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Single-port endoscopic nipple-sparing mastectomy combined with prosthesis breast reconstruction in breast cancer: a retrospective single-center study of 167 cases

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Abstract

Background

Single-port endoscopic nipple-sparing mastectomy combined with prosthetic breast reconstruction (E-NSM-PBR) has been used for breast repair due to aesthetic considerations. However, the clinical feasibility, postoperative complications and oncological safety of E-NSM-PBR in breast surgery remain controversial. This study presents our experience with the application of E-NSM-PBR in breast cancer patients and reports the preliminary results.

Methods

This is a retrospective study of 167 patients who underwent breast surgery using E-NSM-PBR at our institution between March 1, 2023 and December 31, 2024. Their clinicopathological characteristics, postoperative complications, cosmetic outcomes, and oncologic outcomes were analyzed.

Results

All patients underwent nipple-sparing mastectomy under single-port endoscopy, followed by breast prosthesis reconstruction. The average duration of unilateral surgery is 222.9 minutes (ranging from 115 to 537 minutes). The average operation time on both sides was 371 minutes (ranging from 348 to 390 minutes). The average reconstruction volume was 253.6 ml (ranging from 100 to 445 ml). The overall complication rate was 16.8%. The subcutaneous fluid and infection in the breast area are the most common complications in breast reconstruction, with a total of 18 cases (10.2%). The combined necrosis rate of the nipple-areola complex (NAC) and skin flaps is 3.6%. There were 3 cases of implant loss after postoperative radiotherapy. The incidence of bleeding complications was the lowest, only 1.2%. Cosmetic outcomes were satisfactory in 94.6% of patients on a four-point scale by three-panel assessment and 95.8% using the BCCT.core software. After a median follow-up of 29 months, one local and one systemic recurrence were observed.

Conclusions

E-NSM-PBR is a safe and feasible immediate breast reconstruction technique with concealed surgical incision and promising oncologic safety. For suitable candidates, E-NSM-PBR technology can provide good cosmetic results.

Background

Breast cancer is the most prevalent malignancy and the leading cause of cancer-related death among women worldwide[1]. At present, breast surgery based on mastectomy remains the main strategies for

treating breast cancer. However, the absence of breasts often has significant negative effects on the physical, psychological and social interaction of patients[2–4]. With the continuous development of breast reconstruction techniques, an increasing number of patients have put forward higher requirements for breast shape preservation while undergoing tumor treatment. For breast cancer patients who do not meet the indications for breast-conserving surgery, nipple sparing mastectomy (NSM) and its combined immediate breast reconstruction with prosthesis (NSM-PBR) are important treatment options[5]. Compared with traditional total mastectomy, NSM - PBR has been increasingly applied in clinical practice due to its favorable cosmetic results and high patient satisfaction. This surgical procedure also has the advantages of short operation time, rapid postoperative recovery, and avoidance of donor-site related complications[6, 7]. Furthermore, numerous studies have shown that NSM-PBR is comparable in terms of overall survival rate, disease-free survival rate, local recurrence, and distant metastasis to traditional total mastectomy[8–13]. Accordingly, NSM-PBR has been clinically accepted as a feasible therapeutic strategy, which can achieve complete tumor resection with guaranteed oncological safety and meanwhile provide satisfactory cosmetic outcomes for patients.

With the increasing acceptance of breast reconstruction among patients, single-port endoscopic nipple-sparing mastectomy combined with prosthetic breast reconstruction (E-NSM-PBR), another important surgical technique, has attracted growing clinical attention. Conventional open NSM-PBR requires visible incisions on the breast surface, which may compromise postoperative cosmetic outcomes. By contrast, E-NSM-PBR enables further reduce the surgical incision, and has been gradually applied in clinical breast reconstruction in recent years[14–16]. Utilizing a tiny concealed axillary incision, this technique can further improve postoperative aesthetic appearance. Although most patients who undergo E-NSM-PBR achieve satisfactory breast contour and disease control, this procedure demands high surgical proficiency[17, 18]. Its technical system is not yet fully mature, and no unified consensus has been reached regarding its long-term safety. Our center has performed E-NSM-PBR since 2022. This article summarizes our clinical experience of immediate prosthetic breast reconstruction with E-NSM-PBR and elaborates on surgical techniques, postoperative complications, cosmetic outcomes and oncological outcomes.

