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Muscle Splitting Augmentation Mastopexy: A 13-year Analysis and Outcome of Primary and Secondary Procedures

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Background: The muscle splitting technique is a submuscular pocket used for augmentation mammoplasty. Its use and results following primary and secondary procedures are presented.
Methods: A retrospective study that analyzed complication and revision rates following primary and secondary mastopexy with augmentation in a muscle splitting pocket performed between April 2007 and March 2020 was carried out. Data were divided into two groups: primary and secondary single-stage mastopexies with augmentation.
Results: A total of 169 patients had a primary procedure and 49 had secondary procedures. The mean ages of patients in the primary and secondary were 32.3 ± 9.89 and 38.2 ± 9.63 years, respectively. Five (3.0%) patients had periprosthetic or wound infections in the primary group when compared with 0% in secondary surgery group. Wound breakdown was seen in 13 (7.7%) patients with a primary procedure compared with one patient (2%) with a secondary procedure. One patient had partial nipple loss and another had total nipple loss in the primary group (1.2%) when compared with one patient (2.0%) who had partial nipple loss in the secondary group. Revision surgeries were carried out in 16 (10.1%) of the primary procedures compared with five (10.2%) of the secondary procedures.
Conclusion: Even though there was a higher prevalence of complications in the primary procedures group than in the secondary procedures group, the overall complications following muscle splitting mastopexy with augmentation are within an acceptable range. *(Plast Reconstr Surg Glob Open 2022;10:e4138; doi: 10.1097/GOX.0000000000004138; Published online 28 February 2022.)*

INTRODUCTION

Since the introduction of preformed silastic implants, major breakthroughs causing several changes have occurred in the practice of aesthetic breast surgeries.[1] A new aspect of breast aesthetic surgery was introduced by the use of preformed implants for an augmentation mastopexy as a single-stage procedure for correcting breast ptosis associated with hypoplasia.[2] However, the surgery has its associated challenges, and for these reasons, the author has emphasized the attention to detail needed for this delicate procedure.[3]

The muscle splitting technique for submuscular implant placement was published in 2007, and its long-term follow-up results have been compared and published.[4–6] Soon after the introduction of the muscle splitting technique, its use for a single-stage primary mastopexy with augmentation was reported.[7,8]

Revisionary or secondary single-stage mastopexy with augmentation is generally considered to carry an even higher risk than primary mastopexy with augmentation.[9,10] Complications and revision rates exclusively related to primary or secondary mastopexy with augmentation have been reported; however, these studies are few and far between.[9,10] The impact of the use of saline implants or different implant pockets has been frequently documented.[5,9–13] Even though delay phenomenon may play some role in stability of the vascularity of the nipple areolar complex, revisionary mastopexy with augmentation

From Reshape, Reshape House, Kent, UK.

Received for publication October 1, 2021; accepted December 14, 2021.

DOI: 10.1097/GOX.0000000000004138

Disclosure: *The author has no financial interest to declare in relation to the content of this article.*

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poses additional challenges due to thinning of the breast envelope and previous flap designs, and can potentially add risk to the nipple areolar complex vascularity and safety of the breast envelope. The added presence of bacteria in the capsule, in addition to their presence on skin and parenchyma, may also carry a higher risk of periprosthetic infections.[14]

The current study reports the 13-year complication and revision rates when primary and revisionary mastopexies with augmentation were performed in a muscle splitting pocket. In revisionary surgeries, partial submuscular and subglandular pockets were changed to muscle splitting pockets.[15–17]

MATERIAL AND METHODS

A retrospective study to analyze the complication and revision rates following primary and secondary augmentation mastopexies performed between April 2007 and March 2020 was carried out. The data were divided into two groups: the group with a primary mastopexy and the group with a secondary mastopexy with augmentation.

All patients were consulted, operated on, and followed up by the same surgeon. Patients were marked in the standing position and had superomedial flaps performed (Fig. 1A). All patients underwent procedures performed under general anesthesia with muscle relaxation. All primary procedures were performed with a muscle splitting pocket using round silicone gel implants. In patients who had a history of breast implants in the subglandular, partial submuscular, or dual plane, pockets were converted into muscle splitting pockets.[4] The skin was prepared using povidone iodine, and nipples were covered with nipple shields. After initial subglandular pocket, pectoralis muscle is split from the junction of middle and lower third of the sternum going up and laterally to the anterior axillary fold (Fig. 1A). Once implants were placed, the deeper aspect of the incision was closed, the nipple shields were removed, and the respective mastopexy was performed (Fig. 1B). All patients had at least a single intravenous dose of amoxicillin/clavulanic acid or cephalosporin. Drains were not used routinely, and patients were mostly treated as outpatient cases.

