OPEN

PRS GLOBAL OPEN

ORIGINAL ARTICLE

Breast

Use of TIGR Synthetic Reabsorable Mesh in Primary Breast Reconstruction

Will Fairman
Jonathan Nguyen, MD

Background: In postmastectomy prosthetic breast reconstruction, materials such as acellular dermal matrix and synthetic meshes are used to support the implant or expander. The authors present a retrospective review of a synthetic TIGR mesh in primary prepectoral breast reconstruction while evaluating safety outcomes.

Methods: This is a retrospective single-surgeon series of adult female cancer patients who underwent TIGR single-stage direct-to-implant reconstruction or 2-stage tissue expander reconstruction with the use of TIGR mesh. Surgical complications including surgical site infection, wound dehiscence, mastectomy flap necrosis, hematoma or seroma requiring operative intervention, and reconstructive failure were monitored.

Results: A total of 49 patients with 86 breast reconstructions were included in the study. All patients had unilateral cancer and underwent reconstruction between May 2023 and March 2024. There were 37 (75.5%) bilateral mastectomies with reconstruction and 12 (24.5%) unilateral mastectomies with reconstruction. The average age of patients was 53.5 years (range: 32–77 y) and body mass index was 25 kg/m^2 (range: 19–37 kg/m^2). There were 44 direct-to-implant reconstructions and 42 tissue expander reconstructions. From the 86 breast reconstructions, there were 8 complications with an overall complication rate of 9.3%. This included 2 (2.3%) infections, 5 (5.8%) mastectomy skin necroses, and 1 (1.2%) hematoma. There were a total of 3 reconstructive failures requiring mesh and implant removal (3.5%).

Conclusions: We have shown that TIGR mesh has acceptable short-term outcomes in both single-stage and 2-stage implant-based primary breast reconstruction. Future studies should investigate its long-term efficacy, safety, and cost against comparable products. *(Plast Reconstr Surg Glob Open 2025;13:e6622; doi: 10.1097/GOX.0000000000006622; Published online 14 March 2025.)*

INTRODUCTION

Implant-based breast reconstruction after mastectomy is a widely performed operation throughout the world. Much of the innovation in this operation comes from advances in synthetic meshes and acellular dermal matrices (ADMs), which allow the surgeon greater control of implant position and improved aesthetic outcomes.[1]

ADMs are the most popular biologic used in breast reconstruction. These are composed of decellularized extracellular matrices of either human or animal dermis, providing structural support for the implant as well as acting as a scaffold to direct ingrowth and vascularization.[2]

From the Private Practice, Atlanta, GA.

Received for publication June 26, 2024; accepted January 29, 2025.

DOI: 10.1097/GOX.0000000000006622

There is a plethora of ADM options available to surgeons with unique properties, sterilization techniques, thicknesses, and reported infection rates. However, ADMs are known to be an independent risk factor for infection and seroma rates.[3] Additionally, there is a high cost associated with ADMs, depending on the size of a single piece of AlloDerm (Allergan, Irvine, CA), costs range up to $9000 at the senior author's hospital.[4]

The alternative to ADMs is synthetic meshes. Permanent synthetic meshes exist, and studies have shown good long-term structural support. However, their use is limited by issues with palpability, erosion, and chronic foreign body response.[5] Currently, absorbable synthetic meshes are being used and studied as an effective, safe, and cost-efficient alternative to ADMs. There also exists a variety of synthetic meshes available to surgeons with differences in material, absorption time, and strength. However, the main goal for all aforementioned meshes is to provide durable, structural support, and incorporation with minimal complication.[6]

Disclosure statements are at the end of this article, following the correspondence information.

TIGR Matrix Surgical Mesh (Novus Scientific, Uppsala, Sweden) is a long-term 100% bioresorbable synthetic mesh product introduced in 2010. The mesh is designed with fibers made from 2 different synthetic fibers, one being a copolymer of glycolide, lactide, and trimethylene carbonate and the other a copolymer of lactide and trimethylene carbonate. The 2 different materials have different degradation times, providing high strength for more than 6 months, and are completely resorbed 3 years after implantation.[7] Other researchers have studied its effectiveness and safety in breast reconstruction surgery.[8] In this article, we report the technique and outcomes of the senior author's first-year experience using TIGR mesh in implant-based primary, prepectoral breast reconstruction.