Methods

Patients

All E-NSM-PBR surgeries were performed by three well-trained breast surgeons at a Grade III cancer center from March 1, 2023 to December 31, 2024. A total of 167 patients were included, and the follow-up data were collected until the end of the most recent follow-up (June 31, 2026). All data were retrospectively collected in terms of population collection characteristics, clinicopathological characteristics, operation time, postoperative hospital stay, complications, patient aesthetics, etc. The above data were maintained by specially trained research assistants and confirmed by the chief researcher. The current study includes photos of several patients who agreed and signed consent forms to publish their photos.

Indications of E-NSM-PBR

167 patients met the following inclusion criteria: early invasive breast cancer or ductal carcinoma in situ, breast MRI confirmed that the tumor had not invaded the skin or chest wall; The maximum diameter of the invasive cancer mass was less than 5 cm, the regional lymph node stage was cN 0 to 2, and there was no clinical or imaging evidence of distant metastasis; Neoadjuvant chemotherapy is not contraindicated for mastectomy and immediate breast reconstruction, patients who had no skin involvement before neoadjuvant chemotherapy and whose tumors shrank to less than 5cm after neoadjuvant chemotherapy were also included in the study. Skin (including Paget's disease in the papillary areola area), chest wall invasion, regional lymph node staging N3, pregnancy patients receiving CO_2 cavity there is a certain risk, serious complications (such as organ dysfunction, immune deficiency), generally poor patients should not undergo surgery.

Surgical Procedures

Axillary Sentinel Lymph Node Biopsy

The patient was marked in a standing position before surgery. Along the marked line of the inframammary fold, the outline of the breast was drawn to define the boundary of the breast. Then the patient was positioned supine with the ipsilateral upper extremity abducted at 90°. The upper limb on the surgical side was routinely disinfected and wrapped to facilitate the movement and placement of the upper limb on the forehead during the operation. A 0.1 mL aliquot of methylene blue was administered via intradermal injection at the superolateral periareolar region. After 5 minutes of lymphatic mapping, a 4.5 cm incision was created along the axillary fold adjacent to the mammary border. Subcutaneous dissection exposed blue-stained lymphatic channels, which were traced to identify sentinel lymph nodes within level I axillary tissue. All identified sentinel nodes were excised en bloc with surrounding lymphatic tissue for histopathological evaluation. Indicated by positive sentinel node metastasis, complete axillary clearance was performed through the original incision.

Endoscopic Subcutaneous Glandectomy

Utilizing the existing axillary incision, subcutaneous flap elevation was performed with electrocoagulation knife, preserving subcutaneous fat layer. The dissection plane was extended to the pectoralis major fascia to establish an endoscopic operative field. A three port access system (a 10 mm optical trocar and two 5 mm work ports) was fabricated with sterile gloves. The gloves were fixed on the incision protector and the CO_2 insufflation pressure was maintained at 10–12 mmHg. Under endoscopic visualization, the breast glandular tissue was removed using an electrocoagulation hook in an reverse-order. Complete glandular excision was achieved with preservation of the superficial fascia. Sub-nipple tissue specimens were intraoperatively evaluated via frozen section analysis.

- Breast reconstruction

Breast reconstruction using prosthesis technique: The surgical field was thoroughly rinsed with sterile distilled water with iodophor prior to prosthesis placement. A pocket was created following preoperative volumetric analysis, with temporary sizer implantation performed to evaluate breast symmetry and volume match. Upon confirmation of adequate symmetry and volume match, the definitive implant was selected and inserted. A titanium-coated polypropylene mesh (TiLOOP Bra, pfm medical, Germany) was fashioned into a pouch-shaped configuration to encapsulate the prosthesis. This composite construct was then introduced through the axillary approach into the pocket under direct visualization. The prosthesis position was meticulously adjusted to achieve optimal anatomical orientation. A closed suction drain was placed in the dependent portion of the surgical cavity. Given the extensive dissection plane, absorbable hemostatic agent was strategically placed along the implant periphery to minimize postoperative hematoma formation. The axillary incision was closed with layered subcuticular sutures using 4 – 0 absorbable monofilament to optimize aesthetic outcomes. Typical photos of the operation process are shown in Fig. 1.

