Postoperative Complications in Breast Reconstruction With Porcine Acellular Dermis and Polypropylene Meshes in Subpectoral Implant Placement

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Abstract. *Aim: This research compares postoperative complication rates with Strattice™, SERAGYN® BR, and TiLOOP® Bra interposition devices for subpectoral implant placement after skin or nipple sparing mastectomy. Patients and Methods: 188 breast reconstructions in 157 patients after primary (n=96), secondary (n=71), or prophylactic (n=21) surgery were analyzed regarding major and minor complications. Results: With acellular dermal matrix (ADM) Strattice™, 27.5% major and 27.5% minor complications occurred. Implant loss rates were 27.3% in primary and 30.8% in secondary reconstructions. With SERAGYN® BR, 11.1% major and 13.0% minor complications occurred. Implant losses (6.1%) occurred exclusively in primary reconstructions. With TiLOOP® Bra, 14.9% major and 9.6% minor complications occurred. Implant loss rates were 7.7% in primary and 7.1% in secondary reconstructions. Conclusion: ADM was associated with high complication rates in primary and secondary reconstructions. Low complication rates were seen with mesh interposition devices in primary, secondary, and prophylactic reconstructions.*

This article is freely accessible online.

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Key Words: Breast reconstruction, breast cancer, acellular dermal matrix, mesh, titanium-coated, partially absorbable, Strattice™, SERAGYN® BR, TiLOOP® Bra.

Despite the introduction of new and improved therapeutic concepts in breast cancer treatment, a mastectomy is unavoidable in approximately 30% of breast carcinomas (1). In the absence of contraindications and with the patient's consent, either a nipple-sparing (NSM) or skin sparing mastectomy (SSM) of the affected breast should be performed. Immediate breast reconstruction yields a high patient satisfaction rate and its use in surgical cancer therapy is steadily increasing (2-5). In surgical breast reconstruction, the pectoralis major muscle is the essential muscle for the formation of an implant pocket, but its dimension is shortened by subpectoral implant insertion, making the use of synthetic mesh or ADM essential (6). While the term primary breast reconstruction describes the immediate reconstruction of the ablated breast after mastectomy in the same surgical session, secondary reconstruction refers to later reconstruction of a breast after ablation or expander insertion due to sparse skin material and/or a weak pectoral skin that cannot ensure sufficient implant coverage. Prophylactic mastectomy can be performed to reduce the risk of disease in cases of BRCA1 or BRCA2 mutations (7).

Despite great intra- and postoperative diligence, the postoperative outcome and risk of complications can be affected by patient-specific factors (age, weight, breast size, previous diseases, nicotine consumption) and therapeutically required measures [*i.e.*, radiotherapy (RTX)]. The most frequently described complications in surgical breast reconstruction are seromas, wound healing disorders, suture dehiscence, infections, necroses, revision surgery and even implant loss; the average complication frequencies reported in the literature range from 6% to 14% (8-13). These complications are classified as major or minor. Major complications are defined as complications for which

conservative treatment is not sufficient, which require surgical intervention and include revisions and explantations (reconstructive failure). Minor complications can be successfully treated conservatively without further surgical intervention (14).

The risk factors for postoperative complications or reconstructive failures assessed in our study, as in the literature, were RTX, nicotine abuse, body mass index (BMI) outside of normal limits and diabetes mellitus (Table I) (8-13, 15, 16). RTX was categorized as preoperative or postoperative. The time between preoperative RTX and breast reconstruction was at least 6 months; for the majority of the patients included in this study it was between 1.5 and 5 years.

This monocentric, retrospective study investigated complication rates occurring with the dermal matrix Strattice™, the partially absorbable synthetic mesh SERAGYN® BR, and the titanium-coated mesh TiLOOP® Bra in breast reconstructions with subpectoral implant placement, and how these rates were influenced by risk factors and the type of reconstruction. As, with the exception of Eichler *et al.* (17), no comparative study of complication rates with the above-mentioned interposition devices is available, this study aimed to compare complication rates to add to the knowledge base required for individualized treatment decisions regarding the choice of a mesh or an ADM.

