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Nipple-sparing and skin-sparing mastectomy: review of aims, oncological safety and contraindications

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Abstract

Skin-sparing (SSM) and nipple-sparing (NSM) mastectomies relatively new conservative surgical approaches to breast cancer. In SSM most of the breast skin is conserved to create a pocket that facilitates immediate breast reconstruction with implant or autologous graft to achieve a quality cosmetic outcome. NSM is closely similar except that the nipple-areola complex (NAC) is also conserved. Meta-analyses indicate that outcomes for SSM and NSM do not differ from those for non-conservative mastectomies. Recurrence rates in the NAC after NSM are acceptably low (0-3.7%). Other studies indicate that NSM is associated with high patient satisfaction and good psychological adjustment.

Indications are carcinoma or DCIS that require mastectomy (including after neoadjuvant chemotherapy). NSM is also suitable for women undergoing risk-reducing bilateral mastectomy. Tumor not less than 2cm from the NAC is recommended, but may be less important than no evidence of nipple involvement on mandatory intraoperative nipple margin assessment. A positive margin is an absolute contraindication for nipple preservation. Other contraindications are microcalcifications close to the subareolar region and a positive nipple discharge.

Complication rates are similar to those for other types of post-mastectomy reconstructions. The main complication of NSM is NAC necrosis, however as surgeon experience matures, frequency declines. Factors associated with complications are voluminous breast, ptosis, smoking, obesity, and radiotherapy.

Since the access incision is small, breast tissue may be left behind, so only experienced breast surgeons should do these operations; close collaboration with the plastic surgeon. For breast cancer patients requiring mastectomy, NSM should be the option of choice.

Introduction

Skin-sparing mastectomy (SSM) and nipple-sparing mastectomy NSM, often called conservative mastectomies, are developments of a paradigm shift in breast cancer, encapsulated by Umberto Veronesi's maxim "from maximum tolerable treatment to

minimum effective treatment” [1]. The shift was ushered in by the development of breast-conserving surgery (quadrantectomy or lumpectomy). This was followed by sentinel node biopsy which allowed no axillary surgery if the sentinel node was negative [2]. Subsequently, no axillary surgery was shown to be adequate in selected cases with positive sentinel nodes [3]. Conservative mastectomies are also a direct result of the development of oncoplastic surgery which combines tumor removal and preparation of skin flaps (performed by a breast surgeon) with usually immediate breast reconstruction and remodeling (performed by a plastic surgeon) to provide superior aesthetic outcomes, without compromising local disease control. Immediate reconstruction spares women the ordeal of repeat surgery to restore body image. [4].

In skin-sparing mastectomy (SSM) the surgeon removes the gland but leaves most of the breast skin to create a pocket that is filled with a breast implant or the patient’s own tissue. Nipple-sparing mastectomy (NSM) is closely similar to SSM, but is the real conservative innovation in that the nipple-areola complex is preserved as well as the skin. Both techniques are associated with superior aesthetic outcomes and increased patient satisfaction compared to non-conservative mastectomy. [5]. One may wonder why the surgeon should go to the trouble of saving the nipple-areolar complex if it can be easily reconstructed in a later operation under local anesthesia. The reasons are that patients generally report low satisfaction with a reconstructed nipple [6] and psychosocial wellbeing and sexual wellbeing are lower in SSM compared to NSM [7].

In our own study [8] NSM was significantly better than SSM for body image, satisfaction with nipple appearance, satisfaction with nipple sensitivity, and feeling of mutilation. It is also worth noting that reconstructed nipples flatten in most patients after a relatively short time [6]. Nevertheless not all studies agree that NSM is better than SSM. van Verschueret et al. [9] assessed patient satisfaction, body image, and satisfaction with the (reconstructed) NAC in 25 SSM women (50 SSMs) and 20 NSM women (39 NSMs). After a median follow-up was 65 months in the SSM group and 27 months in the NSM group ($P < 0.01$), satisfaction with breasts and overall outcome were considered better in the SSM group, while body image and NAC-specific satisfaction did not differ between the two groups. It was initially thought that sparing the NAC would often preserve sensitivity. For example, a 2016 review by Sisco et al. [10] reported that sensory outcomes in NSM varied, with normal sensation self-reported in the range 10-43%. However, it has now become clear and that nipple sensation is largely or completely lost in most cases. Thus, a Swedish prospective study which quantitatively examined tactile, thermal and nociceptive cutaneous sensitivity before and after NSM found total loss of touch sensation in the nipple in 62% of patients, while touch sensation was impaired in the remaining 38% [11].