Follow-up

Postoperative monitoring protocol comprised structured surveillance intervals: quarterly assessments during the initial 24-month period, biannual evaluations from 2–5 years postoperatively, and annual examinations beyond the 5-year threshold to monitor adverse events and aesthetic parameters. Standardized tri-planar photographic documentation (anterior, bilateral oblique views) was obtained preoperatively, with subsequent imaging performed at each surveillance timepoint maintaining consistent imaging protocols. The aesthetic outcome was evaluated by dual-modality at 1 year after surgery. First, a blinded panel of three board-certified plastic surgeons independently graded reconstruction quality using a validated 4-tier classification system (excellent, good, fair, poor). Comparative analysis against the contralateral native breast informed categorical assignment, with "excellent" and "good" ratings denoting clinically acceptable outcomes. Second, objective quantification was performed using the Breast Cancer Conservative Treatment Cosmetic Results software (BCCT.core v3.0, INESC Porto Research Institute, University of Porto), an image analysis platform employing machine learning algorithms for standardized cosmetic assessment. The BCCT.core system executes algorithm-driven analysis of digital breast images, generating composite scores through quantitative evaluation of four critical parameters: 1) volumetric symmetry, 2) cutaneous chromatic homogeneity, 3) scar characteristics, and 4) nipple-areolar complex positioning. These metrics collectively determine categorical classification into identical four-grade taxonomy as the clinical evaluation. In addition, the oncological results were monitored by breast ultrasound, MRI, CT and other related examinations.

Results

Clinicopathological characteristics

In the current study, 167 patients underwent E-NSM-PBR surgery and we collected their clinical data. The average age of the patients was 43.46 years old (ranging from 20 to 69 years), the mean body mass

index was 23.3 kg/m^2 (ranging from 16.82 to 29.16). A small proportion of patients (4.8%) had a history of diabetes, and 6.6% of the patients had a history of hypertension. Most patients had smaller breasts (A-B, 82.6%). The diameter of breast tumor was less than 5cm in all patients, and 28.1% of the patients had axillary lymph node metastasis. The majority of breast cancer histopathological types were invasive ductal carcinoma (92.2%). In all patients, 9% received preoperative neoadjuvant chemotherapy, and 26.9% received postoperative radiotherapy. The median follow-up time was 29 months, ranging from 18 to 40 months (Table 1).

Surgical outcomes

Most of the 167 patients underwent unilateral breast reconstruction, and only 4 cases were bilateral. Among them, the mean operation time for unilateral breast reconstruction was 224 minutes (ranging from 115 to 537 minutes). The mean operation time on both sides was 371 minutes (ranging from 348 to 390 minutes). All the above mastectomies were therapeutic and all retained the NAC. The prosthetic breast reconstruction timing was all immediate reconstruction, and the mean volume of the implant was 253.8ml (ranging from 100 to 445ml). In addition, 28.1% of the patients underwent axillary lymph node dissection. The patients were discharged at a mean of 7.2 days after the operation (Table 2).

Operative complication and oncologic results

The overall postoperative complication rate of 167 patients undergoing E-NSM-PBR was 16.8%. In the assessment of postoperative complications, subcutaneous effusion in the breast area occurred in 12 cases (7.2%), which was the most common reconstruction-related complication. However, most cases could resolve spontaneously, while a small number of patients with more effusion required drainage to alleviate the condition. Five (3.0%) patients experienced surgical site infection, and all of them recovered by prolonging drainage time and antibiotic treatment. The necrosis rates of NAC and skin flap were 2.4% and 1.2%, respectively. After two-stage debridement and suture, they all recovered, avoiding the removal of prosthesis. There were 3 cases of implant loss, including two cases of severe capsular contracture after radiotherapy and one case of extensive ischemic necrosis of skin flap after radiotherapy. A total of 2 patients experienced postoperative bleeding, with an incidence rate of 1.2%. This occurred when performing subcutaneous layer separation with a cold knife, and both cases were treated with compression bandaging. During the entire follow-up period, there were 1 case of local recurrence and 1 case of distant brain metastasis. The patient with local recurrence received extensive local resection and radiotherapy treatment, while patient with distant brain metastases receive systemic treatment (Table 3).

