

Case Report

# Successful Enucleation of Intra-Nipple Recurrence of Breast Cancer

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## Keywords

Breast cancer · Intra-nipple recurrence · Enucleation

## Abstract

A 36-year-old unmarried woman had undergone nipple-preserving mastectomy and immediate breast reconstruction using extended latissimus dorsi muscle flap for her left breast cancer. During adjuvant endocrine therapy, the patient sometimes developed faint bloody nipple discharge with negative cytological results. More than 9 years after operation, the patient developed left nipple swelling with evident bloody nipple discharge. A small tissue, spouted from the single duct orifice of the nipple by manual compression, showed atypical cells growing in papillary fashion, leading to the diagnosis of intra-nipple recurrence. Based on both the strong request from the patient and high probability of noninvasive nature of the recurrent cancer, we tried to enucleate the intra-nipple recurrence. In the operation, we first threaded the nipple skin at the affected duct orifice of the nipple, second incised the nipple with horizontal skin incision between the bilateral edges of the left areola via a small spindle skin resection just around the affected duct orifice, third threaded the intact lateral nipple skin for countertraction, and finally enucleated the intra-nipple recurrence. After completely enucleating the recurrent focus without any macroscopic cancer residuals in the nipple, we reproduced the nipple into the original shape, resulting in excellent cosmesis without any nipple necrosis. Histological study showed the intra-nipple recurrence to be noninvasive papillary cancer. Approximately a quarter of the main tumor and a small part of one ductal spread focus were pathologically exposed but were present without any missing borders, suggesting complete resection of the intra-nipple recurrence. This is the first case of intra-nipple recurrence of breast cancer successfully enucleated without any complications.

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## Introduction

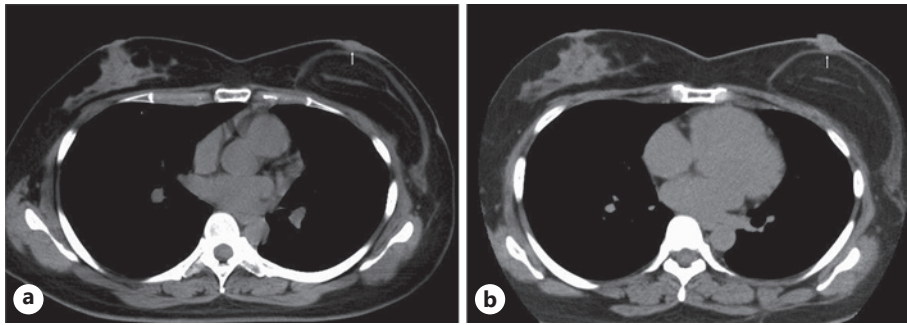
With the advent of oncoplastic surgery for breast cancer [1, 2], surgical techniques of nipple-preservation have become one of the major concerns for breast surgical oncologists [3–6]. In general, surgeons tend to be annoyed with the idea that complete nipple-base resection can easily lead to total or partial nipple necrosis. Some breast surgeons, therefore, resect the nipple-base in a manner to preserve certain amount of subnipple mammary gland, often resulting in a high positive margin rate.

Nipple recurrence after nipple-preserving surgery occurs through the mechanism of stromal invasion, lymphatic permeation, ductal spread, and intra-nipple ductal remnant. Nipple recurrence due to stromal invasion can easily be prevented both with the pathological results of the resected mammary gland, i.e., additive surgery to the nipple-areolar complex, and with the preoperative evaluation of magnetic resonance imaging for the application of nipple-preserving surgery to breast cancer patients. Solitary nipple recurrence through lymphatic permeation has never been reported to date probably due to the different anatomical structure of the nipple compared to that of normal skin. Ductal spread and intra-nipple ductal remnant can generally cause nipple recurrence with the initial clinical symptoms such as nipple erosion, i.e., Paget type recurrence and bloody nipple discharge.