Oncological Safety

No randomized trials have been performed to compare oncological outcomes in conservative mastectomies with those in non-conservative mastectomies. As a result the US National Comprehensive Cancer Network (NCCN) was, until recently, very cautious about NSM in particular. However the 2016 NCCN guidelines suggest that NSM is oncologically safe provided the following indications are respected: early stage, biologically favorable, invasive

breast cancer or DCIS at least 2 cm from the nipple; imaging findings indicating no nipple involvement; nipple margin assessed and found to be clear; no nipple discharge and no Paget's disease. [12]. These recommendations are supported accumulated experience with conservative mastectomies. For example a 2010 meta-analysis of 9 studies and 3739 patients, found that rates of local recurrence in SSM did not differ significantly from those non-SSM, while the SSM group had a lower proportion of distant relapses compared to the non-SSM group [13]. A 2015 meta-analysis of 20 studies involving 5594 carefully selected women with early stage breast cancer, investigated overall survival, disease-free survival and local recurrence in those receiving SSM compared to those receiving conventional mastectomy without reconstruction. The study did not detect any differences in oncologic outcomes between the two groups. From these data we can conclude that, if the indications are respected, NSM is safe oncologically safe. It is possible that indications for conservative mastectomy will expand in the future. For example, some groups are performing NSM when the tumor is less than 2 cm from NAC. [14]. The same group and others [15] are also performing NSM in selected patients after neoadjuvant chemotherapy. Although follow-up is short, and complications may be more frequent, the overall results are promising.

NSM for risk reducing

NSM appears as an attractive option as a risk-reducing procedure for patients at high risk of developing breast cancer. A number of studies have provided evidence. The 2015 study by Yao et al. [16] assessed incidental cancers, complications, and locoregional recurrences in 201 BRCA1/2 mutation carriers who underwent NSM for risk reduction and/or cancer treatment. Most patients received bilateral mastectomies. After a median follow-up 32.6 months, there were no NAC events. The study also reviewed the literature on NSMs for BRCA patients and found that NSM was associated with low rates of complications and loco regional recurrence, similar to those found in non-BRCA carriers. However, they acknowledged that longer follow-up was needed. The 2015 study of Manning et al. [17] retrospectively assessed 728 NSMs in performed 413 patients between 2000 and 2013: 269 for breast cancer, 459 for risk reduction, and 177 (24.3%) in patients known to have a BRCA1/2 mutation, or a genetic variant of uncertain significance. No breast cancers were diagnosed over a median follow-up of 2.15 years (IQR 0.11-8.14). The authors concluded that NSM was an acceptable choice for patients with BRCA mutations, since no evidence of compromise to oncological safety in the short-term was uncovered. Complication rates were acceptable, and subsequent excision of the nipple-areola complex was rarely required.

Complications

Complications of conservative mastectomies with immediate reconstruction include wound dehiscence, infection, implant loss, asymmetry, and capsular contracture, as in non-conservative mastectomies [18–19]

Flap necrosis and NAC necrosis (in NSM) are also relatively common. Headon et al. [20] conducted a pooled analysis of 12,358 NSMs to assess complications (and oncological safety). The overall complication rate was 22.3% and the nipple necrosis rate was 5.9%. Importantly they found that the rates of complications, including nipple necrosis, decreased

over time which was attributed to improving surgeon expertise. Factors predisposing to nipple necrosis were found to be large breast volume; ptotic breast, smoking, prior radiotherapy, and peri-areolar incision. A study from the European Institute of Oncology [21] found that comorbidities, smoking, type of incision, flap thickness, and type of reconstruction all influenced the NAC necrosis rate in NSM.