Patients and Methods

Implant/mesh types. The Allergan company, Dublin, Ireland (at the time of data collection, the company name was LifeCell Corp., Branchburg, NJ, USA), offers the Strattice™ tissue matrix composed of porcine source cell clusters in which all cellular elements are removed while maintaining an intact matrix with biochemical components. This porcine acellular dermis (PADM) is designed to enable soft tissue healing through rapid neovascularization and cell regeneration, aiming to provide permanent support, skin lining and repair through endogenously induced tissue restructuring (18-22). The SERAGYN® BR mesh from Serag Wiessner (Naila, Germany) is a bicomponent mesh made of polypropylene and absorbable polyglycolic acid. The outer mesh layer is absorbed by the body after approximately 120 days, so that only 6 individual polypropylene filaments remain permanently in the breast and the amount of foreign material is reduced. The TiLOOP® Bra from pfm medical (Cologne, Germany) is a titanium-coated hydrophilic monofilament polypropylene mesh. This interposition device remains unchanged in the patient's breast. The titanium oxide is intended to reduce the rate of inflammation and thus limit the rate of late complications.

What all materials have in common is the formation of a soft implant capsule with a smooth inner surface, which should result in the best possible prosthesis coverage. Although using ADM and synthetic meshes offers many advantages, there are also some risks associated with their use, including postoperative complications such as seroma, hematoma, infection, skin necrosis, or implant loss resulting from postoperative complications (8-11, 23-29). Anatomical implants from Allergan, Mentor (Irvine, CA, USA), POLYTECH (Dieburg, Germany) and Sebbin (Boissy-l'Aillerie, France) were used in the breast reconstructions that were the focus of this study.

Study protocol. Data were collected and analyzed in accordance with the Declaration of Helsinki. The study protocol was reviewed by an ethics committee, which issued a favorable opinion on the preparation of this work. A retrospective data analysis was done for breast reconstructions that involved support by an ADM or mesh after NSM or SSM in 157 female patients with subpectoral implant insertion (31 of them bilateral), which were treated according to surgical gold standards at the Breast Center of the University of Greifswald between November 2010 and June 2015. A total of 188 breasts were reconstructed in a 1 or 2 stage surgical procedure as primary or secondary reconstruction. The PADM Strattice™ was used in 34 patients (40 breasts), the textile implant SERAGYN® BR in 48 patients (54 breasts) and the titanium-coated polypropylene mesh TiLOOP® Bra in 75 patients (94 breasts). Primary reconstruction was performed in 98 breasts (52.1%, $p=0.006$); secondary reconstruction in 71 breasts (37.8%, $p=0.005$); and prophylactic ablation and subsequent reconstruction in 21 breasts (11.2%, $p=0.114$) (Table II). The median patient age was 50.6 years, the median BMI was 25.6. A BMI >25 was noted in 23.5% of patients, including 39.6% of patients in the SERAGYN® BR cohort and 42.7% in the TiLOOP® Bra cohort ($p=0.234$). The average ablated material weight was 370.6 g (Table III). All patients were treated with antibiotics for 10 days, thereof 79% with sultamicillin. Clindamycin was used in case of penicillin intolerance. The drains inserted intraoperatively were removed at a flow rate of <30 ml/24 h.

All relevant patient data were analyzed retrospectively in a pseudonymized manner. The complications were documented to be able to compare the tolerability and success rate of the treatments. The complications were divided into major and minor complications as described in the Introduction.

Patients were divided into underweight (<18.5), overweight (25 to 29.5), obese (30 to 39.9), and severely obesity (>40) according to BMI and WHO data. The duration of follow-up was 11.7 months on average (3 weeks to 42 months).

Statistical analyses. Homogeneity tests for categorical variables were performed with Fisher's exact test. For tests of mean differences, ANOVAs for independent samples was used. Pairwise comparison tests (least significant difference) were performed if the p -Value was significant. The significance level was set at 0.05 when testing for differences. All analyses were conducted using SPSS version 22 (IBM, Armonk, NY, USA).