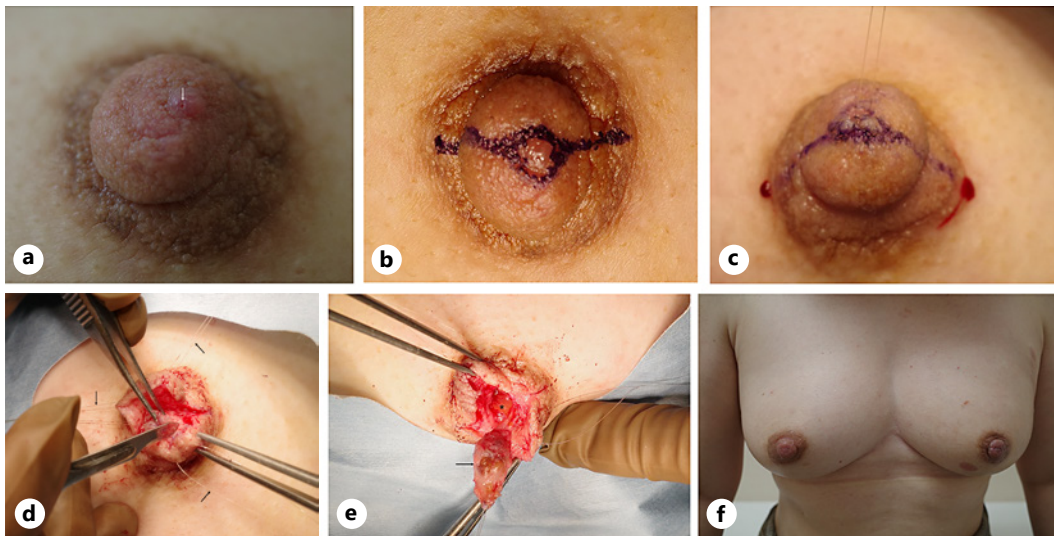
Many breast surgeons probably have the idea that nipple necrosis occurs through the mechanism of ischemic damage to the nipple, leading to extremely rare direct surgical intervention to the nipple such as nipple incision and partial nipple resection except for microdochectomy to the cases of bloody nipple discharge and suspected malignancy. Breast surgeons, therefore, have performed total nipple resection on any type of nipple recurrence without exception. We herein report an extremely rare type of nipple recurrence showing intra-nipple mass formation successfully treated with enucleation of the intra-nipple recurrence without total nipple resection.

## Case Report

A 27-year-old unmarried woman with left breast cancer was referred to our hospital. Under the diagnosis of invasive ductal cancer with massive ductal spread, the patient underwent sentinel node biopsy and nipple-preserving mastectomy with pathologically negative nipple base followed by immediate breast reconstruction using an extended latissimus dorsi flap. Cosmesis of the reconstructed breast was excellent (Fig. 1a). The patient had received adjuvant tamoxifen and luteinizing hormone-releasing hormone agonist for 5 years. During and after the endocrine therapy, the patient sometimes developed faint bloody nipple discharge from a single duct orifice of the preserved nipple in 19th month after operation and thereafter up until postoperative 7th postoperative year. Cytological examinations done to the patient showed no malignant cells in the bloody discharge. After 2 years of interval with no bloody nipple discharge, at the age of 36, the patient noticed left nipple swelling (Figs. 1b, 2a) and evident bloody nipple discharge. A small tissue and certain amount of bloody nipple discharge were spouted out from the enlarged duct orifice of the left nipple on manual compression (Fig. 2a). Pathological study of the small tissue showed atypical cells growing in papillary fashion, i.e., ductal carcinoma, leading to the diagnosis of intra-nipple recurrence (Fig. 3a). We speculated that the recurrence should highly be noninvasive cancer due to her clinical course, spouting pattern of the tissue, and histological findings. In addition, the patient strongly requested us to preserve the nipple. We, therefore, tried to enucleate the recurrent focus instead of total nipple resection after obtaining full informed consent of total or partial nipple necrosis. To enable precise surgical procedures, we performed the operation under

