⁸ The current first-line treatment for most abscesses is needle aspiration with antibiotics.⁹ Needle aspiration for the treatment of a breast abscess has been validated as an effective treatment for a small breast abscess.^{10,11} However, needle aspiration has clear limitations for a large-size breast abscess, and in some cases it is difficult to choose the injection site if the breast abscess is too deep from the skin or the wall is extraordinarily thick based on clinical experience.

With the development of minimally invasive breast biopsy systems such as fine-needle aspiration cytology, core needle biopsy, and vacuum-assisted biopsy, the diagnostic accuracy of breast lesions has been greatly improved.¹² Large-bore, image-guided, vacuum-assisted biopsy has also become established in recent years as a safe, cost-effective alternative to open surgery for the removal of certain benign breast lesions.¹³⁻¹⁵ Very recently, the Mammotome biopsy system (Johnson & Johnson Corp., New Brunswick, NJ), an ultrasound-guided vacuum-assisted system, has been suggested as a new strategy for breast abscesses.^{16,17} However, studies of Mammotome system application for breast abscesses are scarce and have not been extensively investigated. In this study, we aimed to investigate the clinical efficacy of the Mammotome biopsy system in a cohort of breast abscess patients with unfavorable previous outcomes by antibiotic treatment and/or needle aspiration failure.

Methods and Materials

Patients

Seventy patients aged 31.6 ± 7.5 years (range 20 to 50 years) with breast abscesses were recruited retrospectively from 2008 to 2010 and underwent aspiration using an ultrasound-guided, vacuum-assisted system (Mammotome biopsy system). Written informed consent was obtained from all patients at the time of enrollment, and the study was approved by the local ethics review board. All patients were diagnosed with a breast abscess and treated with antibiotics with an unfavorable outcome before being treated with the Mammotome biopsy system. The following patients were included in this study: (1) patients with a breast abscess that was difficult to treat using needle aspiration because of a high potential risk of recurrence (ie, diameter >3.5 cm, subareolar, multilocular, or failed with needle aspiration treatment); and (2) patients who refused to have visible scars by general incision and drainage. Among the group, 40 patients were lactating, and 30 were nonlactating. Patients

mainly showed skin inflammation and breast mass with or without continued fever. Twenty-seven patients had been performed with needle aspiration but failed for pus extraction or abscess recurrence. The clinical characteristics of the enrolled patients in the study are summarized in Table 1.

Procedure of the treatment with the Mammotome biopsy system

Local anesthesia was selected by 15 patients without skin inflammation and pain. Briefly, 10 mL 1% lidocaine was injected into the cutaneous layer and then injected around the mass and along the estimated course of the probe with a 10-mL injection syringe. General anesthesia was administered in all other patients. Adrenaline (1:200,000) was injected into the abscess area. The Mammotome probe was inserted into the abscess cavity at breast hidden spot away from the inflamed skin. We set the Mammotome system to the "position" mode and pushed the probe until the collection chamber was covered, leaving the incision groove open for pus extraction. Under ultrasonographic guidance, pus was aspirated from the cavity. Pus was kept for culture and drug susceptibility testing. Weak skin around the abscess site was carefully examined to avoid tissue damage. For subareolar abscesses, the ducts beneath the nipple were removed until the retracted nipple was released. Small abscesses were totally removed under ultrasound assistance without drainage. For large abscesses with larger compartment residual or in lactating patients, a drainage pipe was inserted. All abscess walls including ducts beneath the nipple of subareolar abscesses were sent for frozen pathological examination. Antibiotics were generally used for all patients. Galactophyga (bromocriptine) was given to lactating patients. A follow-up ultrasound examination was performed in patients 1 day after the procedure and every 3 months up to 1 year for possible recurrence. The presence of residual lesions and complications such as hematomas, ecchymosis, and pain were evaluated.

Statistical analysis

Data were expressed as the mean \pm standard deviation. All statistical analyses were performed using SPSS 11.0.

Table 1 Summary of clinical characteristics of patients (n, case numbers)

	Lactating patients (n = 40)	Nonlactating patients (n = 30)
Previous needle aspiration failure (n)	12	15
Abscess size >3.5 cm (n)	29	22
Palpable breast mass (n)	36	26
Continued fever (n)	35	24
Skin inflammation (n)	31	20

standard version (SPSS Inc, Chicago, IL). Statistics was performed using the Student *t* test, and a *P* value <.05 was considered statistically significant.

Results

All patients were cured by the Mammotome system

The pathologic diagnoses of the breast lesions were all benign. The most common pathogen was *S. aureus*. Skin inflammation of all patients disappeared within 6 days with a median time of $3.02 \pm .65$ days. For the lactating group, milk-like drainage fluid appeared within the first 24 hours after the procedure, and catheters were removed after 2 weeks. For nonlactating patients, catheters were removed approximately 4 days after treatment. No recurrences were found within any of the study groups.

Clinical outcomes in patients groups with different abscess size, age, lactating status, and with/without previous needle aspiration failure

Although the Mammotome system has been suggested for breast abscess treatment, the indications are not well established. We compared the clinical outcomes in patient groups with different abscess size, age, lactating status, and with/without previous needle aspiration failure depending on how long it took for skin inflammation to completely disappear. The outcomes in patients with an abscess size ≤ 3.5 cm was significantly better than those in patients with an abscess size > 3.5 cm (ie, a shorter time for skin inflammation to disappear [$P = .025$]). However, the efficacies of treatments using the Mammotome biopsy system showed no significant difference in patients' age, lactating status, or with/without previous needle aspiration failure ($P > .05$).

