

Assessing the Clinical Efficacy and Effectiveness of Sentinel Lymph Node Biopsy Combined with Breast-Conserving Surgery for Early-Stage Breast Cancer

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Abstract: *Objective:* To analyze the impact of sentinel lymph node biopsy (SLNB) combined with breast-conserving surgery in the clinical treatment of early-stage breast cancer. *Methods:* 80 patients with early-stage breast cancer admitted to the Second Department of Breast Surgery at Dezhou Second People's Hospital from September 2020 to September 2022 were selected and randomly divided into a control group and an observation group using the random number table method, with 40 cases in each group. The control group underwent a modified radical mastectomy, while the observation group underwent SLNB combined with breast-conserving surgery. The surgical efficacy and prognosis between the two groups were compared. *Results:* The observation group exhibited shorter operation, hospitalization, and extubation times, as well as less intraoperative blood loss and drainage volume, all of which were significantly better than those in the control group ($P < 0.05$). Additionally, the observation group demonstrated a higher rate of excellent breast cosmetology and quality of life, with lower complication incidence, significantly outperforming the control group ($P < 0.05$). There was no statistical difference in the metastasis rate and recurrence rate between the two groups ($P > 0.05$). *Conclusion:* The combination of SLNB and breast-conserving surgery proves highly effective for patients with early-stage breast cancer, presenting fewer complications and enhancing both breast cosmetic outcomes and quality of life.

Keywords: Early breast cancer; Sentinel lymph node biopsy; Breast-conserving surgery; Clinical efficacy

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1. Introduction

Breast cancer stands as the predominant malignancy affecting women, causing considerable detriment to both their physical health and life safety. The condition of axillary lymph nodes holds paramount importance in the staging of breast cancer. Therefore, assessing axillary lymph node metastasis is crucial to delineate the necessity of axillary lymph node dissection (ALND)^[1]. Sentinel lymph node biopsy (SLNB) serves as a valuable tool in determining metastasis in axillary lymph nodes associated with the primary tumor. It plays a supportive role in

both disease treatment and prognosis assessment, acting as a deterrent against the spread of tumor cells through lymphatic channels. The significance of SLNB in diagnosing and treating malignant tumors is substantial.

Breast-conserving surgery boasts advantages such as minimal surgical trauma, favorable breast cosmetic outcomes, and heightened postoperative patient satisfaction^[2]. The combination of SLNB and breast-conserving surgery has demonstrated its ability to enhance the prognosis and quality of life for patients grappling with early-stage breast cancer. Consequently, this approach has found widespread application in clinical settings^[3].

This study specifically focused on 80 patients diagnosed with early-stage breast cancer, all of whom underwent treatment at Dezhou Second People's Hospital between September 2020 and September 2022. The primary objective was to observe and analyze the effects of SLNB combined with breast-conserving surgery on these patients.

2. Materials and methods

2.1. General information

Eighty patients with early-stage breast cancer were carefully selected from admissions to the Second Department of Breast Department of Dezhou Second People's Hospital between September 2020 to September 2022. The patients were meticulously grouped using the random number table method, with 40 cases allocated to each group.

For the observation group, the age range of patients was 28 to 70 years, with an average of 47.12 ± 12.18 years. Tumor locations included 23 cases in the left breast and 17 cases in the right breast. Tumor diameter distribution was as follows: ≤ 2 cm in 29 cases and 2–3 cm in 11 cases. American Joint Committee on Cancer (AJCC) staging comprised 27 cases in Stage I and 13 cases in Stage II. Pathological types encompassed 37 cases of invasive ductal carcinoma and 3 cases of lobular carcinoma.

For the control group, the age range of patients was 30 to 72 years, with an average of 47.25 ± 12.21 years. Tumor locations included 25 cases in the left breast and 15 cases in the right breast. Tumor diameter distribution was as follows: ≤ 2 cm in 28 cases and 2–3 cm in 12 cases. AJCC staging comprised 26 cases in Stage I and 14 cases in Stage II. Pathological types encompassed 36 cases of invasive ductal carcinoma and 4 cases of lobular carcinoma. There was no statistical difference between the data of the two groups ($P > 0.05$).

Inclusion criteria included patients diagnosed with early-stage breast cancer confirmed through imaging and needle biopsy, expressing a clear desire to breastfeed, classified as AJCC Stages I–II, with a single tumor and a diameter ≤ 3.0 cm, meeting relevant surgery indications, and providing consent for participation in the study.