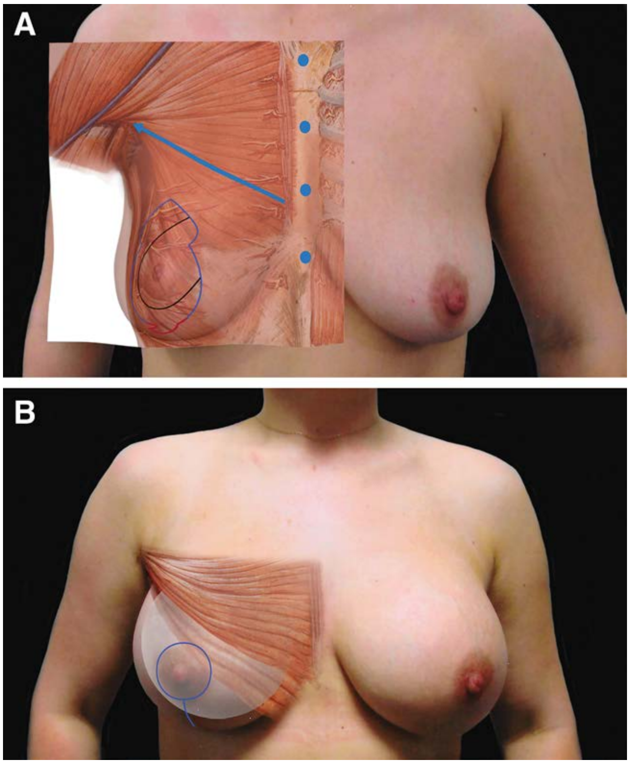

Fig 1. A schematic diagram of surgical anatomy, markings, and level of muscle split. A, An illustration showing VS markings with a medially based flap and extent of pectoralis muscle split superimposed on a ptotic breast. B, One year following VS mastopexy with augmentation in muscle splitting pocket using 275 cm^3 round cohesive gel silicone implants. An illustration of implant in muscle splitting biplane is superimposed to show surgical anatomy of the pocket.

Takeaways

Question: A muscle splitting submuscular pocket for implant placement is gaining acceptance in primary and secondary mammoplasties due to its capacity to produce acceptable, reproducible results without animation deformity.

Findings: In the author's practice, the use of a muscle splitting pocket for mastopexy with augmentation has produced encouraging results in consecutive cases.

Meaning: Use of muscle splitting pocket for mastopexy with augmentation has the capacity to produce longer lasting results and acceptable complication and revision rates without noticeable animation deformity.

STATISTICAL ANALYSIS

The data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 19.0. The results are presented in the text as the frequency and percentage for qualitative/categorical variables (differences in implant size), and mean ± SD for quantitative/continuous variables (age and implant size). The chi-square test was used to compare the categorical variables, and the *t* test was used for quantitative/continuous variables. In all statistical analyses, only *P* values less than 0.05 were considered significant.

RESULTS

A total of 169 patients had single-stage primary mastopexy with augmentation (Fig. 2A–D) and 49 patients had a secondary mastopexy with augmentation (Fig. 3A–D). The mean ages of the patients with a primary mastopexy and with a secondary mastopexy with augmentation were 32.3 ± 9.89 and 38.2 ± 9.63 (*P* value: 0.001) years, respectively. Of these patients with primary mastopexies and secondary mastopexies with augmentation, smoking status was known in 166 and 48 patients respectively, and of these, 11 (22.9%) and 26 (15.7%) were smokers, respectively ($P = 0.242$).

Of the 169 primary mastopexies with augmentation, 96 patients (56.8%) had high-profile implants,

