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Comparison of the Efficacy of Ultrasound-Guided Catheter Drainage Combined with Prednisone and Traditional Incision and Drainage Techniques in the Treatment of Abscess-Type Non-Lactational Mastitis

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Abstract

Objective: This study aims to compare the efficacy of ultrasound-guided catheter drainage combined with prednisone versus traditional incision and drainage in the treatment of abscess-type non-lactational mastitis. **Methods:** A retrospective analysis was conducted on 215 patients with abscess-type non-lactational mastitis treated at our hospital from January 2021 to December 2024. Patients were divided into two groups based on the surgical approach. The control group (n = 107) received traditional incision and drainage, while the study group (n = 108) underwent ultrasound-guided catheter drainage combined with prednisone. Hospitalization duration and operation time were compared between the two groups. Changes in inflammatory markers and pain scores, as well as breast aesthetic outcomes, were also evaluated. **Results:** No significant differences were found between the groups in terms of age, sex, or past medical history. The study group had significantly shorter hospitalization and operation times than the control group ($P < 0.05$). Both groups showed decreased levels of IL-6, Hs-CRP, TNF-α, and reduced VAS scores after treatment compared to baseline ($P < 0.05$). However, the study group exhibited significantly lower post-treatment levels of IL-6, Hs-CRP, TNF-α, and lower VAS scores than the control group ($P < 0.05$). The rate of satisfactory breast aesthetics was also higher in the study group ($P < 0.05$). **Conclusion:** Ultrasound-guided catheter drainage combined with prednisone provides superior clinical outcomes in patients with abscess-type non-lactational

mastitis, resulting in reduced hospital and operation times, significantly decreased inflammatory and pain responses, and better postoperative breast aesthetics. This approach merits wider clinical adoption.

Keywords

Abscess-Type Nonlactational Mastitis, Traditional Incision and Drainage Technique, Prednisone, Ultrasound-Guided Catheter Drainage Technique, Breast Aesthetic Outcome, Inflammatory Response

1. Introduction

Currently, the incidence of non-lactational mastitis accounts for 1.0% to 5.4% of breast diseases during the same period and has shown an increasing trend in recent years [1]. However, the pathogenesis of abscess-type non-lactational mastitis remains unclear. Previous clinical studies have indicated that the occurrence of this disease is closely related to various factors, including autoimmune diseases, smoking, bacterial infections, and ductal changes [2]. Surgical intervention remains the preferred treatment modality; however, traditional incision and drainage techniques result in considerable tissue trauma, greater postoperative pain, and delayed patient recovery. Additionally, patients with abscess-type non-lactational mastitis often present with varying degrees of infection and extensive lesion areas, and conventional treatments frequently lead to breast deformity, adversely impacting patients' physical and psychological well-being [3]. With the ongoing advancement of minimally invasive technologies, treatment approaches for abscess-type non-lactational mastitis have also evolved; drainage and lavage of the abscess cavity can be performed under ultrasound guidance, facilitating infection control and immune modulation, while also minimizing effects on breast aesthetics and achieving notable cosmetic outcomes [4]. In light of this, the present study analyzes the efficacy of ultrasound-guided catheter drainage combined with prednisone therapy versus conventional incision and drainage techniques in the management of abscess-type non-lactational mastitis, aiming to provide scientific evidence for clinical practice.

2. Materials and Methods

2.1. General Information

This study has obtained ethical approval. A total of 215 patients with abscess-type nonlactational mastitis were enrolled between January 2021 and December 2024. Based on the surgical method, patients were divided into two groups. The control group included 107 cases, with ages ranging from 31 to 32 years and a mean age of (31.6 ± 6.2) years; the mass diameters ranged from 2 to 7 cm, with an average diameter of (4.4 ± 1.1) cm, and the lesions were located on the left side in 49 cases and on the right side in 58 cases. The study group comprised 108 cases, with ages

ranging from 30 to 32 years and a mean age of (31.0 ± 6.0) years; the mass diameters were between 2 and 6 cm, with a mean diameter of (4.1 ± 0.9), and 52 cases were on the left side and 56 cases were on the right side. The general demographic and clinical data of the two groups were comparable ($P > 0.05$).

2.2. Treatment Methods

The control group received treatment using conventional incision and drainage techniques. Patients were administered amoxicillin at a dosage of 0.5 g per dose, three times daily, taken orally for two weeks, followed by a repeat of the conventional incision and drainage procedure. The incision was designed as a fusiform shape and positioned radially on the mammary gland. Pus was aspirated from the lesion, the affected tissue was excised, after which the wound was sutured and appropriate drainage was established.