Cosmetic outcomes

The primary motivations for developing E-NSM-PBR is the improvement in cosmetic outcomes. The cosmetic outcomes were evaluated in 167 patients with a follow-up of at least 12 months (Table 4). Satisfactory cosmetic outcomes were observed in over 94% of patients by three-panel assessment and BCCT.core software. Minimally invasive and aesthetic are the most prominent features of single port endoscopic breast reconstruction. All patients were satisfied with the surgical scars, the incision in the

axillary fold was naturally concealed and was almost invisible. Representative postoperative images of the E-NSM-PBR reconstruction surgery are shown in Fig. 2 and Fig. 3.

Table 1
The clinical characteristics of the patients

Parameters	Mean ± SD or N	Range or rate (%)
Age (y)	43.46 ± 7.1	20.0–69.0
BMI (kg/m^2)	23.30 ± 1.03	16.82–29.16
Comorbidity		
Hypertension	11	6.6
Diabetes	8	4.8
Breast cup size		
≤A	56	33.5
B	82	49.1
≥C	29	17.4
T stage		
pTis	13	7.8
pT1	65	38.9
pT2	89	53.3
pT3	0	0
N stage		
pN0	120	71.9
pN+	47	28.1
Histopathological type		
Invasive ductal carcinoma	154	92.2
Intraductal carcinoma in situ	13	7.8
Phyllodes tumor	0	0
ER		
Positive	129	77.2
Negative	38	22.8
PR		
Positive	120	71.9
Negative	47	28.1

Parameters	Mean ± SD or N	Range or rate (%)
HER-2		
Positive	32	19.2
Negative	135	80.8
Ki-67		
≤ 20%	71	42.5
>20%	96	57.5
Subtype		
Luminal A	48	28.7
Luminal B	61	36.5
HER-2positive	32	19.2
TNBC	26	15.6
Neoadjuvant chemotherapy	15	9.0
Adjuvant radiotherapy	45	26.9

BMI, body mass index; ER, estrogen receptor; PR, progesterone receptor; HER-2, human epidermal growth factor receptor 2; TNBC, triple negative breast cancer.

Table 2
Surgical outcomes

All patients (n = 167)	Mean ± SD or N	Range or rate (%)
Breast reconstruction		
Unilateral	163	98.2
Bilateral	4	1.8
Type of mastectomy		
Prophylactic	0	0
Therapeutic	167	100
NAC excision		
YES	0	0.0
NO	167	100.0
Operation time (min)		
Unilateral	224.0 ± 62.9	115–537
Bilateral	371.0 ± 21.3	348–390
Blood loss (ml)	75.3 ± 58.5	45–180
Reconstruction implant volume (ml)	253.8 ± 84.7	100–445
Timing of breast reconstruction		
IBR	167	100.0
DIBR	0	0.0
Lymph node surgery		
SLNB	120	71.9
ALND	30	18
SLNB followed by ALND	17	10.1
No surgery	0	0
Postoperative hospital stay (D)	7.2 ± 2.3	3–17

NAC, the nipple-areola complex; IBR, immediate breast reconstruction; DIBR, delayed immediate breast reconstruction; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; D, days.

Table 3
Complications and oncologic outcomes

Complications	N	Rate (%)
Total complications	28	16.8
Hematoma/hemorrhage	2	1.2
Subcutaneous fluid in breast area	12	7.2
Infection	5	3.0
NAC necrosis	4	2.4
Skin flap necrosis	2	1.2
Implant loss	3	1.8
Oncologic outcomes		
Local-regional recurrence	1	0.6
Distant metastasisz	1	0.6

Table 4
Cosmetic results (n = 167)

Cosmetic score	Panel assessment, n (%)	BCCT.core, n (%)
Excellent	117 (70.0%)	92 (55.1%)
Good	41 (24.6%)	68 (40.7%)
Fair	6 (3.6%)	4 (2.4%)
Poor	3 (1.8%)	3 (1.8%)

BCCT.core: The Breast Cancer Conservative Treatment software

Discussion

The application of endoscopic technology in the field of breast surgery has been gradually becoming more widespread, and its use in breast resection and subsequent breast reconstruction surgeries has significantly increased. Current research has shown that endoscopic-assisted breast surgery and conventional open breast surgery do not have significant differences in key prognostic indicators such as disease-free survival and overall survival. As a minimally invasive surgical method, the core advantage of endoscopic-assisted breast surgery lies in its excellent cosmetic effect after surgery and the less noticeable surgical scar. In this retrospective single-center study of 167 breast cancer patients, we demonstrated that minimally invasive single-port E-NSM-PBR is safe and feasible. Our results show

acceptable operative times, low major complication rates, satisfactory cosmetic outcomes, and encouraging intermediate-term oncologic safety.