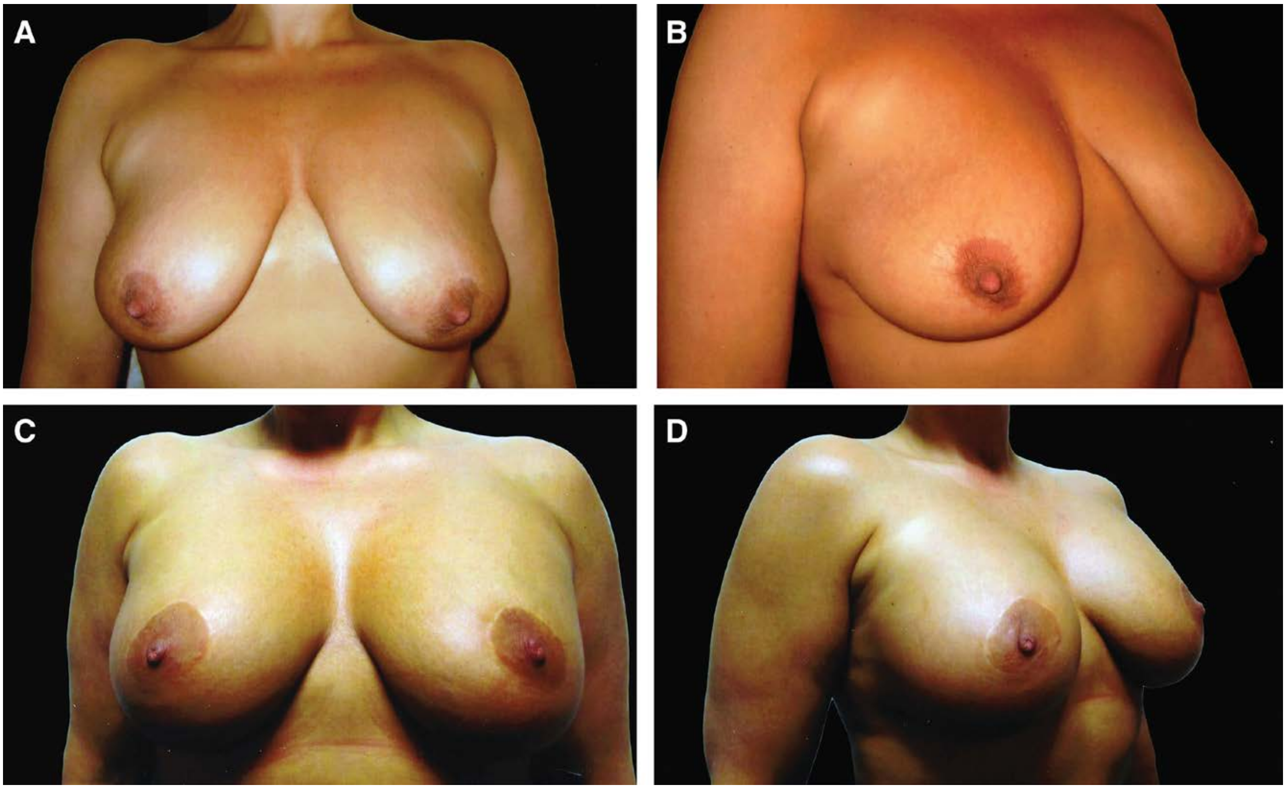

Fig. 2. Before and after of a primary mastopexy with muscle splitting augmentation. A, B, A 33-year-old patient with a history of childbirths and breastfeeding, leading to grade III ptosis. The patient showed interest in breast uplift with implants. C, D, Postoperative views taken 2.5 years following single-stage augmentation with VS mastopexy, using 250 cm^3 smooth high-profile cohesive gel silicone implants.

49 patients (29%) had medium-profile implants, and 24 patients (14.2%) had low-profile implants. Of the patients who received secondary mastopexies with augmentation, 39 (79.6%) had high-profile, five (10.2%) had medium-profile, and five (10.2%) had low-profile implants. (**See tables, Supplemental Digital Content 1,** which displays: Table 1. Distribution of various profiles used in primary and secondary single-stage mastopexy with augmentation [SSMA]. Table 2. Distribution of different and same size implants between primary and secondary single-stage mastopexy with augmentation. Table 3. Degree and type of ptosis in patients presenting and requesting augmentation mastopexy. Table 4. Preoperative and 6-months postoperative sternal notch [SN] to nipple areolar complex [NAC] measurements in primary and secondary mastopexy with augmentation. Table 5. Preoperative and 6-months postoperative NAC to IMC measurements in preoperative and postoperative patients of primary and secondary augmentation mastopexy [Nipple Areolar Complex = NAC, Inframammary Crease IMC]. Table 6. Distribution of various types of mastopexies employed in the series [PA=Periareolar, VSCT+Vertical Scar Cat's Tail, VS = Vertical Scar, WP = Wise pattern]. Table 7. Tissue removed in primary and secondary augmentation mastopexy. Patients who had PA augmentation mastopexy were not included in this table. Table 8. Prevalence of different complications and use of drains between primary and secondary SSMA. Nipple sensation was altered or lost in 25.4% of primary when compared with 22.4% in secondary SSMA. Additional procedures involved an extra procedure in addition to breast surgery. **http://links.lww.com/PRSGO/B943**.)

The same size implants were used in the 142 primary mastopexies with augmentation compared with 45 secondary mastopexies with augmentation. Different size implants were used in 26 patients (15.3%) with primary and three (6.1%) with secondary mastopexies with augmentation (Supplemental Table 2, http://links.lww.com/PRSGO/B943).