Discussion

Over the past 10 years, there has been considerable development of minimally invasive breast biopsy systems. The vacuum-assisted system provides a new alternative for the excision of benign breast lesions and has been shown to be successful in previous studies.^{18,19} A breast abscess is one of the most severe problems related to breast-feeding. Currently, the first-line treatment for most abscesses is needle aspiration with antibiotics.⁹ However, recurrences often occur, and the duration of treatment is relatively long. The Mammotome biopsy system has recently been suggested for breast abscess; however, this application has not been extensively investigated, and studies remain scarce.^{16,17} In the present study, we report that a cohort of patients with a breast abscess was successfully treated by the Mammotome biopsy system. Skin inflammation of all treated patients disappeared within 6 days with no recurrences. We also found that the

Mammotome biopsy system compared with needle aspiration was an effective treatment with fewer invasions when incision and drainage were necessary to treat a breast abscess.

The Mammotome biopsy system in combination with appropriate antibiotic therapy has been described in the literature since the early 1990s and is the mainstay of treatment in many specialty breast clinics around the world.²⁰⁻²² A reduced incidence of scarring and fistula formation, the feasibility of outpatient treatment and continued breast-feeding in lactating women, reduced costs, and a superior cosmetic result are the major advantages of the Mammotome biopsy system. Furthermore, the Mammotome biopsy system has a very high success rate in women with both lactational and nonlactational breast abscesses.¹⁶ However, these advantages of the Mammotome biopsy system still need to be validated in larger cohorts of patients with breast abscesses.^{17,23} Our results in this study are consistent with previous reports of the Mammotome system for the treatment of breast abscesses.

One interesting finding in our current report was that the outcome of patients with a smaller abscess size (≤ 3.5 cm) was significantly better than the outcome of patients with larger abscesses. When the size of the abscess was small (≤ 3.5 cm), the abscess was totally removed by the Mammotome system like a papilloma excision. However, based on our experience, large abscesses (> 3.5 cm) with no defined margin normally contain necrotic tissue in the cavity that is difficult to aspirate with a needle, whereas the Mammotome probe, which is thicker than the aspiration needle, can suck the intracavity abscess much more easily. For breast abscesses with a large area of inflammation, it is difficult to choose the injection site for needle aspiration because of the short needle length. With the longer Mammotome probe, abscesses can be easily removed by the sharp and tough probe without a fear of distance.

According to our current data, there was no outcome difference between the previous needle failure and non-needle failure groups, which suggests that the Mammotome system is the best choice in patients with breast abscesses. The major reason for needle aspirate failure is that the pus has not been completely cleared, which is mainly dependent on the operator's experience and characteristics of the pus-like subareolar abscess in nonlactating patients. The key principle to treat recurrent subareolar abscesses is to excise the central and retracted parts of the nipple containing the plugged lactiferous ducts.^{24,25} This procedure can be safely performed by the Mammotome system, whereas a syringe needle cannot. In addition, repeated needle aspiration requires frequent visits to the clinic and a prolonged examination time in the hospital. Thus, if there is a possibility of needle aspiration failure or once needle aspiration failure occurs, Mammotome system treatment is recommended.

There are a number of other advantages for treating breast abscesses with the Mammotome system. First, early and repeated ultrasound assessment of a breast infection provides a reliable way of differentiating between cellulitis,

mastitis, and abscess formation especially when biopsy is required. Second, aspiration under ultrasound guidance rather than blindly has significant advantages in assessing the adequacy of pus aspiration and allows complete drainage for multiloculated collections with minimal tissue damage. Although the injection of liquid into the cavity can dilute the pus and make it easy to evacuate, not all cases can be applied because of the difficulty of injection and suction. Approximately 50% of patients with a multilocular abscess may result in needle aspiration failure.²⁶ From our experience in our clinic, needle obstruction often occurs under such situations, and patients with multilocular abscess often require multiple injections. The Mammotome system may solve this problem with its cutting edge and hollow probe.

The discovery of cancer within a breast abscess is rare, occurring in 4.37% of patients with abscesses who have been surgically drained and biopsied.²⁷ Although the pathologic diagnoses of the lesions in our current study were all benign, appropriate post-drainage breast imaging and histology to assess abnormalities would eliminate the chances of missed malignancies and delayed therapy. A biopsy for the abscess wall is recommended because the early diagnosis of breast cancer is the most important factor for the successful treatment for this malignancy in women.

For a favorable outcome, adequate antibiotic cover is essential when treating breast abscesses with the Mammotome system. With the advantages of the Mammotome system, in which pus can easily be obtained for culture, antibiotic choices can be guided by microbiological culture and drug-sensitivity analysis. In nonlactational, subareolar abscesses, the need for additional anaerobic cover is well established.²⁵ It is critical to establish the underlying etiology of a breast abscess in order to direct subsequent management.

In conclusion, the Mammotome system in combination with appropriate antibiotic therapy can be used safely as the first-line approach to breast abscess management especially for patients with a particular cosmetic demand; for patients with needle aspiration failure, a large diameter size (>3.5 cm), skin inflammation, or multilocular and viscous pus; and for pathological investigation for the abscess wall.

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