Exclusion criteria included patients with axillary lymph node enlargement or multicenter lesions, those who have undergone preoperative chemoradiotherapy or have a history of axillary surgery, those diagnosed with secondary breast cancer, and those with concomitant other malignant tumors or significant organ lesions.

2.2. Methods

The control group underwent modified radical resection with general anesthesia in a supine position. The incision size was meticulously determined based on the patient's breast shape, size, and lesion location. An incision, positioned 3 cm away from the tumor's edge, took a horizontal or vertical fusiform shape. The surgical approach involved undermining while preserving both the pectoralis major and minor muscles. Lymph nodes situated between the pectoralis major muscles and the axilla were dissected, followed by postoperative chest bandaging and the placement of a drainage tube under the armpit.

The observation group underwent SLNB combined with breast-conserving surgery.

- (1) SLNB surgery: After ensuring successful anesthesia, 2–4 mL of a 1% methylene blue solution was injected into the parenchyma surrounding the tumor. A 5 cm incision was made at the lower edge of the axillary hair area, and the skin flap was freed toward the axilla. Lymph nodes in the axilla were systematically searched from top to bottom and from inside to outside. The presence of stained lymphatic vessels outside the pectoralis major muscle was detected, and sentinel lymph nodes were identified, promptly removed, and sent for pathological examination. Positive results prompted ALND, while negative results led to standard surgical incision closure.
- (2) Breast-conserving surgery: After successful general anesthesia, the surgical range was precisely marked, and an arc-shaped incision was made. Tumor tissue was removed 2 cm from the outer edge, ensuring complete excision. Resection specimens were promptly sent for pathological examination. Positive results prompted an expanded resection scope, with specimens submitted for examination again. Patients with positive results underwent a total mastectomy, while those with negative results had their incisions closed using cosmetic sutures.

2.3. Observation indicators

- (1) Perioperative indicators: Perioperative data, including operation time, hospitalization duration, and extubation time, were meticulously recorded for both groups. Additionally, measurements were taken for intraoperative blood loss and postoperative drainage volume.
- (2) Breast cosmetic effect: The evaluation of breast cosmetic outcomes took place six months post-surgery. The criteria were as follows: Symmetrical breasts with a normal appearance and skin color, and a nipple gap < 2cm were denoted as “excellent”; Symmetrical breasts with a generally normal appearance, light and bright skin, and a nipple gap between 2–3 cm were denoted as “good”; Not meeting the above criteria were denoted as “poor”^[4]. The excellent rate was calculated as (number of “excellent” + “good” cases) / total number of cases × 100%.
- (3) Quality of life: The quality of life for breast cancer patients was assessed using the FACT-B scale during a 6-month follow-up period after surgery^[5]. Evaluation encompassed social, emotional, physiological, functional, and additional dimensions. Corresponding scores were assigned as 28 points, 24 points, 28 points, 28 points, and 36 points, respectively. These scores demonstrated a positive correlation with the quality of life.
- (4) Prognostic indicators: postoperative complications, including hypoaesthesia, subcutaneous effusion, skin flap necrosis, swelling, and numbness were statistically documented for both groups. Additionally, the metastasis rate and recurrence rate six months post-surgery were recorded to assess prognostic outcomes.

2.4. Statistical analysis

Data analysis was conducted using SPSS 27.0 software. Measurement data were presented as mean ± standard deviation (SD), and a *t*-test was employed for comparison. Count data were expressed as *n* (%), and the χ^2 test was applied. Significance was set at $P < 0.05$ to indicate statistical significance.

3. Results

3.1. Comparison of perioperative indicators between the two groups

Table 1 shows that the observation group exhibited significantly shorter operation, hospitalization, and extubation times, accompanied by reduced intraoperative blood loss and drainage volume, all of which were

notably superior to those in the control group ($P < 0.05$).