Surgical technique

The first thing to say about the surgical technique for conservative mastectomy with immediate reconstruction is that close collaboration between breast surgeon and plastic surgeon is essential. The breast surgeon's crucial roles are ensure that all glandular tissue is removed and that the skin flaps are prepared meticulously so as to reduce to a minimum the risk removing too much subcutaneous fat as to compromise blood supply and increase risk of flap necrosis. In fact flap thickness can vary greatly depending mainly on patient adiposity; however – and irrespective of the dissection instrument used – it is essential that Cooper's ligaments are identified within the fascia superficialis, between the gland and the subcutaneous adipose, and the dissection is always confined within this generally avascular plane (bleeding indicates the plane is being missed). Another important step is the dissection of the retro-areolar tissue. This must be radical. A sample of retro-areolar tissue must be sent for intraoperative frozen section. If this tissue is tumor-positive the entire NAC has to be removed and the NSM become an SSM.

Various types of incision are used to remove the gland and prepare the flaps, depending on tumor location and breast type. Originally NSM was not performed on large ptotic breasts. However a Wise pattern mastectomy allows breast reduction and affords good aesthetic outcomes. The mastectomy specimen is usually removed through an inferior periareolar incision.

The large pocket to receive the tissue expander, implant, or autologous graft is prepared after breast gland removal. To do this, the lower insertions of the pectoralis major is detached and then attached to the lower flap. Subsequently, the prosthesis is emplaced and the skin is closed.

Conclusions

Based on the data reviewed here we can affirm that NSM is oncologically safe provided patients are carefully selected. NSM can also be proposed as a risk-reducing procedure in women with a BRCA mutation or strong family history of breast cancer. Conservative mastectomy with immediate reconstruction not only preserves breast appearance, but also provides an opportunity for breast remodeling that may enhance the woman's appearance. If performed by experienced surgeons complication rates are acceptable. It is expected that the proportion of women receiving conservative mastectomy will grow in the future, particularly as the number of women recognized to have BRCA or similar mutations increases. We emphasize however that women who are adequately treated by breast-conserving surgery should not be proposed for conservative mastectomy.