Safety and aesthetics are core elements of breast reconstruction surgery. In our study, the median follow-up period was 29 months, and only 2 cases experienced local recurrence or distant metastasis, while longer follow-up is needed, our preliminary oncologic results are reassuring. We strictly adhere to the principles of oncological surgery: achieving negative surgical margins, completely excising the specimen, and preventing tumor spillage. Intraoperative frozen section of the retro-areolar tissue confirmed negative margins in all patients. Therefore, we believe that single-port endoscopic NSM-PBR is oncologically safe when performed by experienced surgeons following standardized procedures. However, conventional open breast surgery inevitably leaves a visible scar on the breast, which may affect patient satisfaction, particularly in Asian populations where scar formation can be more prominent. In our single-port endoscopic approach, the incision is placed in the axilla, resulting in a well-concealed scar, which is more prominent in aesthetics. In terms of the safety of surgical operation, Gui et al. compared the minimally invasive NSM-PBR (including endoscopy and robot assisted) with the open NSM-PBR, and found that the intraoperative time of minimally invasive surgery was longer, but the amount of bleeding was less[5]. Our results are consistent with these findings: the average operation time (224 minutes) is slightly higher than that of conventional open surgery (206 minutes reported by Gui et al.), but the amount of bleeding is minimal. Due to the learning curve of endoscopic breast surgery. After a period of time, our average operation time was shortened from 245 minutes in the first 50 cases to 215 minutes in the last 117 cases. This supports the notion that proficient endoscopic approaches do not significantly prolong the operation time or compromise the safety of surgical procedures. On the other hand, traditional endoscopic NSM may require multiple holes for assistance or a periareolar incision, which may still leave visible scars and potentially endanger the blood supply of the NAC[19, 20]. Yang et al. introduced the single axillary incision reverse-order endoscopic NSM technique in 88 surgeries, they chose to use auxiliary holes in the areola area to remove the glands in the lower inner quadrant[14]. Our single-port endoscopic technique also adopts a single-port axillary incision. The difference is that we used an electric coagulation hook throughout the surgical operation process. Due to its sufficient length, it is easier to operate in the lower inner quadrant, and there is no need to make an incision around the areola, so in theory, it can better preserve the blood supply of the NAC. Compared with robot assisted NSM technology, although the latter has the technical advantages of three-dimensional field of view and wrist style flexible operation of instruments, it has obvious shortcomings such as high surgical costs, longer preoperative equipment debugging and intraoperative preparation time[21–23]. Our team's single port endoscopic breast reconstruction technology achieves a high-quality balance between surgical safety, clinical feasibility, economic applicability, and cosmetic effects, with significantly higher cost-effectiveness and promotion. It is particularly suitable for application in regional medical institutions with limited medical resources.

The overall complication rate in our study was 16.8%, with most being minor complications. The most common complication was subcutaneous fluid (7.2%), followed by NAC / skin flap necrosis (3.6%) and