Table 1. Comparison of perioperative indicators between the two groups (mean \pm SD)

Group	Operation time (min)	Intraoperative blood loss (mL)	Length of stay (d)	Extubation time (d)	Postoperative drainage volume (mL)
Observation group ($n = 40$)	74.21 \pm 9.48	32.42 \pm 7.19	9.98 \pm 1.22	7.52 \pm 2.21	42.86 \pm 6.74
Control group ($n = 40$)	80.72 \pm 9.25	70.81 \pm 8.45	11.05 \pm 1.72	9.08 \pm 2.75	112.63 \pm 24.85
<i>t</i>	3.109	3.094	3.209	2.797	17.138
<i>P</i>	0.003	0.003	0.002	0.007	0.000

3.2. Comparison of breast cosmetic effects between the two groups

The observation group demonstrated a higher rate of “excellent” and “good” in breast aesthetics compared to the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of breast cosmetic effects between two groups [n (%)]

Group	Excellent	Good	Poor	Excellent rate
Observation group ($n = 40$)	27 (67.50)	11 (27.50)	2 (5.00)	38 (95.00)
Control group ($n = 40$)	21 (52.50)	9 (22.50)	10 (20.00)	30 (75.00)
χ^2	-	-	-	6.275
<i>P</i>	-	-	-	0.012

3.3. Comparison of quality of life between the two groups

Table 3 shows that the FACT-B score in the observation group surpassed that of the control group ($P < 0.05$).

Table 3. Comparison of quality of life between the two groups (mean \pm SD, points)

Group	Social state	Emotional state	Physiological state	Functional state	Other aspect
Observation group ($n = 40$)	21.38 \pm 5.39	19.32 \pm 4.08	22.25 \pm 4.95	21.45 \pm 6.36	24.92 \pm 5.28
Control group ($n = 40$)	17.95 \pm 4.88	17.02 \pm 3.43	18.56 \pm 5.47	18.28 \pm 5.62	21.55 \pm 5.04
<i>t</i>	2.984	2.729	3.163	2.362	2.920
<i>P</i>	0.004	0.008	0.002	0.021	0.005

3.4. Comparison of postoperative complication rates between the two groups

The observation group exhibited a significantly lower incidence of complications in comparison to the control group ($P < 0.05$), as presented in **Table 4**.

Table 4. Comparison of postoperative complication rates between the two groups [n (%)]

Group	Decreased sensation	Subcutaneous effusion	Flap necrosis	Swelling and numbness	Overall incidence
Observation group ($n = 40$)	0 (0.00)	1(2.50)	0 (0.00)	1(2.50)	2 (5.00)
Control group ($n = 40$)	2 (5.00)	2 (5.00)	1(2.50)	3 (7.50)	8 (20.00)
χ^2	-	-	-	-	4.114
<i>P</i>	-	-	-	-	0.043

3.5. Comparison of metastasis rate and recurrence rate between the two groups

Table 5 shows that there was no statistical difference observed in the metastasis rate and recurrence rate between the two groups ($P > 0.05$).

Table 5. Comparison of metastasis rate and recurrence rate between two groups [n (%)]

Group	Metastasis rate	Recurrence rate
Observation group ($n = 40$)	1 (2.50)	1 (2.50)
Control group ($n = 40$)	3 (7.50)	4 (10.00)
χ^2	1.053	1.920
P	0.305	0.166

4. Discussion

The majority of early-stage breast cancer patients do not present with axillary lymph node metastasis. Extensive ALND often results in disrupted lymphatic reflux, leading to postoperative complications such as pain, numbness, edema, and restricted upper limb movement, significantly impacting patients' quality of life.

Clinically, modified radical mastectomy is frequently employed to treat early-stage breast cancer. However, this approach is highly invasive, removing the affected breast and ipsilateral axillary lymph nodes, with potential nerve damage and a higher incidence of complications [6]. In contrast, breast-conserving surgery allows for faster postoperative recovery, preserving normal glandular tissue and breast shape, thus enhancing treatment efficacy, breast aesthetics, and patient satisfaction [7]. SLNB is a minimally invasive procedure that accurately determines tumor metastasis, allowing for the avoidance of lymph node dissection in patients with negative results and reducing the risk of recurrence in positive cases [8]. This approach contributes to the overall improvement of patient treatment outcomes, mental health, and quality of life, particularly for those with negative results who can undergo breast-conserving surgery without the emotional burden of breast loss [9].