Takeaways

Question: What is a safe alternative to acellular dermal matrix (ADM) in implant-based breast reconstruction?

Findings: A single surgeon's retrospective review suggests that synthetic TIGR mesh demonstrates adequate short-term results for implant-based primary breast reconstructions in single- and 2-stage cases. Complication rates for TIGR mesh, including infections and complications, fell toward the bottom end of the reported data for implant-based breast reconstruction.

Meaning: TIGR is a safe, effective alternative to ADMs, proving to have comparably low rates of infection and mastectomy flap necrosis with high levels of success. Ultimately, TIGR mesh may provide an efficient and cost-effective alternative to ADMs in the future.

PATIENTS AND METHODS

This is a single-surgeon retrospective study of adult female cancer patients who received TIGR mesh for implant-based primary, prepectoral breast reconstruction. Both single-stage direct-to-implant and 2-stage tissue expander reconstruction were performed by the senior author (J.N.). Mastectomies were performed by 3 different breast surgeons. The type of reconstruction was discussed and decided with the patient and breast surgeon preoperatively, depending on the patient's desires, physical examination findings, and treatment plan.

TIGR demographic and clinical data were queried. The clinical outcomes studied were surgical site infection, wound dehiscence, mastectomy flap necrosis, hematoma or seroma requiring operative intervention, and reconstructive failure.

DESCRIPTION OF SURGICAL TECHNIQUE

All patients received either nipple-sparing mastectomy, skin-sparing mastectomy, or wise-pattern skin-reducing mastectomy with autoderm flap. For 1-stage direct-to-implant reconstruction, a permanent implant was anteriorly wrapped on the back table with a 15 × 20 cm piece of TIGR mesh, secured with Vicryl sutures. The TIGR-wrapped implant was irrigated with dilute betadine and irrisept solution, placed into the prepectoral cavity, and secured with interrupted Vicryl sutures in the following positions: laterally, inferolaterally, inferiorly, inferomedially, and medially. (Fig. 1) For 2-stage tissue expander reconstruction, the tissue expander was irrigated in dilute betadine and irrisept solution, evacuated of air, and then tacked to all tabs to the prepectoral chest wall with Vicryl sutures. The tissue expander was then filled with normal saline to a volume that ensured no tension on the skin upon closure. TIGR mesh was also irrigated with the betadine as well as irrisept solution and then placed over the expander in an anterior drape coverage with sutures to the chest wall in all 4 cardinal directions (Fig. 2). Drains were used in all patients, specifically one