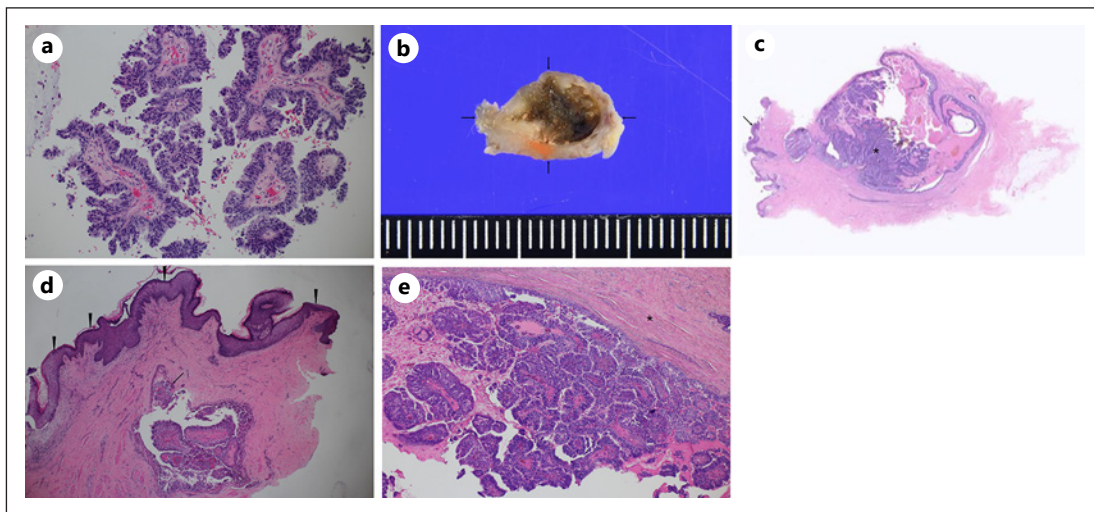


**Fig. 1.** CT findings. **a** CT at 51 months after operation showed that little mammary gland tissue (arrow) was observed under the nipple-areolar complex. Excellent symmetry, although reconstructed left breast was slightly larger than the right breast, could be observed. **b** CT on the present event showed evident nipple swelling (arrowhead) and extension of the intra-nipple recurrence toward the latissimus dorsi flap (arrow) compared with those of annual check-up CTs. CT, computed tomography.



**Fig. 2.** Affected nipple, enucleation techniques of the intra-nipple recurrence, and postoperative cosmetic outcome. **a** Nipple swelling and the enlarged duct orifice (arrow) were observed. **b** Incisional line was set horizontally with small spindle nipple skin resection line around the affected duct orifice. **c** Threading was done to the nipple skin at the affected duct orifice using a 4-0 bladed absorbable suture. **d** After incising the nipple skin, further threading was done to the lateral nipple skin with 4-0 bladed absorbable sutures at 3 points (arrows) for the purpose of giving appropriate tension to the target tumor. **e** Just before the complete tumor resection, we could observe fat tissue (asterisk) just beneath the tumor. The enucleated mass was mostly covered with a fibrous membrane, was partially exposed (arrow), but was excised without tumor cutting. The remaining part of the nipple had no tumor residuals (arrowhead). **f** The reproduced nipple showed a good shape. **g** Although horizontal skin incision was visible on the left nipple, cosmetic outcome of the reconstructed nipple was excellent. Fig.2d is missing. Instead, Fig.2c is again listed as Fig.2d. I've sent the true Fig.2d attached to my e-mail sent to the Editorial office.

general anesthesia. First, we set a small spindle skin resection line just around the affected duct orifice of the nipple and then connected it to the horizontal skin incisional lines toward the bilateral edges of the left areola (Fig. 2b). Second, after threading the nipple skin using a 4-0 bladed absorbable suture at the affected duct orifice (Fig. 2c), we incised the nipple, similarly



**Fig. 3.** Pathological findings. **a** The spouted tissue from the nipple duct orifice showed atypical cells growing in a papillary fashion. **b** Approximately three-quarters of the bisected recurrent tumor were encompassed with fibrous band (arrows). **c** Low magnified view of the enucleated tumor showed a nipple skin (arrow) and intraductal papillary growth of atypical cells. Approximately a quarter of the main tumor (arrowheads) and a small part of one ductal spread focus (asterisk) were exposed but were present without any missing boarders pathologically (arrows), suggesting complete resection of the intra-nipple recurrence. **d** Magnified view showed malignant cell clusters in a ductal spread fashion (arrow) very close to the nipple skin (arrowheads) but no malignant cells in the nipple skin. **e** Main tumor consisted of intraductal atypical cells growing in a papillary fashion, major part of which was surrounded by abundant collagen fibers (asterisk).

threaded the lateral nipple skin with the same sutures at three points to properly apply countertraction to the target focus (Fig. 2d), and enucleated the intra-nipple tumor with a surgical knife (Fig. 2e, 3b). The incised nipple was reproduced into the original shape (Fig. 2f) with simple interrupted stitches using the same 4-0 bladed absorbable sutures. Pathological examination showed high columnar atypical cells growing in a papillary fashion with neither malignant cells in the nipple epidermis around the duct orifice nor stromal invasion (Fig. 3c–e). Approximately a quarter of the main tumor and a small part of one ductal spread focus were pathologically exposed but were present without any missing boarders, suggesting a complete resection of the intra-nipple recurrence.