The degree of ptosis was recorded in 165 primary and 47 secondary mastopexies with augmentation using the Regnault classification.[18] (SDC 1, Table 3). Preoperative sternal notch (SN) to nipple areolar complex (NAC) measurements were recorded in 166 primary cases. The new NAC position was marked at 21.3 ± 1.51 cm in 160 patients, and postoperative SN to NAC measurements were measured in 160 patients. Preoperative SN to NAC measurements were recorded in 46 secondary augmentation mastopexies (Supplemental Table 4, http://links.lww.com/PRSGO/B943).

The NAC to inframammary crease (IMC) measurements were also noted in both groups. In the primary group, NAC to IMC measurements were noted in 148 patients. Postoperative measurements in this group were noted in 108 patients. Of the 49 secondary mastopexies with augmentation, preoperative NAC to IMC measurements were noted in 39 patients. Postoperative NAC to

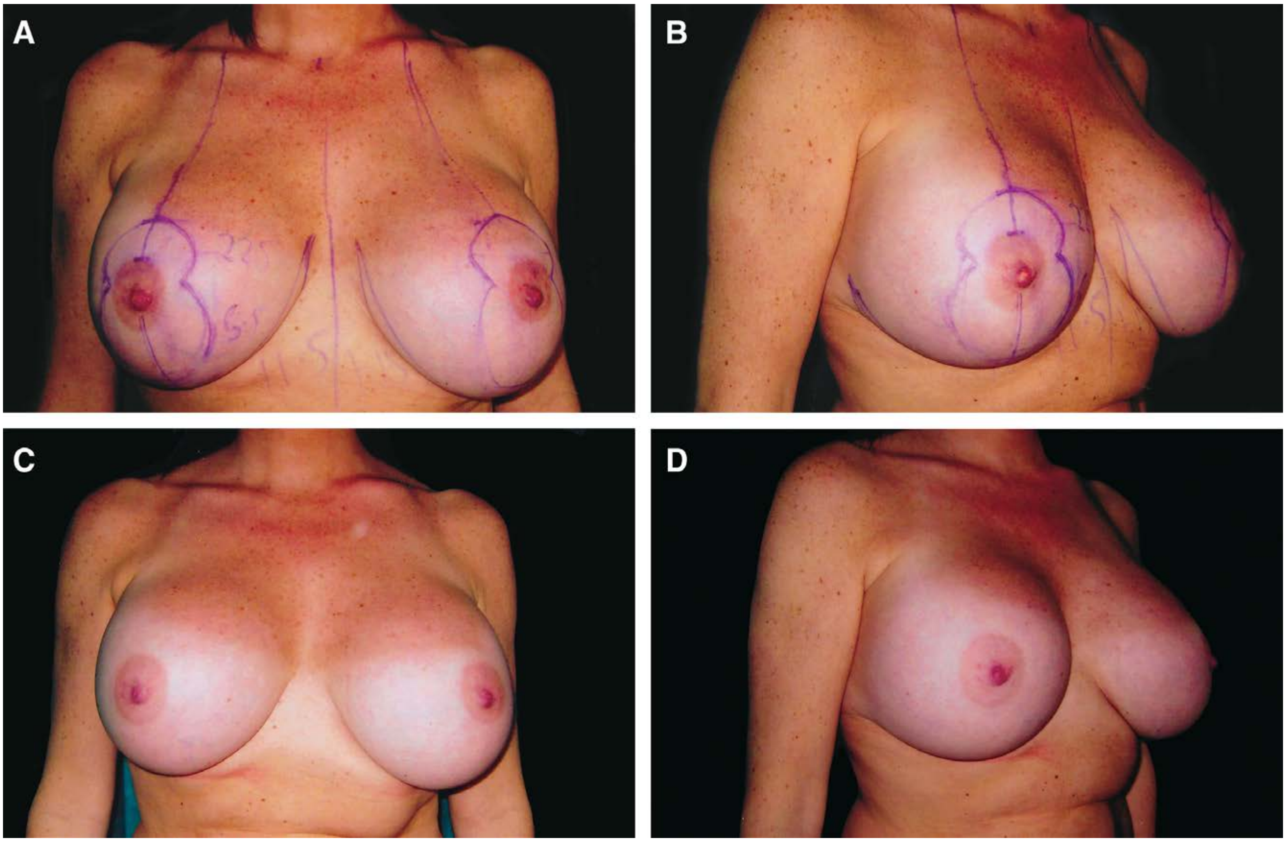

Fig. 3. Before and after of a secondary mastopexy with muscle splitting augmentation. A, B, Preoperative views of a 42-year-old patient with a nine-year history of augmentation mammoplasty using 550 cm^3 round-textured silicone gel implants in subglandular pocket. She wanted to go for a smaller breast implant with mastopexy. C, D, Postoperative views taken 3.5 years later, showing results following VS mastopexy with 400 cm^3 round-textured implants placed in muscle splitting submuscular pocket. She also had inframammary crease relocation.