Results

A total of 58 complications occurred, with 27 minor (14.4%) and 31 major (16.5%) cases (Table IV). Explantation, including the synthetic mesh or ADM, was performed on 27 implants (14.4%). Eight implants (4.3%) were removed due to R1 status. These were not included in the statistical analysis. Implant loss due to reconstructive failure affected 19 (10.1%) breasts, thereof 11 (27.5%) in the Strattice™ cohort, 2 (3.7%) in the SERAGYN® BR cohort and 6 (6.4%) in the TiLOOP® Bra cohort.

The focus of the assessments was the relation between reconstructive failure and type of reconstruction (Table V). Overall, implant loss occurred in 9 of 96 (9.4%) primary and 10 of 71 (14.1%) secondary reconstructions. In the Strattice™ cohort, implant loss occurred in 3 of 11 (27.3%) primary and

Table I. *Distribution of risk factors.*

Risk factor	Strattice™ (n=40)	SERAGYN® BR (n=54)	TiLOOP® Bra (n=94)	Total (n=188)	p-Value
Radiotherapy before reconstructive surgery (n=18)	8 (23.5%)	2 (4.2%)	18 (24%)	18 (11.5%)	0.153
Radiotherapy after reconstructive surgery (n=23)	6 (17.6%)	8 (16.7%)	23 (30.7%)	23 (14.6%)	0.738
Nicotine abuse (n=40)	9 (26.5%)	12 (25%)	19 (25.3%)	40 (25.5%)	0.139
BMI <18,5 (n=8)	5 (14.7%)	0 (0%)	3 (4%)	8 (5.1%)	0.093
BMI 25-29,5 (n=44)	7 (20.6%)	15 (31.3%)	22 (29.3%)	44 (28%)	0.021
BMI 30-39 (n=13)	1 (2.9%)	3 (6.3%)	9 (12%)	13 (8.3%)	0.018
BMI >40 (n=2)	0 (0 %)	1 (2.1%)	1 (1.3%)	2 (1.3%)	0.607
Total BMI >25 (n=59)	8 (23.5%)	19 (39.6%)	32 (42.7%)	59 (37.6%)	0.001

Table II. *Distribution of reconstruction types.*

	Strattice™ (n=40)	SERAGYN® BR (n=54)	TiLOOP® Bra (n=94)	Total (n=188)	p-Value
Primary reconstruction (n=96)	11 (27.5%)	33 (61.1%)	52 (55.3%)	96 (51.1%)	0.006
Secondary reconstruction (n=71)	26 (65%)	17 (31.5%)	28 (29.8%)	71 (37.8%)	0.005
Prophylactic reconstruction (n=21)	3 (7.5%)	4 (7.4%)	14 (14.9%)	21 (11.2%)	0.114
Total (n=188)	40 (100%)	54 (100%)	94 (100%)	188 (100%)	-

Table III. *Overall patient characteristics.*

	Strattice™ (n=40)	SERAGYN® BR (n=54)	TiLOOP® Bra (n=94)	Total (n=188)	p-Value
Age (years) (SD; min-max)	52.3 (5.9; 40-69)	53.5 (10.7; 27-74)	48.1(10.3; 23-69)	50.6 (9.9; 23-74)	0.007
BMI (SD; min-max)	24.6 (4.3; 17.2-37.9)	26.2 (4.5; 20.2-46.9)	25.7 (4.4; 17.9-37.1)	25.6 (4.4; 17.2-46.9)	0.296
Ablated material weight (g) (SD; min-max)	295.7 (150.3; 66-550)	378.6 (213; 99-926)	399.4 (244.2; 27-1095)	370.6 (224.3; 27-1095)	0.288
Implant size (g) (SD; min-max)	375.6 (74; 160-405)	408.5 (99.3; 125-580)	457.3 (106; 135-580)	424.7 (102.3; 125-580)	0.088
Duration of hospitalization (d) (SD; min-max)	6.4 (1.8; 4-14)	7.6 (2.4; 3-12)	7.4 (2; 3-15)	7.2 (2.1; 3-15)	0.031
Drain retention (d) (SD; min-max)	6.2 (1.7; 3-11)	7.3 (3; 1-15)	7.3 (2.1; 3-13)	7.1 (2.4;1-15)	0.046
Total drained volume (ml) (SD; min-max)	409.5 (299.7; 19-1,750)	505.3 (275; 10-1,485)	559.7 (297.8; 40-1,450)	510.2 (295.3; 1-1,750)	0.048
Follow-up (months) (SD; min-max)	17.8 (0.4; 1-42)	11.3 (7.1; 3-31)	9.2 (9; 3.29-33)	11.7 (9.4; 0.69-42)	<0.001