The patient was discharged on the operation day and the reconstructed nipple healed without any event. The patient has been well for 6 months with excellent postoperative cosmesis of the nipple (Fig. 2g).

### Discussion

Compared with breast-conserving therapy, nipple-preserving surgery without breast reconstruction had a limited clinical role to breast cancer patients for a long time. With the spread of oncoplastic surgery [1, 2], however, the ratio of nipple-preserving surgery has been dramatically increasing, and how to preserve the nipple is drawing attention of the breast surgical oncologists. We have found that nipple necrosis does not occur when venous return around the nipple is not inhibited, i.e., preservation of subcutaneous veins around the nipple, even if a mammary gland under the nipple is totally resected [7]. In addition, even intra-nipple ducts can be safely resected, i.e., core out of the nipple, without nipple necrosis on the basis

of preserved venous return. Rusby et al. [8] also reported only one-third of vessels to the nipple traveled within the duct bundle, whereas two-thirds traveled in the nipple skin.

In this case, computed tomography clearly showed a little mammary gland tissue left under the nipple after primary operation. Due to the confirmation of pathological negative nipple base in the primary operation, we could not accurately determine the etiology of this type of recurrence either by ductal spread or by intra-nipple ductal remnant. Judged by the clinical outcome in this case, however, our nipple-preservation techniques with intra- and postoperative pathological evaluation, i.e., presumed complete nipple-base resection, cannot completely block the nipple recurrence itself but may allow its occurrence limited to the one bearing an indolent and surgically curable phenotype.

Various techniques have been reported to create nipple-areolar complex mainly using composite nipple graft and local tissue rearrangement [9, 10]. The latter further includes autologous graft and allograft augmentation. Each technique could be applied to this case but needed at least secondary nipple-areolar complex reconstruction. Regarding local control, it is necessary to wait for the long-term follow-up result, but, judged from the clinical course and pathological findings; we can highly expect that this operation should provide sufficient local control to the patient.

In this operation, we resected the recurrent nodule and the intra-nipple accompanying ducts with possible ductal spread. Actually, after incising the nipple and areolar epidermis, we shaved the nipple with a surgical knife trying to attach intra-nipple normal tissue as much as possible under applying appropriate countertraction to the target nodule by pulling the threads anchored to the intact lateral nipple skin. Macroscopic and microscopic findings showed a partial exposure, i.e., no safety margins, of the recurrent tumor. It, however, is often experienced that intracystic breast cancer without ductal spread can be safely resected with lumpectomy alone. We, therefore, do not consider that partial no safety margin around the tumor should directly imply residual cancer cells in the nipple due to both the pathological findings of the intra-nipple lesion and the macroscopic findings of the preserved nipple.

Unfortunately, unlike in-breast recurrence after breast-conserving therapy, no imaging modalities can depict typical images of noninvasive cancer in the nipple preoperatively. Nipple recurrence, however, highly bears the noninvasive character in case of no stromal invasion to the nipple base at the primary operation. Breast surgeons, therefore, should try to enucleate the intra-nipple recurrence instead of total nipple resection after obtaining full informed consent regarding the possible nipple necrosis from the patient.

In conclusion, we have successfully enucleated the intra-nipple recurrence instead of total nipple resection. To our knowledge, this is the first case of recurrent tumor enucleation in the nipple. Breast surgeons should be familiar with the enucleation techniques for intra-nipple recurrence.

## Statement of Ethics

The study was approved by the Kishiwada Tokushukai Hospital Ethics Committee (IRB #Case 20-01). Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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## Author Contributions

Yasuda K. contributed to the design of the report. Oura S. drafted the manuscript. Makimoto S. revised the manuscript. All authors have read and approved the final version of the manuscript.

## Data Availability Statement

All data generated during this study are included in this article. Further inquiries can be directed to the corresponding author.

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