surgical site infection (3.0%). Conventionally, we remove the drainage tube when the drainage volume is less than 50 ml per day for three consecutive days. Some patients experience swelling and pain in the reconstructed breast after the drainage tube is removed. Regarding the treatment of subcutaneous fluid accumulation, a small amount of subcutaneous fluid can be absorbed spontaneously without any intervention, while a large amount of subcutaneous fluid requires ultrasound - guided puncture and drainage to relieve breast distension and pain. A small number of patients with subcutaneous fluid progress to breast inflammation and require thorough drainage combined with anti-inflammatory treatment. All patients with subcutaneous fluid accumulation recover after active treatment. A small number of patients experienced NAC / skin flap necrosis, and this mainly occurred in the early cases. All of these cases healed through secondary debridement and suturing. We attribute this to the meticulous dissection under endoscopic magnification, which allows precise identification and preservation of the subdermal vascular plexus. Additionally, the single axillary incision avoids any incision on the breast surface and areola area, which is more conducive to preserving the blood supply of the breast skin and areola. In the early stage, we also explored the use of cold knife to separate subcutaneous glands to expedite the surgical process. Since the cold knife lacks hemostatic properties, part of the blood vessels expanded and bled after the metabolism of adrenaline injected locally into the breast, resulting in postoperative bleeding and subcutaneous hematoma in two patients. Both patients were treated with breast pressure bandage to avoid secondary operation hemostasis. In our series, the low rate of implant loss (1.8%) is particularly noteworthy because implant loss is a serious complication, often indicating a failure in the reconstruction process. Compared with open NSM-PBR, the rate of implant loss in endoscopic NSM-PBR has not increased[5, 8, 24], and our single-channel technique did not add to this risk either. The preservation of native skin flaps and the absence of a long incision likely reduce bacterial contamination and maintain better flap perfusion, which is beneficial to the success of the procedure and avoiding implant loss due to surgery. Although surgical procedures do not increase the risk of prosthesis loss, radiotherapy has a greater impact on breast reconstruction, including severe capsular contracture, breast skin damage, prosthesis position offset, breast asymmetry, breast stiffness, infection and so on[25–28]. In our study, three cases of implant loss occurred after radiotherapy, including two cases of severe capsular contracture and hard texture, and one case of prosthesis exposure due to extensive skin ischemia and necrosis caused by radiotherapy.

Our study included patients with early and middle stage breast cancer, tumor size ≤ 5 cm, and no NAC or skin involvement. These indications are similar to those of other minimally invasive breast reconstruction surgeries[29, 30]. Patients with large, ptotic breasts (grade III) were generally excluded because of the increased risk of flap necrosis and difficulty in achieving symmetry. For such patients, open NSM or alternative reconstruction methods may be more appropriate. The single-port technique is best suited for small-to-moderate breast sizes (cup A–B) and mild or no ptosis, which is common in Asian populations. Neoadjuvant chemotherapy was not a contraindication, provided that the tumor shrank adequately and there was no skin involvement. In our series, 15 patients (9.0%) received neoadjuvant therapy, and their operative outcomes were comparable to those who did not, consistent with previous reports[31, 32].

Several limitations of this study should be acknowledged. First, this is a retrospective, single-center study without a concurrent control group undergoing open NSM-PBR. Although we compared our results with historical and published data, selection bias cannot be excluded. Second, the 29 months follow-up period is relatively short to fully assess long-term oncologic outcomes such as 5 year recurrence and survival rates. Third, cosmetic outcomes were assessed at a single time point, long-term changes of breast shape, including capsular contracture and implant malposition, need to be further evaluated. Fourth, the learning curve effect may have influenced our results; later cases may have achieved better outcomes, such as fewer complications, compared to earlier cases. Finally, single-port endoscopic surgery requires specialized training and involves a learning curve in its early stages, which may limit its initial application in some primary hospitals. Despite these limitations, our study provides valuable data for the adoption of this new technology.

Conclusion

Minimally invasive axillary single-port E-NSM-PBR is a safe and feasible option for well-selected patients with breast cancer. It offers excellent cosmetic outcomes, and acceptable complication rates, with encouraging intermediate-term oncologic safety.

Abbreviations

E-NSM-PBR single-port endoscopic nipple-sparing mastectomy combined with prosthetic breast reconstruction

NAC nipple-areola complex

NSM nipple sparing mastectomy

NSM-PBR nipple sparing mastectomy combined with prosthesis breast reconstruction

MRI magnetic resonance imaging

CT computed tomography

BCCT The Breast Cancer Conservative Treatment

Declarations

Authors' contributions

QL and XFL did the conception and design of the study. NBW gave administrative support. HWD ans YH provided study materials or patients. QL, YZ and ZQL performed the collection and assembly of data. QL, XFL and ZQL completed the data analysis and interpretation. All authors writed the manuscript. All authors approved the final manuscript.