8 of 26 (30.8%) secondary reconstructions; in the SERAGYN® BR cohort, implant loss occurred exclusively with primary reconstructions (2 of 33 breasts, 6.1%). In the TiLOOP® Bra cohort, implant loss occurred in 4 of 52 (7.7%) primary and 2 of 28 (7.1%) secondary reconstructions.

The proportion of prophylactic reconstructions by the interposition device was 3 breasts (7.5%) for Strattice™, 4 breasts (7.4%) for SERAGYN® BR and 14 breasts (14.9%) for TiLOOP® Bra. All prophylactic reconstructions had a complication-free outcome. No statistically significant correlation between the type of reconstruction and

reconstructive failure was found (Strattice™, $p=1.000$; SERAGYN® BR, $p=0.285$; TiLOOP® Bra, $p=0.312$).

The most frequently documented complications in descending order were: seroma (11.7%), revision surgery (8.0%), hematoma (7.6%), wound infection (5.9%), suture dehiscence (5.3%), wound healing disorder (4.3%), postoperative hemorrhage and skin necrosis (2.7% each) and abscesses (1.1%) (Table VI). The association of these complications with risk factors was further investigated. With all 3 interposition devices, preoperative RTX was significantly correlated with the occurrence of seromas ($p=0.026$), wound

Table IV. Distribution of major and minor complications (percentages by individual cohort).

	Strattice™ (n=40)	SERAGYN® BR (n=54)	TiLOOP® Bra (n=94)	Total (n=188)	p-Value
Major complications (n=31)	11 (27.5%)	6 (11.1%)	14 (14.9%)	31 (16.5%)	0.005
Minor complications (n=27)	11 (27.5%)	7 (13%)	9 (9.6%)	27 (14.4%)	0.3679

Table V. Implant loss in relation to reconstruction type (percentages by total patient numbers with the respective reconstruction type).

Interposition device	Implant loss (n=19)	Primary reconstruction (n=96)	Secondary reconstruction (n=71)	Prophylactic reconstruction (n=21)	p-Value
Strattice™ (n=40)	11 (27.5%)	3 of 11 (27.3%)	8 of 26 (30.8%)	0 of 3 (0%)	1.000
SERAGYN® BR (n=54)	2 (3.7%)	2 of 33 (6.1%)	0 of 17 (0%)	0 of 4 (0%)	0.285
TiLOOP® Bra (n=94)	6 (6.4%)	4 of 52 (7.7%)	2 of 28 (7.1%)	0 of 14 (0%)	0.312

Table VI. Distribution of complications.