IMC measurements in the secondary group were noted in 25 patients (Supplemental Table 5, http://links.lww.com/PRSGO/B943).

Of the 169 primary patients, five patients (3%) had a left unilateral periareolar (PA), 44 (26%) had a bilateral PA, three (1.8%) had a right vertical and left PA, 10 (5.9%) had a right unilateral PA. There was a right unilateral vertical scar cat's tail (VSCT) in seven patients (4.1%), a vertical scar (VS) in 14 (8.3%), and a VSCT in 59 (34.9%). Twenty-seven patients (16%) had Wise pattern mastopexies. Of the 49 secondary mastopexies with augmentation, 13 (26.5%) had a PA, 11(22.4%) had a VS, 15 (30.6%) had a VSCT, and 10 (20.4%) had Wise pattern mastopexies (SDC 1, Table 6). Tissue resection was performed and recorded only in patients with a VS or in patients who had Wise pattern mastopexies. The tissue resection was grouped as skin only, less than 50 grams, between 50 and 100 grams, and over 100 grams (Supplemental Table 7, http://links.lww.com/PRSGO/B943).

Of the 169 patients with primary mastopexies with augmentation, 31 (18.3%) had drains compared with 10 (20.4%) patients who had secondary mastopexies with augmentation (*P* value: 0.745). Of the 169 patients who underwent a primary mastopexy with augmentation, 121 (71.6%) underwent surgery as an outpatient compared with 34 (69.4%) patients who underwent secondary mastopexies with augmentation (*P* value: 0.764) (Supplemental Table 8, http://links.lww.com/PRSGO/B943).

Postoperative adverse outcomes were divided mainly into postoperative complications requiring immediate clinical attention and revision surgeries where patients needed surgical intervention and reoperation. Nonexpanding hematomas were seen in two patients (1.2%) with primary mastopexies compared with 0% of patients with secondary mastopexies with augmentation (*P* value: 1.00). Nipple sensation was lost or noticeably changed in 43 (25.4%) patients with primary mastopexies compared with 11 (22.4) patients with secondary mastopexies with augmentation (*P* value: 0.668) (Supplemental Table 1, http://links.lww.com/PRSGO/B943). Five patients (3.0%) had periprosthetic or wound infections with primary mastopexy with augmentation compared with 0% of patients with secondary mastopexies with augmentation (*P* value: 1.00). Wound breakdown was seen in 13 patients (7.7%) with primary mastopexies compared with one patient (2%) with a secondary mastopexy with augmentation (*P* value: 0.275). One patient had a partial nipple loss, and another patient had a total nipple loss in the primary augmentation mastopexy group (1.2%) compared with one patient (2.0%) who had a partial nipple loss in secondary mastopexy with augmentation group (*P* value: 1.00). Revision surgeries were carried out in 16 patients (10.1%) in the primary procedure group compared with five (10.2%) patients in the secondary procedure group (Supplemental Table 8, http://links.lww.com/PRSGO/B943). These revisions and reoperations involved inadequate results following periareolar mastopexies, waterfall deformity, scar touchups, and placement of larger implants.

DISCUSSION

The introduction of the preformed silastic breast prostheses by Cronin and Gerow immediately caused its simultaneous use in conjunction with mastopexy as single-stage mastopexy with augmentation.[1,2] Even though the positive psychosocial effects are significantly higher with breast implants alone than with mastopexy with augmentation,[19] mastopexy with augmentation has changed the horizon of aesthetic breast surgical procedures. Since its introduction, the single-stage procedure has transformed the approach in a particular set of patients who present with small ptotic breasts, where mastopexy alone will further compromise the size of the breasts, or when implants alone are used and the patient ends up having large and ptotic breasts.[2] When either of these procedures are performed on their own, each will require further treatment to address the resultant aesthetic deficits, causing a reoperation rate of 100%.[12]

The principle points of concern with single-stage procedures are an increased risk of infection, implant exposure, a loss of nipple sensation, and nipple loss.[3] Other serious risks include the potential for poor scarring and skin flap failure.[3] Many authors have compared augmentation mammoplasties or mastopexies with single-stage mastopexies with augmentation, and have reported that when performed as a single-stage procedure, the complication and revision rates are not exponentially higher.[7,8,10,11] Various algorithms for the selection of skin markings and scar selection have been proposed for achieving an adequate outcome.[20,21] Similarly, different techniques with or without implants have been described for single-stage mastopexy with augmentation for optimization of results.[7,22,23] Pocket and implant-specific factors contributing or leading to revision surgeries have been described in the previously published articles.[5,24] Among the implant-related revisions, the use of saline implants and requests to have larger implants were the leading factors, whereas the tissue-related revision surgeries were mostly related to periareolar mastopexies with augmentation.[9,12,13] Additionally, when breast reduction was combined with implants, it carried the highest percentage of revision and complication rates.[13]