The study group adopted a protocol of catheter drainage under color Doppler ultrasonography guidance combined with prednisone therapy. Under sonographic guidance, a coarse-needle puncture biopsy and pathological examination were performed at the site of greatest abscess prominence, and pus samples were simultaneously collected for culture. A thin and flexible drainage catheter was inserted into the incision for side-hole drainage. On the day of treatment and thereafter, the abscess cavity was irrigated with a solution comprising 500 mL of 0.9% sodium chloride, 2 mg of dexamethasone, and 20 mg of gentamicin. Following these procedures, patients received prednisone according to the following regimen: during the first and second weeks of initial treatment, a daily dose of 0.75 mg/kg was administered; in the third week, the dose was reduced by 5 mg (one tablet); during the fourth week, the daily dose was further reduced by 5 mg (one tablet) based on the previous week's dosage, until the maintenance dose reached 5 mg (one tablet) per day, which was then continued for an additional 7 days before discontinuation. The patient's abscess status was closely monitored, and if the abscess lesion contracted to the core, surgical excision of the mass was promptly performed.

2.3. Observation Indicators

1) Compare the length of hospital stay and operation time between the two groups. 2) Compare changes in inflammatory factors and pain scores between the two groups. 3) Compare the aesthetic outcomes of the breasts between the two groups. Scoring criteria: a) Complete breast symmetry (4 points), almost symmetry (3 points), slight asymmetry (2 points), and deformity (1 point); b) No breast inversion (4 points), slight inversion (3 points), perceptible inversion (2 points), and significant inversion (1 point); c) Normal breast elasticity (4 points), slightly decreased elasticity (3 points), significantly decreased elasticity (2 points), and no elasticity (1 point); d) No nipple displacement (4 points), displacement < 15 mm (3 points), displacement 15 - 30 mm (2 points), and displacement >30 mm (1 point); e) Invisible surgical scar (4 points), slight color difference from sur-

rounding skin (3 points), significant color difference from surrounding skin (2 points), and gross surgical scar (1 point).

Based on the total score, the classifications are: Excellent 18 - 20 points, Good 15 - 17 points, Fair 11 - 14 points, and Poor ≤10 points. The excellent and good rate = (number of Excellent + Good cases)/total cases × 100% [5].

2.4. Statistical Methods

SPSS 20.0 software was used, the Chi-square test was used for count data (%), the T-test for $\bar{x} \pm s$ data, and $P < 0.05$ was considered to indicate a statistically significant difference.

3. Results

3.1. Comparison of Hospitalization Time and Operation Time between the Two Groups

The hospitalization time and operation time in the study group were both shorter than those in the control group ($P < 0.05$), as shown in Table 1.

Table 1. Comparison of hospitalization time and operation time between the two groups ($\bar{x} \pm s$).

Group	Number of cases	Length of hospital stay (d)	Surgery time (min)
Control group	107	17.67 ± 1.40	68.25 ± 3.13
Research group	108	9.35 ± 0.10	45.00 ± 0.12
T value	/	6.812	6.578
P value	/	<0.05	<0.05

3.2. Comparison of Changes in Inflammatory Factors and Pain Scores between the Two Groups

After treatment, the levels of IL-6, Hs-CRP, and TNF-α in both groups were lower than before treatment, and the VAS scores were also lower than before treatment ($P < 0.05$). Compared with the control group, the research group had even lower levels of IL-6, Hs-CRP, and TNF-α after treatment, and lower VAS scores ($P < 0.05$), as shown in Table 2.

Table 2. Comparison of changes in inflammatory factors and pain scores between the two groups ($\bar{x} \pm s$).

Group	Time	IL-6 (pg/mL)	Hs-CRP (mg/L)	TNF-α (ng/mL)	VAS score (points)
Control group	Before treatment	163.35 ± 15.57	13.57 ± 1.92	3.92 ± 0.21	5.28 ± 1.42
	After treatment [a]	103.67 ± 3.43	9.39 ± 0.10	2.89 ± 0.15	2.66 ± 0.24
Research group	Before treatment	164.01 ± 14.91	13.29 ± 2.12	3.93 ± 0.20	5.27 ± 1.44
	After treatment [ab]	60.57 ± 1.02	7.24 ± 0.91	1.54 ± 0.16	1.40 ± 0.02

Note: Within-group comparison [a]$P < 0.05$; between-group comparison [b]$P < 0.05$.

3.3. Comparison of Aesthetic Outcomes of the Breasts between the Two Groups

The breast aesthetics excellence rate in the study group was higher than that in the control group ($P < 0.05$), as shown in Table 3.

Table 3. Comparison of breast aesthetic outcomes between the two groups (cases, %).

Group	Number of cases	Poor	Middle	Good	Excellent	Yield rate
Control group	107	12	29	46	20	66 (61.68)
Research group	108	0	9	12	87	99 (91.67)
X^2 value	/					10. 828
P-value	/					<0.05

Figure 1. Traditional incision drainage technique treatment (right breast).