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Acknowledgement

Not applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics

The study was approved by the ethics committee of Hunan Cancer Hospital. The need for informed consent was waived because of the retrospective nature of the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Figures

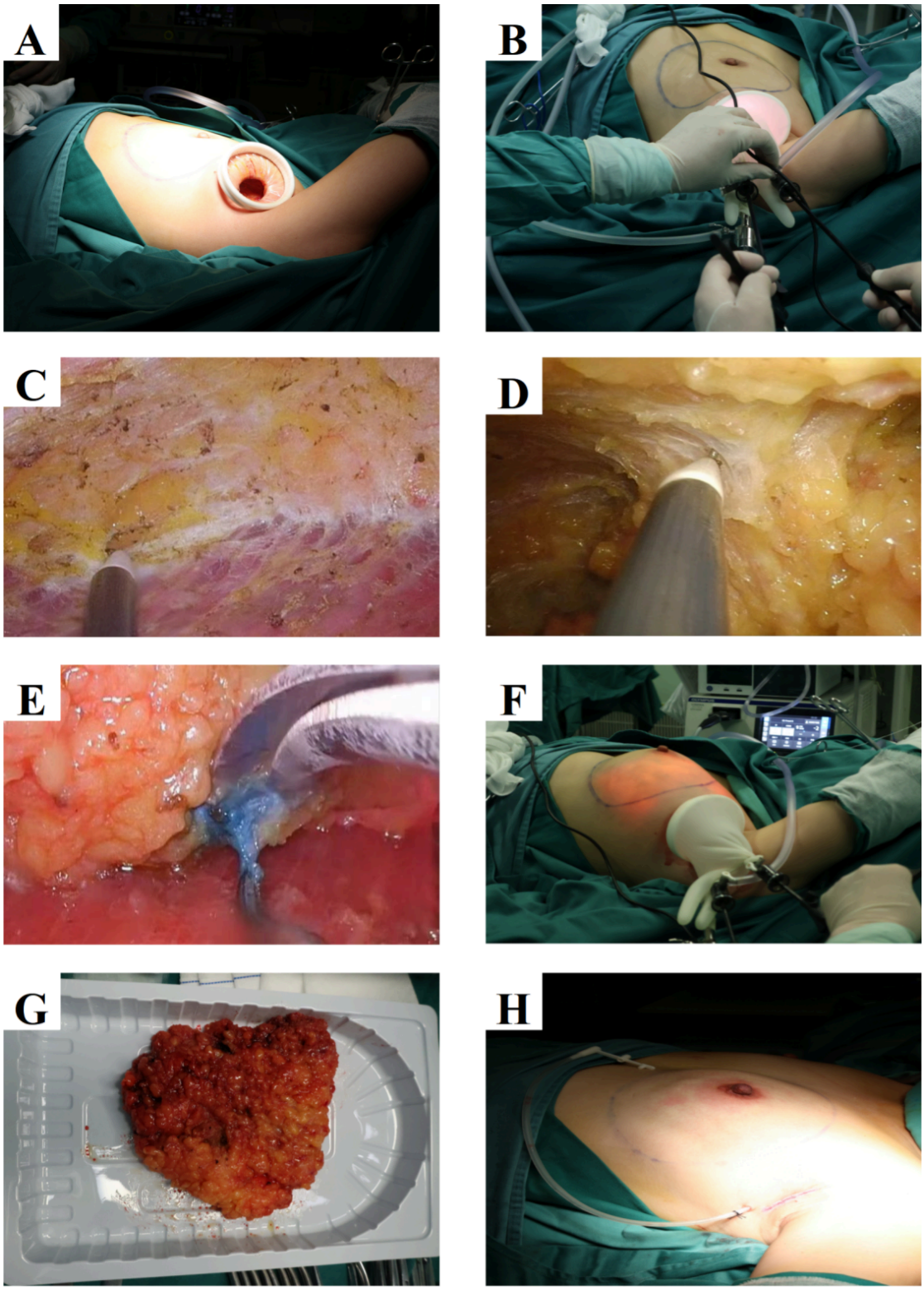


Figure 1

Procedure of single-port E-NSM-PBR.