To date, there are few articles encompassing the full scope of this surgery, and it is not surprising that in a literature search that retrieved 259 articles on single-stage mastopexies and breast augmentation, only 23 articles were suitable for a meta-analysis.[25] Very few of these studies included primary and secondary procedures.[9,10] Of those review articles, Dr. Spear reported complication and revision rates of 17.4% and 8.7% in single-stage primary and secondary augmentation mastopexies, respectively.[9] In his review article, Calobrace not only reported the complication rate between the two groups, but also added tissue-related and implant-related reoperation rate in each group.[10] The author of the present study has reported complication and revision rates of 13.6% and 4.5%, respectively in his first, and a revision rate of 11.1% in the subsequent article.[7,8] The current study involved complications and revision rates for both soft tissue and implant-related complications in primary and secondary mastopexies with augmentation mammoplasty. Patients were followed up for at least 18 months, as long-term implant-related complications are not unique to the single-stage mastopexy with augmentation.[6] In the current study, wound breakdown, hematomas, and infections were higher with the primary procedures than with the secondary mastopexies, whereas nipple areolar vascular compromise was twice as common in secondary procedures (2%) than in the primary procedures (1.2%) (Supplemental Table 8, http://links.lww.com/PRSGO/B943).

In patients having a mastopexy with augmentation, the control of postoperative NAC to IMC crease is absolutely essential to prevent bottoming out, which is a common reason for tissue-related reoperations.[26] This complication is commonly seen if a periareolar mastopexy is used in patients who present with excess skin in the lower pole of the breast, leading to a bottoming out.[13–26] Similarly, use of the VS technique in all cases may also lead to a further increase in the NAC to IMC measurement, leading to a bottoming out. The use of this single technique was associated with a 20% revision rate in one prospective study.[13] An optimal NAC to IMC crease distance of 7–8 cm for B cup size, 9–10 cm for C cup, and 10–11 cm for a D cup size breast was described by Stevens et al as their preferred choice.[27] However, recognition of the preoperative NAC to IMC measurement is important,[26] and the excision of the ellipse of skin from an inframammary crease or by dropping the circum-areolar mosque-dome incision was recommended by Calobrace if the preoperative nipple to inframammary crease measurements exceeded 8–10 cm.[10] In the current series for single-stage bilateral mastopexy with augmentation, periareolar mastopexy marking was selected if the preoperative NAC to IMC distance was equal to or less than 5 cm, and a VS mastopexy was selected if preoperative measurements were 6–8 cm. Areolar keyhole markings were dropped or a limited transverse ellipse was added in the crease if the preoperative markings were 8–10 cm. An anchor-shaped scar, with the elimination of the measured transverse ellipse along the full width of the inframammary crease, was performed if the NAC to IMC markings were more than 10 cm (Supplemental Table 5, http://links.lww.com/PRSGO/B943).[26] All mastopexies were performed using a superomedial dermoglandular flap, including periareolar mastopexies.[28,29] The addition of a superomedial flap in periareolar mastopexies allows for better NAC mobilization, reduces tension on the NAC edges, prevents stretching and flattening of the nipple in the postoperative period, and results in better quality scars.

In mastopexy with augmentation, simultaneous expansion and tightening of the breast skin envelope exert pressure on the pedicle that can potentially compromise vascularity of the NAC. To mitigate this risk and add safety to the procedure, the author is currently using layered mastopexy. The technique involves pocket dissection, and placement of implant and closure first and mastopexy later. A layer of breast parenchyma is left to cover the implant to prevent its exposure in case of wound dehiscence. The continuity of tissue all around allows medially oriented flap, especially secondary cases, to have enhanced blood supply, venous return, sensory input, lymphatic drainage, and lactation potential.[30]

Secondary mastopexies with augmentation were mostly performed for secondary ptosis following breast augmentation, inadequate mastopexy with augmentation, capsular contracture with ptosis following augmentation mammoplasty, and patients requesting to replace larger implants for smaller implants. Secondary procedures also involve extensive tissue handling, and the presence of microorganisms present in capsules and biofilms may potentially increase the risk of periprosthetic and superficial wound infections in secondary mastopexies with augmentation.[14] However, in the current series, there was a periprosthetic infection and superficial wound infection rate of 3% in primary mastopexies with augmentation compared with 0% in secondary mastopexies with augmentation. Similarly, wound-healing problems were seen in 7.7% of the primary procedures, as opposed to 2% in the secondary procedures. Periprosthetic infections and wound-healing issues were conservatively treated with antibiotics. Similarly, hematomas that were nonexpanding in nature were successfully treated with compression adhesive dressings. There were similar results and behavior of these local microorganisms (known as the "human microbiome") in an earlier study.[31,32]