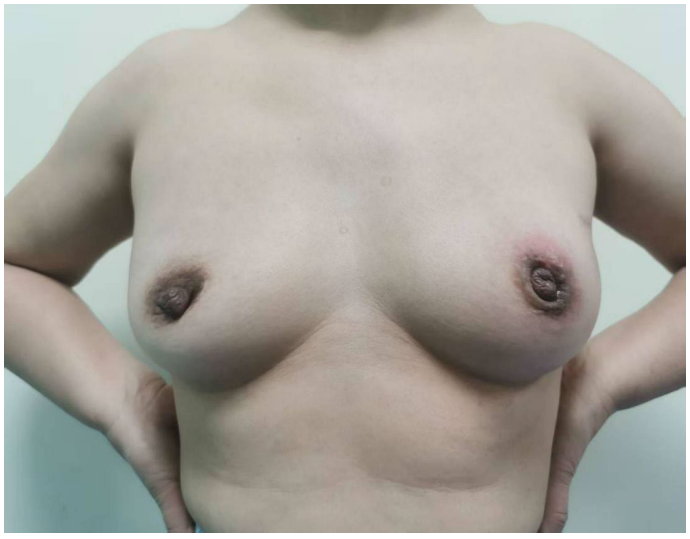

Figure 2. Catheter drainage under color Doppler ultrasound guidance combined with prednisone treatment (before).

Figure 3. Catheter drainage combined with prednisone therapy under ultrasound guidance (after).

4. Discussion

Abscess-type non-lactational mastitis is characterized by a variety of symptoms, including breast lumps with tenderness, pain, fever, and localized redness and swelling. It is a commonly observed breast condition in clinical practice [6] [7]. While its pathogenesis remains incompletely understood, it is currently thought that this disease primarily results from skin infection invading the mammary ducts and impaired drainage of ductal contents; other factors may include local inflammatory stimuli. The main clinical interventions focus on suppressing inflammation and administering antibacterial therapy [8] [9]. Prednisone, a commonly used adrenocorticosteroid, can effectively inhibit inflammatory cells in the body, thereby alleviating the inflammatory response [10] [11].

In this study, the control group was treated with the traditional incision and drainage (**Figure 1**) technique for, while the study group received ultrasound-guided catheter drainage (**Figure 2** & **Figure 3**) combined with prednisone for. The results indicate that, compared to the control group, the study group had shorter hospitalization and surgical times, as well as lower levels of IL-6, Hs-CRP, and TNF-α after treatment. Additionally, the visual analog scale (VAS) scores were lower, and the rate of aesthetic satisfaction regarding breast appearance was higher. This suggests that in the treatment of abscess-type non-lactational mastitis, ultrasound-guided catheter drainage combined with prednisone treatment is superior to traditional incision drainage techniques, achieving more desirable clinical outcomes. Regarding the underlying mechanisms, prior to surgical excision of the mass, patients in the study group first underwent ultrasound-guided catheter drainage in combination with prednisone. Prednisone exerts potent anti-inflammatory effects, and its gradual and judicious administration can effectively inhibit leukocyte infiltration and phagocytic response, thereby reducing the release of inflammatory mediators in patients with abscess-type nonlactational mastitis, leading to improved control of the inflammatory response and amelioration

of the patient's inflammatory state. Additionally, on the day of puncture drainage and afterwards, continuous irrigation of the abscess cavity with a mixture of 0. 9% sodium chloride injection, dexamethasone, and gentamicin not only provides anti-inflammatory benefits, but also yields anti-infective effects, further alleviating the inflammatory condition. Following puncture biopsy, abscess cavity irrigation, and prednisone therapy, the scope and size of the lesions were reduced in patients with abscess-type nonlactational mastitis. When surgical excision was performed, the lesion had shrunk to its core, resulting in significantly smaller surgical incisions, which facilitated rapid postoperative wound healing and were more conducive to preserving breast aesthetics in patients [12]-[14].

On the other hand, following treatments such as puncture drainage, abscess cavity irrigation, and administration of prednisone, the size of the lesion tissue is markedly reduced. Consequently, during subsequent surgical excision, a smaller volume of tissue requires removal, thereby minimizing surgical trauma, reducing intraoperative blood loss, and mitigating the stress response in patients with abscess-type non-lactational mastitis. Furthermore, these preoperative interventions substantially decrease the preoperative inflammatory state, which in turn leads to significant alleviation of postoperative inflammatory and pain responses, and accelerates patients' physical recovery [15]-[17].

In summary, for patients with abscess-type non-lactational mastitis, ultrasound-guided catheter drainage combined with prednisone therapy demonstrates superior clinical efficacy compared to conventional incision and drainage techniques. This method significantly shortens hospital stay and surgical duration, markedly reduces inflammatory and pain responses, and results in better postoperative breast aesthetics. Therefore, it is recommended for wider clinical adoption.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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