This study results indicate that the observation group, subjected to SLNB combined with breast-conserving surgery, exhibited shorter operation, hospitalization, and extubation times, along with reduced intraoperative blood loss and drainage volume, compared to the control group ($P < 0.05$). This suggests that this combined approach provides advantages such as minimal bleeding, high surgical efficiency, and swift postoperative recovery, demonstrating significant therapeutic efficacy. Furthermore, the excellent rate of breast cosmetology and quality of life in the observation group surpassed that of the control group ($P < 0.05$). This suggests that SLNB combined with breast-conserving surgery meets the aesthetic needs of early-stage breast cancer patients, enhancing their overall quality of life. While modified radical surgery can preserve the pectoralis major muscles, breast-conserving surgery, guided by SLNB, maximally retains non-lesional breast tissue, utilizing the healthy side nipple as a reference standard. This approach effectively controls the height difference between both sides post-surgery, addressing women's aesthetic needs and improving their quality of life. The lower incidence of complications in the observation group compared to the control group ($P < 0.05$) emphasizes the accuracy of SLNB results. Monitoring cancer cell metastasis and evaluating lymph node involvement enables the avoidance of unnecessary ALND in negative patients, preserving normal tissue and lymph nodes, minimizing removal scope, and reducing surgical trauma and complications. Therefore, SLNB combined with breast-conserving surgery achieves optimal efficacy with high safety and a low complication rate, with no significant differences observed in metastasis and recurrence rates compared to modified radical mastectomy [10].

In summary, SLNB combined with breast-conserving surgery for early-stage breast cancer patients offers

advantages such as reduced intraoperative trauma, minimized bleeding, shorter operation times, and faster postoperative recovery. It effectively decreases complication rates while enhancing breast aesthetics and overall quality of life.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Xie Y, Dong Y, Song H, et al., 2020, Application Value of Breast Conservation Combined with Sentinel Lymph Node Biopsy Surgery and Modified Radical Mastectomy in the Treatment of Early Breast Cancer. *Chinese Journal of Clinical Oncology and Rehabilitation*, 27(7): 856–860.
- [2] Wang C, Li X, Wen J, et al., 2020, Effects of Breast-Conserving Surgery Combined with Sentinel Lymph Node Biopsy on Axillary Extubation Time, Shoulder Joint Mobility and Long-Term Efficacy in Patients with Early Breast Cancer. *China Medical Herald*, 17(36): 105–109.
- [3] Liu P, Zhang H, Li W, et al., 2020, Observation on the Effect of Breast-Conserving Surgery Combined with Sentinel Lymph Node Biopsy in the Treatment of Early Breast Cancer. *Chinese Journal of Practical Medicine*, 47(22): 69–71.
- [4] Shen J, Bao X, Ma Y, et al., 2021, Observation on the Clinical Efficacy of Sentinel Lymph Node Biopsy Combined with Breast-Conserving Surgery and Radical Resection in the Treatment of Breast Cancer. *Shanxi Medical Journal*, 50(3): 433–435.
- [5] Fang W, Zong S, Zhang C, et al., 2022, Clinical Study of Breast-Conserving Surgery Combined with Sentinel Lymph Node Biopsy in the Treatment of Early Triple-Negative Breast Cancer. *Progress in Modern General Surgery in China*, 25(8): 636–638.
- [6] Yang H, Feng X, Chen Y, et al., 2022, Effect of Breast-Conserving Surgery Combined with Sentinel Lymph Node Biopsy on Prognosis and Breast Cosmetic Satisfaction in Patients with Early Breast Cancer. *Cancer Progress*, 20(24): 2557–2559 + 2563.
- [7] Zheng S, Cao C, 2022, The Efficacy of Breast Conservation Combined with Sentinel Lymph Node Biopsy in the Treatment of Early Triple-Negative Breast Cancer and Its Impact on Postoperative Quality of Life. *Chinese Maternal and Child Health Care*, 37(1): 48–51.
- [8] Song D, 2019, Research on the Clinical Application Value of Sentinel Lymph Node Biopsy in Breast-Conserving Treatment of Early Breast Cancer. *Heilongjiang Traditional Chinese Medicine*, 48(1): 217–218.
- [9] Yu X, 2021, Clinical Efficacy of Breast Conservation Combined with Sentinel Lymph Node Biopsy in Patients with Early Breast Cancer. *Chinese Practical Medicine*, 16(28): 34–37.
- [10] Wu G, Zhong M, Zhang B, et al., 2020, Research on the Application of Sentinel Lymph Node Biopsy Combined with Breast-Conserving and Axillary-Conserving Surgery in the Treatment of Early Breast Cancer. *Modern Chinese Doctors*, 2020(36): 57–61.

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