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The salvage of nipple-areola complex using dimethyl sulfoxide

Alper Ural [1], Harun Karaduman [2], Hala Halbony [2]

[1] Department of Plastic, Reconstructive Aesthetic Surgery, VM Medical Park Ankara Hospital, Ankara, Turkey
[2] Department of Plastic, Reconstructive Aesthetic Surgery, Kahramanmaraş Sütçü İmam University, Kahramanmaraş, Turkey

ORCID of the author(s)

AU: https://orcid.org/0000-0001-8135-6444
HK: https://orcid.org/0000-0003-2696-7255
HH: https://orcid.org/0000-0002-4870-1530

Corresponding Author
Alper Ural
VM Medical Park Ankara Hospital, Department of Plastic, Reconstructive and Aesthetic Surgery, Ankara, Turkey
E-mail: alper_ural@yahoo.com

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The authors stated that the written consent was obtained from the patient presented with images in the study.

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Abstract

Nipple-areolar complex (NAC) necrosis is one of the most perilous minor complications in breast surgery. It is more common following mastectomy and less common after reduction mammoplasty. In the case study presented below, we share our approach and experience in NAC salvage following superomedial pedicle reduction mammoplasty. The application of dimethyl sulfoxide (DMSO) notably improved perfusion and played a crucial role in the salvage of NAC.

Keywords: mammoplasty, breast reduction, nipple-areola complex, salvage

Introduction

Breast reduction surgery, one of the most frequently performed plastic surgery operations, not only increases self-esteem but also relieves the burden on women suffering from hypertrophic breasts [1]. Patients with hypertrophic breasts often complain of shoulder, neck, and back pain, excessive sweating, maceration, and mycosis developing in the inframammary fold, especially in the summertime [2]. Although various safe techniques have been described for the reduction of large breasts, numbness in the NAC area can still result, in addition to insufficient breastfeeding as well as necrosis and total loss. This paper describes the management of unilateral nipple-areola complex (NAC) ischemia following a reduction mammoplasty operation in a 33-year-old female patient – an issue that became apparent on the second postoperative day, and which was satisfactorily resolved using topical Dimethyl Sulfoxide (DMSO).

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Case presentation

Our patient presented at our hospital's Plastic Surgery Clinic, complaining about her large, pendular breasts. Comprehensive information was provided to the patient, who then signed the informed consent form. The patient has previously given birth once and has also breastfed. She is an active smoker and was advised to quit smoking three weeks before the operation. Her body mass index (BMI) was 30.4. The patient's nipple position was 33 cm bilaterally (Figure 1), and we planned to relocate her nipples to a position 21 cm from the sternum's manubrium using a superomedial pedicle reduction mammoplasty.

On the first postoperative day, her physical examination and NAC circulation appeared healthy. However, on the second postoperative day, an ischemic appearance developed in the left nipple-areolar complex (Figure 2). We observed a diminished left NAC circulation, with the area appearing dusky and pale. The capillary refill test affirmed the impaired circulation. Further signs of compromised circulation, such as bullous formation and color change, were noted. Shortly after identifying the diminished circulation, all peri-areolar sutures were removed, and the pedicle was fully released to ensure there was no tension or kinking (Figure 3). Gauze soaked in DMSO (Botafarma, Ankara) was applied three times daily for 10 days. The patient was closely monitored during this period, with office examinations and evaluations of videos she sent via telemedicine both day and night. Enoxaparin of 6000 IU was also administered subcutaneously once daily for 1 week.

By the end of the week, both capillary refill time and NAC viability had noticeably improved. Staged delayed sutures were performed at our outpatient clinic. The lateral two-thirds of the area was sutured on the 10th postoperative day, with the remainder sutured in the second postoperative week. With diligent follow-up, the ischemic and congested appearance of the NAC had successfully resolved by the end of the second week (Figure 4). By the first postoperative month, NAC healing and aesthetic appearance had significantly improved (Figure 5). By the third postoperative month, the salvaged NAC and overall appearance of the breast tissue were reasonably acceptable, which the patient expressed satisfaction with (Figure 6). We advised tattooing the inferior border of the NAC for enhanced aesthetic outcomes, but the patient chose not to pursue this.

Figure 1: Preoperative photo of the patient



Figure 2: Impaired circulation, congested and dusky NAC



Figure 3: All the periareolar sutures were removed



Figure 4: NAC was salvaged successfully at the end of the second week



Figure 5: Healed NAC on postoperative 1st month



Figure 6: The salvaged NAC appearance was reasonably satisfying in the postoperative 3rd month.



Discussion

Reduction mammoplasty is associated with several risk factors, which can be categorized into major and minor complications. Major complications include thromboembolic events, surgical site infections, abscess formation, bleeding, and infected seromas. Conversely, minor complications encompass wound dehiscence, NAC necrosis, skin necrosis, hematoma, seroma, hypertrophic scarring, and keloid formation [3].