Since its introduction, the muscle splitting biplane pocket for augmentation mammoplasty has produced acceptable and durable results with negligible or no animation deformity.[4,15,16,33] The use of this technique has been incorporated and combined with mastopexy.[7] Continuous efforts have been introduced to reduce the complications and revision rates.[26,30] Timely published reports and modifications have allowed safety and reduced the complication rates with reproducible results.[6,8,33–38]

Strength and Weaknesses of the Study

The strength of the study is that all consultations and primary surgeries were performed using muscle splitting pockets and round silicone gel implants. The weaknesses of the study are that it is a retrospective study, has a small sample, and long-term implant-related complications were not part of these data, which can potentially affect the revision rate presented in this study. Patient outcome of the results was not analyzed using standardized questionnaires like BREAST-Q or SF-36 or a PROMIS score. There is no a-priori sample size calculation and a lack of clarity of primary outcome.

CONCLUSIONS

Single-stage mastopexy with augmentation in a muscle splitting biplane is a safe procedure with acceptable complications and revision rates. There was a higher prevalence of complications in primary than in secondary procedures; however, the revision rate was not statistically significant.

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ACKNOWLEDGMENT

All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

REFERENCES

1. Cronin TD, Gerow RM. Augmentation mammoplasty: a new "natural feel" prosthesis. *Transactions of the Third International Congress of Plastic and Reconstructive Surgery, Washington.* Excerpta Medica, Amsterdam; 1964: 41–49.
2. Regnault P. The Hypoplastic and ptotic breast; a combined operation with prosthetic augmentation. *Plast Reconstr Surg.* 1966;37:31–37.
3. Spear S. Augmentation/mastopexy: "surgeon beware." *Plast Reconstr Surg.* 2003;112:905–906.
4. Khan UD. Muscle splitting breast augmentation. A new pocket in a different plane. *Aesth Plast Surg.* 2007;31:553–558.
5. Khan UD. Muscle splitting, subglandular and partial submuscular augmentation mammoplasties. A twelve year retrospective analysis of 2026 primary cases. *Aesth Plast Surg.* 2013;37:290–302.
6. Khan UD. Muscle splitting augmentation mammoplasty: A 13-year outcome analysis of 1511 primary augmentation mammoplasties. *Aesthet Plast Surg.* 2019;43:1469–1477.
7. Khan UD. Augmentation mastopexy in muscle splitting biplane: an outcome of first 44 consecutive cases of mastopexies in a new pocket. *Aesth Plast Surg.* 2010;34:313–321.
8. Khan UD. Augmentation mastopexy and augmentation mammoplasty: an analysis of 1,406 consecutive cases. *Plast Aesthet Res.* 2016;3:26–30.
9. Spear SL, Boehmler JH, Clemens MW. Augmentation/mastopexy: a 3-year review of a single surgeon's practice. *Plast Reconstr Surg.* 2006;118:136S–147S
10. Calobrace MB, Herdt DR, Cothron KJ. Simultaneous augmentation/mastopexy: a retrospective 5-year review of 332 consecutive cases. *Plast Reconstr Surg.* 2013;131:145–156.
11. Spear SL, Pelletiere CV, Menon N. One-stage augmentation combined with mastopexy: aesthetic results and patient satisfaction. *Aesthetic Plast Surg.* 2004;28:259–267.
12. Stevens WG, Macias LH, Spring M, et al. One-stage augmentation mastopexy: a review of 1192 simultaneous breast augmentation and mastopexy procedures in 615 consecutive patients. *Aesthet Surg J.* 2014;34:723–732.
13. Swanson E. Prospective comparative clinical evaluation of 784 consecutive cases of breast augmentation and vertical mammoplasty, performed individually and in combination. *Plast Reconstr Surg.* 2013;132:30e–45e.
14. Pajkos A, Deva AK, Vickery K, et al. Detection of subclinical infection in significant breast implant capsules. *Plast Reconstr Surg.* 2003;111:1605–1611.
15. Khan UD. Dynamic breasts: a common complication following partial submuscular augmentation and its correction using muscle splitting biplane technique. *Aesthet Plast Surg.* 2009;33:353–360.

