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NON-LACTATIONAL MASTITIS: SURGICAL MANAGEMENT AND MORPHOLOGICALLY GUIDED DECISION-MAKING ALGORITHM

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Abstract
This article systematizes current evidence on surgical treatment of non-lactational mastitis (NLM) and substantiates a differentiated operative decision-making algorithm based on ultrasound parameters of the abscess cavity and the morphological maturity of the pyogenic membrane. US-guided aspiration is shown to achieve primary success in 78 – 85% of cases for abscesses ⩽3 cm. It is demonstrated that excision of a mature pyogenic membrane (>4 mm) constitutes a mandatory, non-optional operative component. Surgery combined with steroids is shown to reduce GLM recurrence to 4.0% versus 20.9% with steroid monotherapy, while total ductectomy for periductal mastitis reduces recurrence to 4–8% versus 28–42% with standard drainage. Integration of ultrasound parameters and pyogenic membrane morphological maturity into a unified algorithm is substantiated as an evidence-based approach to improving surgical outcomes in NLM.

Keywords: Non-lactational mastitis, surgical algorithm, ultrasound-guided aspiration, VAC therapy, pyogenic membrane, periductal mastitis, ductectomy, granulomatous mastitis.

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Introduction

SUT BEZINING NOLAKTASION YIRINGLI-YALLIG'LANISH KASALLIKLARI: XIRURGIK DAVOLASH VA MORFOLOGIK ASOSLANGAN TAKTIKA TANLASH ALGORITMI

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Annotatsiya

Ushbu maqolada nolaktasion sut bezining yiringli-yallig'lanish kasalliklarini (NSBYYK) xirurgik davolashning zamonaviy uslublari tizimlashtiriladi va ultratovush (UTT) ko'rsatkichlari hamda yiringli membrananing morfologik pishib-etilish darajasiga asoslangan differensial operatsion qaror qabul qilish algoritmi ilmiy asoslanadi. UTT nazorati ostida aspiratsiya usuli ≤3 sm hajmdagi absesslar uchun 78–85% birlamchi muvaffaqiyatni ta'minlashi isbotlangan. Pishgan yiringli membrana (>4 mm) aniqlanganda membranani kesib olish majburiy operatsion komponenti ekanligi ko'rsatilgan. GLM da jarrohlik va steroidlar kombinatsiyasi residivni 4,0% gacha, periduktal mastit da total duktektomiya esa 4–8% gacha kamaytirishi isbotlangan. UTT ko'rsatkichlari va yiringli membrananing morfologik pishib-etilishini yagona algoritmga integratsiya qilish NSBYYK ni xirurgik davolashni yaxshilashning ilmiy asoslangan yo'nalishi ekanligi asoslab berilgan.

Kalit so'zlar: nolaktasion mastit, xirurgik algoritm, UTT aspirasiyasi, VAK-terapiya, yiringli membrana, periduktal mastit, duktektomiya, granulematoz mastit.

НЕЛАКТАЦИОННЫЕ ГНОЙНО-ВОСПАЛИТЕЛЬНЫЕ ЗАБОЛЕВАНИЯ МОЛОЧНОЙ ЖЕЛЕЗЫ: ХИРУРГИЧЕСКОЕ ЛЕЧЕНИЕ И МОРФОЛОГИЧЕСКИ ОБОСНОВАННЫЙ АЛГОРИТМ ВЫБОРА ТАКТИКИ

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Аннотация
В статье систематизированы современные данные о методах хирургического лечения нелактационных гнойно-воспалительных заболеваний молочной железы (НГВЗМЖ) и обоснован дифференцированный алгоритм выбора объёма оперативного вмешательства на основе УЗИ-параметров абсцессной полости и морфологической зрелости пиогенной мембраны. Доказано, что пункционно-аспирационный метод под УЗИ-контролем при абсцессах ≤3 см обеспечивает первичный успех в 78–85% случаев. Показано, что иссечение зрелой пиогенной мембраны (>4 мм) является обязательным, а не опциональным компонентом операции. Подтверждено, что комбинация хирургии со стероидами снижает рецидив ГЛМ до 4,0% против 20,9% при монотерапии стероидами, а тотальная дукэктомия при перидуктальном мастите — до 4–8% против 28–42% при стандартном дренировании. Аргументировано, что интеграция УЗИ-параметров и морфологической зрелости пиогенной мембраны в единый алгоритм является научно обоснованным направлением совершенствования хирургических результатов при НГВЗМЖ.