	Strattice™ (n=40)	SERAGYN® BR (n=54)	TiLOOP® Bra (n=94)	Total (n=188)	p-Value
Seroma (n=22)	11 (27.5%)	7 (13%)	4 (4.3%)	22 (11.7%)	0.001
Hematoma (n=12)	3 (7.5%)	4 (7.4%)	5 (5.3%)	12 (7.6%)	0.837
Wound healing disorder (n=8)	3 (7.5%)	1 (1.9%)	4 (4.2%)	8 (4.3%)	0.422
Secondary hemorrhage (n=5)	0 (0%)	2 (4.2%)	3 (3.2%)	5 (2.7%)	0.491
Suture dehiscence (n=10)	5 (12.5%)	1 (1.9%)	4 (4.3%)	10 (5.3%)	0.018
Wound infection (n=11)	2 (5.9%)	2 (3.7%)	7 (9.3%)	11 (5.9%)	0.625
Skin necrosis (n=5)	2 (5%)	0 (0%)	3 (3.2%)	5 (2.7%)	0.298
Abscess (n=2)	1 (2.5%)	0 (0%)	1 (1.1%)	2 (1.1%)	0.505
Revision surgery (n=15)	2 (5%)	5 (9.3%)	8 (7.4%)	15 (8%)	0.659
Implant loss/reconstructive failure (n=19)	11 (27.5%)	2 (3.7%)	6 (6.4%)	19 (10.1%)	0.000

healing disorders ($p=0.023$), wound infections ($p=0.001$) and implant losses ($p<0.001$). Patients with preoperative RTX had higher frequencies of implant losses in all 3 cohorts. Among the total of 19 implant losses, 8 cases were associated with preoperative RTX, 2 cases with postoperative and 9 cases occurred without RTX. Preoperative RTX was statistically significantly associated with reconstructive failure ($p<0.001$). Postoperative RTX was not significantly related to reconstructive failure ($p=0.105$). Overall, diabetic patients had a higher frequency of clinically evident seroma postoperatively ($p=0.015$). There was no statistically significant association between the type of reconstruction and postoperative complications for any interposition device (Strattice™, $p=1.000$; SERAGYN® BR, $p=0.285$; TiLOOP® Bra, $p=0.312$).

Discussion

In the literature, the use of synthetic meshes and PADM together with silicone implants is described as having a low

postoperative complication rate, high patient acceptance and satisfaction, and a low incidence of postoperative morbidity (31, 31). For this reason, a comparison between acellular dermal matrices and the already established meshes is useful in order to guide the individual product choice for affected patients (32). Preliminary guidance is available from the retrospective comparison of the synthetic meshes TiLOOP® Bra and SERAGYN® BR undertaken by Eichler et al (17). The complication rates reported for the titanium-coated mesh used in that study (major: 8.3%, minor: 8.9%) and SERAGYN® BR (major: 3.9%, minor: 18%) are readily comparable with our study. On the contrary, some studies published on Strattice™ report clearly different results than our study regarding revision surgery and implant losses. While the overall complication rate in the Strattice™ cohort studied here was 27.5% each for major and minor events, the majority of publications report rates between 6% and 10% for both types of complications. These publications have focused primarily on capsular fibrosis and reconstructive failures (8-13). However, it is particularly

striking that in some publications, such as the study by Salzberg *et al.* (10), that around 77% of patients who received an acellular dermis were treated in the context of prophylactic reconstruction (8, 10, 11). To date, only a few publications have reported a comparably high complication rate in connection with the use of an ADM (33-35): The complication rates published by these authors are comparable to the results of our study, ranging from approximately 20% (8, 35) to 30% (33, 36) and include seroma, infection, and skin necrosis. The results reported by Ng *et al.* (36) on the postoperative outcome in patients treated with RTX and Strattice™, showed a complication rate of 32%, which is also comparable to our study. Frequencies of minor complications with Strattice™ were above the average of 0% to 32% found in the other ADM studies (34, 35, 37-39). The most common complication reported across publications was seroma formation. In our study, seroma rates in the ADM cohort were markedly higher than in the SERAGYN® BR and TiLOOP® cohorts and also higher than in other publications with reported seroma rates of <10% (9, 10, 12, 23). In our study, RTX prior to breast reconstructive surgery was a significant risk factor with regard to postoperative seroma formation.