References

1. Veronesi U, Stafyla V, Luini A, Veronesi P. Breast cancer: from “maximum tolerable” to “minimum effective” treatment. *Front Oncol.* 2012; 2:125.doi: 10.3389/fonc.2012.00125 [PubMed: 23061042]
2. Veronesi U, Viale G, Paganelli G, Zurrada S, Luini A, Galimberti V, et al. Sentinel lymph node biopsy in breast cancer: ten-year results of a randomized controlled study. *Ann Surg.* 2010; 251(4): 595–600. DOI: 10.1097/SLA.0b013e3181c0e92a [PubMed: 20195151]
3. Giuliano AE, Hunt KK, Ballman KV, Beitsch PD, Whitworth PW, Blumencranz PW, et al. Axillary dissection vs no axillary dissection in women with invasive breast cancer and sentinel node metastasis. *JAMA.* 2011; 305:569–575. [PubMed: 21304082]
4. Rietjens M, Urban CA, Rey PC, Mazzarol G, Maisonneuve P, Garusi C, et al. Long-term oncological results of breast conservative treatment with oncoplastic surgery. *Breast.* 2007; 16:387–395. [PubMed: 17376687]
5. Jabor MA, Shayani P, Collins DR Jr, Karas T, Cohen BE. Nipple-areola reconstruction: satisfaction and clinical determinants. *Plast Reconstr Surg.* 2002; 110:457–463. [PubMed: 12142660]
6. Zhong T, Antony A, Cordeiro P. Surgical outcomes and nipple projection using the modified skate flap for nipple-areolar reconstruction in a series of 422 implant reconstructions. *Ann Plast Surg.* 2009; 62(5):591–5. DOI: 10.1097/SAP.0b013e31819fb1c9 [PubMed: 19387168]
7. Wei CH, Scott AM, Price AN, Miller HC, Klassen AF, Jhanwar SM, et al. Psychosocial and Sexual Well-Being Following Nipple-Sparing Mastectomy and Reconstruction. *Breast J.* 2016; 22(1):10–7. DOI: 10.1111/tbj.12542 [PubMed: 26782950]
8. Didier F, Radice D, Gandini S, Bedolis R, Rotmensz N, Maldifassi A, et al. Does nipple preservation in mastectomy improve satisfaction with cosmetic results, psychological adjustment, body image and sexuality? *Breast Cancer Res Treat.* 2009; 118(3):623–33. DOI: 10.1007/s10549-008-0238-4 [PubMed: 19003526]
9. van Verschuer VM, Mureau MA, Gopie JP, Vos EL, Verhoef C, Menke-Pluijmers MB, et al. Patient satisfaction and nipple-areola sensitivity after bilateral prophylactic mastectomy and immediate implant breast reconstruction in a high breast cancer risk population: NSM versus SSM. *Ann Plast Surg.* 2016; 77(2):145–52. DOI: 10.1097/SAP.0000000000000366 [PubMed: 26076217]
10. Sisco M, Yao KA. Nipple-sparing mastectomy: A contemporary perspective. *J Surg Oncol.* 2016; 113(8):883–90. DOI: 10.1002/jso.24209 [PubMed: 26931641]
11. Gahm J, Hansson P, Brandberg Y, Wickman M. Breast sensibility after bilateral risk-reducing mastectomy and immediate breast reconstruction: a prospective study. *J Plast Reconstr Aesthet Surg.* 2013; 66(11):1521–7. DOI: 10.1016/j.bjps.2013.06.054 [PubMed: 23953096]
12. NCCN. NCCN (Clinical Practice Guidelines in Oncology: Breast Cancer, Version 1.2016. 2016. https://www.nccn.org/professionals/physician_gls/f_guidelines.asp
13. Lanitis S, Tekkis PP, Sgourakis G, Dimopoulos N, Al Mufti R, Hadjiminias DJ. Comparison of skin-sparing mastectomy versus non-skin-sparing mastectomy for breast cancer: a meta-analysis of observational studies. *Ann Surg.* 2010; 251(4):632–9. DOI: 10.1097/SLA.0b013e3181d35bf8 [PubMed: 20224371]
14. Santoro S, Loreti A, Cavaliere F, Costarelli L, La Pinta M, Manna E, et al. Neoadjuvant chemotherapy is not a contraindication for nipple sparing mastectomy. *Breast.* 2015; 24(5):661–6. DOI: 10.1016/j.breast.2015.08.001 [PubMed: 26343944]
15. Frey JD1, Choi M, Karp NS. The Effect of Neoadjuvant Chemotherapy Compared to Adjuvant Chemotherapy in Healing after Nipple-Sparing. *Plast Reconstr Surg.* 2017; 139(1):10e–19e. DOI: 10.1097/PRS.0000000000002841 [PubMed: 28027218]
16. Yao K, Liederbach E, Tang R, Lei L, Czechura T, Sisco M, et al. Nipple-sparing mastectomy in BRCA1/2 mutation carriers: an interim analysis and review of the literature. *Ann Surg Oncol.* 2015; 22(2):370–6. DOI: 10.1245/s10434-014-3883-3 [PubMed: 25023546]
17. Manning AT, Wood C, Eaton A, Stempel M, Capko D, Pusic A, Morrow M, Sacchini V. Nipple-sparing mastectomy in patients with BRCA1/2 mutations and variants of uncertain significance. *Br J Surg.* 2015; 102(11):1354–9. DOI: 10.1002/bjs.9884 [PubMed: 26313374]
18. Carlson GW. Risk of recurrence after treatment of early breast cancer with skin-sparing mastectomy: two editorial perspectives. *Ann Surg Oncol.* 1998; 5(2):101–2. [PubMed: 9527261]

19. Lipsky KA, Neifeld JP, Boyle RM, Frable WJ, Ronan S, Lotfi P, et al. Complications of mastectomy and their relationship to biopsy technique. *J Surg Oncol.* 1996; 3(3):290–4.
20. Headon HL, Kasem A, Mokbel K. The Oncological Safety of Nipple-Sparing Mastectomy: A Systematic Review of the Literature with a Pooled Analysis of 12,358 Procedures. *Arch Plast Surg.* 2016; 43(4):328–38. DOI: 10.5999/aps.2016.43.4.328 [PubMed: 27462565]
21. Lohsiriwat V, Rotmensz N, Botteri E, Intra M, Veronesi P, Martella S, et al. Do clinicopathological features of the cancer patient relate with nipple areolar complex necrosis in nipple-sparing mastectomy? *Ann Surg Oncol.* 2013; 20(3):990–6. DOI: 10.1245/s10434-012-2677-8 [PubMed: 23070785]