16. Khan UD. High transverse capsuloplasty for the correction of malpositioned implants following augmentation mammoplasty in partial submuscular plane. *Aesthetic Plast Surg*. 2012;36:590–599.
17. Khan UD. Subglandular to muscle splitting biplane conversion for revision augmentation mammoplasty. In: *Aesthetic Surgery of Breast*. 1st ed. Berlin: Springer; 2015:535–541.
18. Regnault P. Breast ptosis. Definition and treatment. *Clin Plast Surg*. 1976;3:193–203.
19. Kalaaji A, Dreyer S, Brinkmann J, et al. Quality of life after breast enlargement with implants versus augmentation mastopexy: a comparative study. *Aesthet Surg J*. 2018;38:1304–1315.
20. Pferdehirt R, Nahabedian MY. Finesse in mastopexy and augmentation mastopexy. *Plast Reconstr Surg*. 2021;148:451e–461e.
21. Sarosiek K, Maxwell GP, Unger JG. Getting the most out of augmentation-mastopexy. *Plast Reconstr Surg*. 2018;142:742e–759e.
22. Munhoz AM, Neto AM, Ferrari O. Single-stage augmentation mastopexy with composite reverse inferior muscle sling technique for autologous reinforcement of the inferior pole: technical refinements and outcomes. *Aesthet Surg J*. 2020;40:NP356–NP373.
23. Walters J, Bourn L, Tessler O, et al. Single staged mastopexy with autologous fat grafting: an alternative to augmentation mastopexy with implants. *Aesthet Surg J*. 2020;40:NP152–NP158.
24. Montemurro P, Cheema M, Hedén P, et al. Benchmarking the outcomes of single-stage augmentation mastopexy against primary breast augmentation: a single surgeon's experience of 905 consecutive cases. *Plast Reconstr Surg*. 2019;144:326–334.
25. Khavanin N, Jordan SW, Rambachan A, et al. A systematic review of single-stage augmentation-mastopexy. *Plast Reconstr Surg*. 2014;134:922–931.
26. Khan UD. Use of nipple areolar complex to inframammary crease measurements to reduce bottoming out after augmentation mastopexy. In: Mugea TT, Schifmann MA, eds. *Aesthetic Surgery of the Brest*. 1st ed. Berlin: Springer-Verlag.
27. Spring MA, Macias LH, Nadeau M, et al. Secondary augmentation-mastopexy: indication, preferred practices, and the treatment of complications. *Aesth Plast Surg*. 2014;34:1018–1040.
28. Asplund OA, Davies DM. Vertical scar breast reduction with medial flap or glandular transposition of the nipple-areola. *Br J Plast Surg*. 1996;49:507–514.
29. Hall-Findlay EJ. Vertical breast reduction with a medially-based pedicle. *Aesthet Surg J*. 2002;22:185–194.
30. Khan UD. Layered mastopexy with augmentation in muscle splitting biplane: a modification for lower pole safety and stability. *Aesth Plast Surg*. 2021(Online ahead-of-print).
31. Khan UD. Periprosthetic infection in primary and secondary augmentation mammoplasty using round silicone gel breast implants: comparative analysis of 2521 primary and 386 secondary mammoplasties in a single surgeon practice. *Aesthetic Plastic Surgery*. 2020;45:1-10. http://link.springer.com/article/10.1007/s00266-020-01965-y
32. Graf RM, Closs Ono MC. Invited discussion on: "periprosthetic infection in primary and secondary augmentation mammoplasty using round silicone gel breast implants. comparative analysis of 2521 primary and 386 secondary mammoplasties in a single surgeon practice." *Aesthetic Plast Surg*. 2021;45:11–14.
33. Baxter RA. Update on the split-muscle technique for breast augmentation: prevention and correction of animation distortion and double bubble deformity. *Aesthet Plast Surg*. 2011;33:353–360.
34. Saleh DB, Callear J, Riaz M. An anatomic appraisal of biplanar muscle-splitting breast augmentation. *Aesthet Surg J*. 2016;36:1019–1025.
35. Stumpfle RL, Pereira-Lima LF, Valiati AA, et al. Transaxillary muscle splitting breast augmentation: experience with 160 cases. *Aesthet Plast Surg*. 2012;36:343–348.
36. Lang Stümpfle R, Piccinini PS, Pereira-Lima LF, et al. Muscle-splitting augmentation-mastopexy: implant protection with an inferior dermoglandular flap. *Ann Plast Surg*. 2019;82:137–144.
37. Rigo MH, Piccinini PS, Sartori LDP, et al. SMS-split muscle support: a reproducible approach for breast implant stabilization. *Aesthetic Plast Surg*. 2020;44:698–705.
38. Stümpfle RL, Piccinini PS, Zanin EM. Muscle-splitting transaxillary revision breast augmentation–a single surgeon's experience. *Aesth Plast Surg*. 2021;45:2027–2203.