Xiong reported that NAC necrosis, at 5.56%, was the second most common complication of reduction mammoplasty, following wound dehiscence for superior and superomedial pedicles [4]. Risk factors correlated with an increased risk of NAC necrosis include a high BMI, resection weight of 650 g or more,

diabetes, a preoperative-postoperative SN-N distance (i.e., a pedicle length of over 10 cm), and smoking. Cessation of smoking more than four weeks before the operation may potentially reduce this risk [4]. In our case, the patient had four of these five mentioned risk factors. S. Polotto et al. found that partial NAC necrosis was the third most common minor complication, at 5.55%, however, their study primarily involved inferior pedicle and Thorek procedures [3].

DMSO, originally used as an organic solvent, was first discovered in the 19th century by the German chemical industry [5]. DMSO is a colorless liquid that has a highly polar group and two non-polar groups, enabling it to dissolve in both aqueous and non-aqueous solutions. DMSO was found to have local anti-inflammatory effects and was used in the treatment of cutaneous scleroderma, digital ischemia, keloids, and hypertrophic scars [5]. Over 50 years ago, DMSO was approved by the United States Food and Drug Administration for use in the treatment of interstitial cystitis [6]. Rand-Luby et al. demonstrated that the application of topical 60% DMSO to human mastectomy flaps decreased the ischemic area by approximately 63% [7]. The application of DMSO also reduces skin flap necrosis and improves the overall surgical flap outcomes [8]. The exact mechanism of action is not entirely known, but DMSO stimulates histamine release by mast cells and increases prostaglandin E1 production, inducing vasodilation. Furthermore, as a hydroxyl-inactivating compound, DMSO scavenges free radical species, reducing ischemia-reperfusion injury [7].

The topical application of DMSO is associated with side effects, most of which are tolerable to patients. These may include localized erythema, edema, itching, and a garlic-like odor in the breath [7]. Additionally, the oral use of DMSO can cause side effects, including nausea, vomiting, dizziness, constipation, and diarrhea. DMSO can amplify the effect of certain medications like blood thinners, steroids, and sedatives, possibly leading to serious health complications. In this particular case, initial venous congestion and stasis were attributed to patient characteristics and increased edema, which might have further led to an impairment of arterial circulation, resulting in this ischemia. To the best of our knowledge, the release of sutures coupled with the vasodilatory and anti-inflammatory benefits of DMSO were the key factors in salvaging the left NAC in this case.

Conclusion

In conclusion, this case demonstrates the safety and efficacy of DMSO in alleviating and treating NAC ischemia, as well as preventing necrosis following reduction mammoplasty. Based on the promising results from both this case and the literature, we believe DMSO can be safely used as a supplemental agent in similar situations, as it provides beneficial effects and enhances NAC circulation.

References

1. Bilgen F, Ural A, Bekerecioğlu M. Inferior and Central Mound Pedicle Breast Reduction in Gigantomastia: A Safe Alternative? J Invest Surg. 2021 Apr;34(4):401-7. doi: 10.1080/08941939.2019.1648609. Epub 2019 Aug 12. PMID: 31405319.
2. Bilgen F, Ural A, Bekerecioğlu M. Preoperative estimation of breast resection weight in patients undergoing inferior pedicle reduction mammoplasty: the Bilgen formula. Turk J Med Sci. 2020 Jun 23;50(4):817-23. doi: 10.3906/sag-1905-7. PMID: 32233179; PMCID: PMC7379463.
3. Polotto S, Grieco MP, Simonacci F, Bertozzi N, Marchesi F, Grignaffini E, Raposio E. Reduction mammoplasty techniques in post-bariatric patients: our experience. Acta Biomed. 2017 Aug 23;88(2):156-60. doi: 10.23750/abm.v88i2.5085. PMID: 28845829; PMCID: PMC6166156.
4. Xiong V, Ramaut L, Matasa R, Perez-Nunez L, Ortiz S. Assessment of risk factors for postoperative complications of breast reduction by superior or superomedial pedicle. Ann Chir Plast Esthet. 2024 Jul 12:S0294-1260(24)00068-2. doi: 10.1016/j.anplas.2024.06.010. Epub ahead of print. PMID: 39003221.
5. Huang SH, Wu CH, Chen SJ, Sytwu HK, Lin GJ. Immunomodulatory effects and potential clinical applications of dimethyl sulfoxide. Immunobiology. 2020 May;225(3):151906. doi: 10.1016/j.imbio.2020.151906. Epub 2020 Jan 22. PMID: 31987604.
6. Wiesemann GS, Cox EA, Nichols DS, Spiguel LR, Heath FD, Kanchwala S, Sorice-Virk S. Salvage of Nipple-Areolar Complex Ischemia With Dimethyl Sulfoxide: A Case Series. Ann Plast Surg. 2023 Jan 31. doi: 10.1097/SAP.0000000000003461. Epub ahead of print. PMID: 36752563.
7. Silverstein ML, McLean P, Crowley JS, Gosman AA. Topical Dimethyl Sulfoxide for Congested Nipple-areolar Complexes in Breast Surgery: A Pilot Study. Plast Reconstr Surg Glob Open. 2022 Oct 28;10(10):e4595. doi: 10.1097/GOX.0000000000004595. PMID: 36320619; PMCID: PMC9616635.
8. Celen O, Yildirim E, Berberoğlu U. Prevention of wound edge necrosis by local application of dimethylsulfoxide. Acta Chir Belg. 2005 May-Jun;105(3):287-90. doi: 10.1080/00015458.2005.11679718. PMID: 16018522.

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