In our study, risk factors were equally or less common in patients treated with acellular dermis than in patients treated with SERAGYN® BR or TiLOOP® Bra. The percentage of patients with postoperative RTX in the Strattice™ cohort was almost identical to the SERAGYN® BR cohort and lower than in the TiLOOP® Bra cohort. Preoperative RTX occurred in similar percentages of patients in the Strattice™ and TiLOOP® Bra cohorts but in a lower percentage of patients in the cohort treated with SERAGYN® BR. The percentage of smokers was similar between cohorts. Concerning the BMI risk factor, the Strattice™ cohort had the lowest percentage of patients with a BMI >25. A notable difference was found with regard to the type of reconstruction: the majority of breasts treated with SERAGYN® BR or TiLOOP® Bra received primary reconstruction while the majority of breasts treated with Strattice™ received secondary reconstruction. Evidence from other studies suggests that the type and timing of reconstruction and whether breast reconstruction was performed in the context of cancer therapy has an impact on the multifactorial modulated outcome (15, 39-42). In our study, no significant association between the type of reconstruction or mastectomy and postoperative complications was found for any interposition device studied.

In the absence of comprehensive data, the PADM has been increasingly used, due to its properties, in patients with thin pectoral skin and after previous surgery and RTX (20). In 2015, seven years after the marketing authorization of the medical device, the LifeCell company communicated restrictions for the use of this product and set clear indication limits for the first time. These restrictions particularly applied to secondary reconstructions, post- or preoperative

RTX, as well as the following risk factors: obesity, nicotine abuse, diabetes mellitus, immunosuppression, malnutrition and COPD (20, 43). Ng *et al.* (36) did not see significant differences with Strattice™ between pre- and postoperative RTX with regard to the postoperative outcome, even though about 75% of the complications reported in that publication occurred in patients with preoperative RTX. Based on that conclusion, the aforementioned publication weakens the absolute contraindication of RTX before or after Strattice™ implantation. With 32%, the complication rate documented by Ng *et al.* is approximately as high as in our study (36).

Mitchel (44) showed a much lower complication rate of just under 11% when using Strattice™ in conjunction with preoperative RTX. The author attributed the low complication rate to intraoperative rinsing of the subpectoral implant pocket and washing of the ADM in an antibiotic solution. In addition, he considered the acellular dermis to be protective against the negative consequences of postoperative RTX, as no complications were documented in patients undergoing post-reconstructive RTX in his study (44). In our study, we found strikingly lower rates for overall major complications and for reconstructive failures with the alloplastic materials TiLOOP® Bra and SERAGYN® BR, compared to Strattice™.

The outcomes reported in our study are generally consistent with other publications (17, 15, 24-29, 38). The rates of revision surgery, which are around 9% for SERAGYN® BR and 7% for TiLOOP® Bra, together with the documented reconstructive failures of 3.7% for SERAGYN® BR and 6.4% for TiLOOP® Bra, represent a satisfactory outcome that is comparable to the general literature (16, 17, 24-26, 28, 30, 38). Based on first experiences with the 2 component mesh SERAGYN® BR, Paepke *et al.* (24) pointed out that any analysis of complications should also consider the underlying oncological intervention, emphasizing that postoperative problems could have less to do with the insertion of foreign material.

An additional influencing factor is the size of the breast: the greater the volume of ablated material, the greater the risk of a postoperative complication. The size of the breast is particularly relevant with regard to revision surgery and reconstructive failures (16, 45). In our study, the highest ablated material weight was noted in patients treated with SERAGYN® BR while it was below the average in patients treated with Strattice™. Patients treated with TiLOOP® Bra were in the middle range ($p=0.288$) (Table III). Since the breast size correlated with BMI, an increased ablated material weight in our patients should be interpreted as being an equally large risk factor as an overweight or obese BMI. RTX of the thoracic wall remains an established risk factor: In all breast reconstructions with the PADM or one of the mesh alloplastic materials, there is a possible causality between RTX and implant losses as well as wound infections.