Ключевые слова: нелактационный мастит, хирургический алгоритм, УЗИ-аспирация, VAC-терапия, пиогенная мембрана, перидуктальный мастит, дукэктомия, гранулематозный мастит.

INTRODUCTION

This paper is Part II of a two-part series; Part I addresses the etiology, pathogenesis and diagnosis of NLM. The central premise of this article is that the operative volume in NLM should be determined by three complementary criteria: (1) ultrasound parameters of the abscess cavity, (2) morphological maturity of the pyogenic membrane, and (3) the causative pathogen and antibiogram results.
Applying a uniform standard of incision-and-drainage (I&D) to all NLM forms results in recurrence in 15–65% of patients [1] — a rate that is unacceptable by modern evidence-based standards and that provides the principal rationale for the differentiated morphologically guided approach proposed here.

LITERATURE SEARCH METHODS

Narrative review. Databases: Scopus, WoS, PubMed (2015–2025). Search queries: "non-puerperal mastitis surgical treatment", "granulomatous mastitis surgery recurrence", "breast abscess aspiration algorithm", "VAC breast abscess", "periductal mastitis ductectomy", "granulomatous mastitis steroid surgery combination". 14 sources included.

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DIFFERENTIATED SURGICAL ALGORITHM

Table 1. Morphologically guided surgical algorithm for NLM

US volume	Loculation	Membrane	Method	Antibiotherapy
≤3 cm	Unilocular	Immature (<2 mm)	US-guided aspiration ×1–3	Culture-guided, 10–14 days
3–6 cm	Unilocular	Mod. mature (2–4 mm)	I&D ± membrane excision	Culture-guided, 14 days
>6 cm / any	Multilocular	Mature (>4 mm)	Wide drainage + mandatory membrane excision	Culture-guided, 14–21 days
Phlegmon	—	Unformed	Necrectomy + VAC 5–10 days	Broad-spectrum → culture-guided
GLM (no abscess)	—	No membrane	Stage I–II: steroids; III–IV: resection + steroids	Only if Ck / MRSA
PDM + fistula (recurrent)	Fistulous tract	Mature + tract	Total ductectomy	Culture-guided, 14–21 days

For Ck infection: rifampicin-based triple therapy [13]; for MRSA: vancomycin / linezolid. Antibiotherapy duration is adjusted according to clinical response and repeated culture.

SURGICAL METHODS

Ultrasound-guided needle aspiration

First-line method for abscesses ≤3 cm with a unilocular cavity. Ghunaim H. et al. [3] (22 studies) reported a primary success rate of 78–85% for abscesses ≤3 cm; multilocular abscesses showed significantly lower success rates. In Ck infection [13], Ck biofilm within the pyogenic membrane survives aspiration of cavity contents — rifampicin-based antibiotherapy is therefore mandatory alongside aspiration. Failure criterion: persistence of the cavity after ≥3 aspiration sessions.

Incision and drainage (I&D)

Indications: abscesses 3–6 cm; multilocular abscesses; failure of ≥3 aspirations; central subareolar abscesses. Incision choice: subareolar abscess — periareolar curved incision; intramammary — radial; retromammary — inframammary fold. Zhang W. et al. [4] (n=87) demonstrated that anatomically differentiated access (posterior vs non-posterior space) significantly affects healing time and complication rate.

Critical technical point: when a mature pyogenic membrane (>4 mm on US or confirmed by frozen section) is encountered, excision of the abscess wall is a mandatory operative step — not an option. Preserving the dense fibrous capsule perpetuates Ck biofilm and causes recurrence [13].

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VAC (Vacuum-Assisted Closure) therapy

Indications: breast phlegmon; abscesses >6 cm with extensive necrosis; wound dehiscence following initial drainage. Goncharov A.V. et al. [8] reported significantly shorter healing times and reduced secondary suppuration with VAC therapy in non-lactational suppurative breast disease (retrospective study, GRADE: low). Parameters: −80 to −120 mmHg; dressing change every 48–72 h; duration 5–10 days. VAC does not replace antibiotherapy.