(A) Supine position with the upper limb on the forehead and make the surgical incision in the axillary fold near the edge of the breast. (B) Establish a three port access system with sterile gloves. (C) Separation of retromammary space by electrocoagulation hook. (D) Separation of subcutaneous layer by electrocoagulation hook. (E) Intraoperative biopsy of sub-nipple tissue. (F, G) Complete removal of subcutaneous gland and extraction through axillary incision. (H) Prosthesis implantation and cosmetic suture incision.

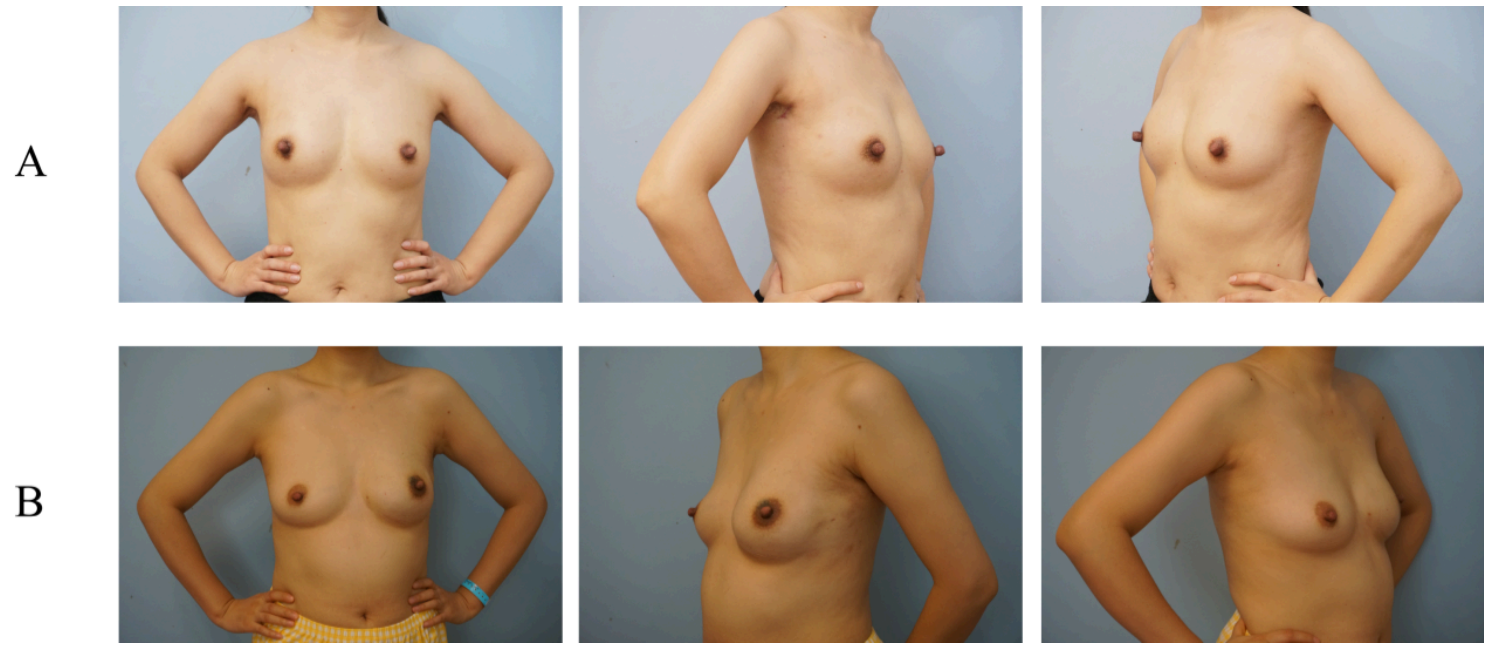


Figure 2

Cosmetic outcomes of immediate breast reconstruction using E-NSM-PBR 6 months after surgery.

(A) A patient underwent axillary single-port endoscopic NSM and immediate prosthesis reconstruction of the right breast. (B) A patient received axillary single-port endoscopic NSM and immediate prosthesis reconstruction of the left breast.



Figure 3

Radiotherapy after E-NSM-PBR reconstruction surgery.

(A) Front view of a patient using single-port E-NSM-PBR before receiving radiotherapy. (B) Front view 1 week after radiotherapy. (C) Front view 6 months after radiotherapy.