However, although our data do not support a statistically significant association between postoperative RTX and

implant losses, the risk of reconstructive failure after breast reconstruction in conjunction with RTX of the treated area has been confirmed in most of the published literature. The reason for this is the delayed or inhibited revascularization and cell infiltration in the wound area (8, 15, 40, 42, 46, 47). With regard to the use of TiLOOP® Bra, it has been reported that the outcome is not influenced by RTX (48). Nevertheless, recommendations for implant-based breast reconstruction suggest avoiding a combination with postoperative RTX, regardless of whether mesh, dermis or neither of them is used (14, 49). A study by Karsten *et al.* (50) shows that implantation of Strattice™ triggers a significant interleukin release in the patient's T and B cells and thus an increased immune response. Another study has demonstrated the proinflammatory effect of ADMs in an animal model (51). Strattice™ was reported to be associated with the highest incidence of inflammatory reactions compared with other ADMs in several publications (31, 52). In contrast to our study, Eichler *et al.* (17) did not report any significant differences in implant loss rates in a retrospective comparison of synthetic meshes and the human ADMs SurgiMend® and ePIflex®. On this basis, a trend towards the use of synthetic meshes in clinical practice is observed in the aforementioned study with comparable outcomes but significantly different costs. The majority of breast reconstructions analyzed in our study were associated with few or no complications. In total, 71.8% of breasts were reconstructed without a postoperative complication.

Our study describes real-world clinical events through a retrospective evaluation of data. However, the impact of our results on the optimization of patient care is rather low. Controlled, randomized, prospective multicenter studies could provide further information for individualized therapy choices in the future.

A low complication rate can be noted with the 2 component mesh SERAGYN® BR and the titanium-coated polypropylene mesh TiLOOP® Bra across all reconstruction procedures analyzed in our study. This contrasts with the high rate of postoperative complications in breast reconstructions associated with the acellular dermis Strattice™, in particular with secondary breast reconstruction. It should be emphasized that in our study, as in other publications, ADM was used preferentially in secondary reconstructions and in conjunction with RTX. More results are needed, especially in comparing the type of reconstruction together with RTX when using Strattice™. Nevertheless, if pre- or postoperative RTX is necessary, breast reconstruction with autologous tissue (*e.g.*, TRAM or DIEP flap) should be recommended in accordance with the guidelines instead of mesh- or dermis-supported reconstruction (7). Should the respective patient nevertheless opt for breast reconstruction with mesh or acellular dermis, the increased risk with regard to postoperative complications must be pointed out and explained in detail.

Conflicts of Interest

Katharina Schüler, Thomas Kohlmann, Zaher Alwafai, Florian Nawroth and Marek Zygmunt have no conflicts of interest to disclose. Stefan Paepke is a consultant of the following companies: pfm medical ag, Cologne, Germany; Novusscientific, Sweden; Triconmed, Germany; Sysmex, Germany; Sysmex, Europe; Neodynamics, Sweden; MBN, Germany; Invitroque Europe GmbH; Dynamesh, Germany; Scientific grants: RTI Surgical; pfm medical ag; Novusscientific, Sweden; AG, Germany; GBG, Germany. He has supported workshops of: Roche, Grenzach-Whylen; Sysmex, Germany; Philips GmbH; Triconmed, Germany. In the past, he has been a consultant of Serag Wiessner AG (<5 years); KCI (>3 years); DZIG, Berlin (< 5 years); Allergan (>3 years). Ralf Ohlinger is a consultant and has supported workshops of pfm medical ag, Cologne, Serag Wiessner AG and KCI in the past.

Authors' Contributions

Ralf Ohlinger planned the study, recruited the patients, performed the surgery, analyzed the data, wrote and edited the manuscript. Marek Zygmunt planned the study and edited the manuscript. Florian Nawroth edited the manuscript. Zaher Alwafai recruited the patients, performed the surgery and edited the manuscript. Thomas Kohlmann performed the statistical analysis and edited the manuscript. Stefan Paepke analyzed the data, wrote and edited the manuscript. Katharina Schüler collected and analyzed the data, wrote and edited the manuscript, assisted with surgeries.

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Received June 19, 2021

Revised July 11, 2021

Accepted July 15, 2021