Staged operative approach for extensive GLM

Xie L. et al. [6] demonstrated a statist`ically significant advantage of a two-stage approach over single-stage surgery in GLM ($p<0.01$): Stage 1 — drainage of the acute suppurative focus; Stage 2 (4–8 weeks later, following sub-remission on steroids) — radical resection within healthy tissue margins. Preoperative MRI is mandatory when ≥2 quadrants are involved [12].

Reconstructive surgery

Indications: parenchymal deficit >20%, risk of significant cosmetic deformity, confirmed complete eradication of infectious focus. Huang J. et al. [10] described the dermis-retained dermo-glandular flap technique, enabling closure of defects up to 120 cm^3 without implants. Reconstruction should be deferred in cases of phlegmon, MRSA infection, or active GLM until microbiological clearance is achieved.

FORM-SPECIFIC MANAGEMENT

Granulomatous lobular mastitis

According to the 2022 international consensus [12]: Stages I–II (no suppuration) — steroids (prednisolone 0.5–1.0 mg/kg/day, 3–6 months); Stages III–IV or steroid failure — surgery + steroids. Lei X. et al. [9] (meta-analysis, 15 studies): recurrence with surgery alone — 6.8%; steroids alone — 20.9%; combination — 4.0%. Steroid monotherapy achieves remission in 90.6%; surgery alone in 94.5% [5,12].

The network meta-analysis by Zhou Y. et al. [2] (n=1,095) showed the lowest OR of recurrence with combination therapy (OR 0.23). However, the 95% CI (0.01–4.53) crosses 1, indicating statistical non-significance[5,11]. The clinical benefit of combination therapy is supported by Lei [9], but RCT confirmation is required.

Periductal mastitis with fistulas

Primary PDM episode with abscess: I&D + culture-guided antibiotherapy + smoking cessation counselling. Second recurrence or chronic fistula: Hadfield's operation (total ductectomy) — subareolar resection of the entire duct system including the fistulous tract. Pesce C. et al. [7]: recurrence 4–8% vs 28–42% with I&D. Technical principle: the fistulous tract must be included en bloc in the resection specimen.

IgG4-associated mastitis

First line: prednisolone 30–40 mg/day with gradual tapering; surgery is reserved for steroid failure or diagnostic verification. Surgery without steroid preparation is associated with high recurrence rates.

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ANTIBIOTIC THERAPY

Antibiotherapy must be based exclusively on culture results with MALDI-TOF identification and antibiogram. Empirical antibiotherapy is not recommended for autoimmune forms (GLM without Ck/MRSA, IgG4-mastitis): it is not only ineffective but delays accurate diagnosis [12,14].

For Ck infection: rifampicin-based triple regimen for ≥12 weeks (89% remission [13]); β-lactams are contraindicated (70% resistance). For MRSA: vancomycin IV or linezolid orally. For Mycobacterium spp.: species-specific therapy based on identification results.

LIMITATIONS

RCTs on surgical treatment of NLM are practically absent; all recommendations are based on retrospective cohort data (GRADE: low — very low). Unresolved questions: (1) the exact diameter threshold for transitioning from aspiration to I&D (the "3 cm" boundary is expert consensus, not RCT-derived); (2) the role of routine excision of moderately mature (2–4 mm) membranes; (3) optimal VAC duration for breast phlegmon; (4) the role of primary closure in non-lactational abscesses. Patient-reported outcome data (BREAST-Q, SF-36) as surgical endpoints in NLM are absent from published literature. Regional data for the Central Asian population are lacking.

CONCLUSIONS

1. US-guided aspiration is the first-line method for abscesses ≤3 cm (primary success 78–85%); in Ck infection, mandatory concomitant rifampicin-based antibiotherapy is required.
2. For a mature pyogenic membrane (>4 mm), excision of the abscess wall is a mandatory, not optional, operative component.
3. Combined surgery + steroids for GLM achieves 4.0% recurrence per Lei et al. [9]; the 2025 network meta-analysis is statistically non-significant — RCTs are necessary.
4. Total ductectomy is the only radical method for recurrent PDM (recurrence 4–8% vs 28–42%) [7].
5. Patient-reported quality-of-life data as NLM surgical outcomes are absent; obtaining such data is a priority for future prospective research in the region.

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