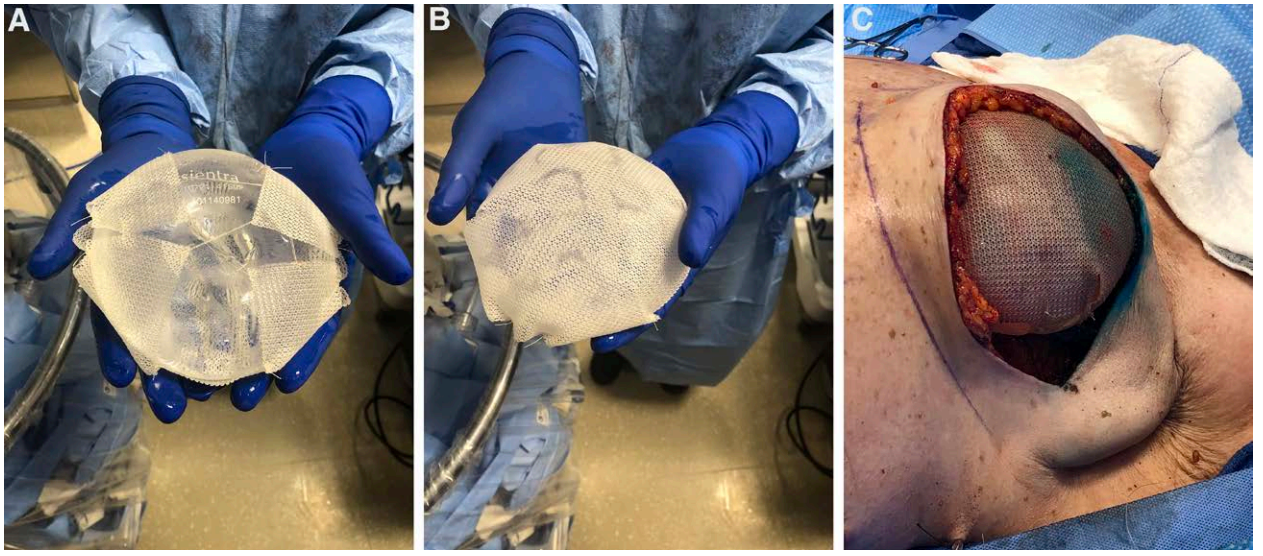

Fig. 1. Intraoperative use of TIGR mesh. A, Posterior side of TIGR-wrapped implant. B, Anterior side of TIGR-wrapped implant. C, Implantation of TIGR-wrapped implant into the mastectomy cavity.

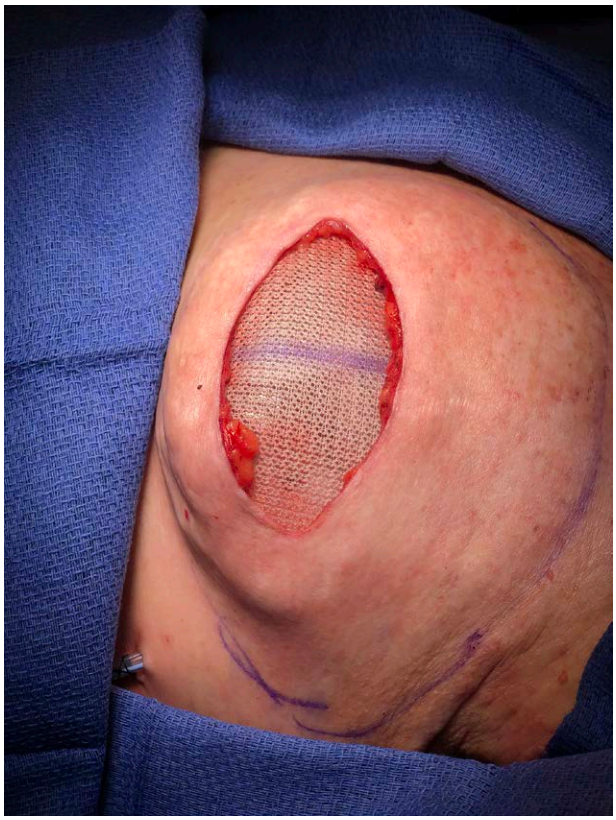

Fig. 2. Tissue expander in mastectomy cavity with anterior TIGR mesh drape coverage.

15 Fr drain per breast. The drain removal protocol followed 1 output of less than 30 mL per day for 2 consecutive days.

RESULTS

A total of 49 patients underwent breast reconstruction at a community hospital between May 2023 and March 2024. All patients had unilateral breast cancer. There were 37 (75.5%) bilateral mastectomies with reconstruction and 12 (24.5%) unilateral mastectomies with reconstruction, for a total of 86 breast reconstructions. There were a total of ten nipple-sparing mastectomies (11.6%), 33 skin-reduction mastectomies (38.4%), and 43 skin-sparing mastectomies (50%). The average age of patients was 53.5 years (range: 32–77 y). The average body mass index (BMI) was 25.0 kg/m^2 (range: 19–37 kg/m^2). The average follow-up was 118 days. There were 44 (51.2%) direct-to-implant reconstructions and 42 (48.8%) tissue expander reconstructions (Table 1).

One (2.0%) patient was an active smoker. One (2.0%) patient had type II diabetes mellitus. Eighteen (36.7%) patients had hypertension. Three (6.1%) patients had a history of prior radiation to the breast. Fifteen (30.6%) patients had a history of neoadjuvant chemotherapy (Table 1).

From the 86 breast reconstructions, there were 8 complications with an overall complication rate of 9.3%. This included 2 (2.3%) infections, 5 (5.8%) mastectomy skin necroses, and 1 (1.2%) hematoma. There were a total of 3 reconstructive failures requiring mesh and implant removal (3.5%). One failure was from infection, and the other 2 failures were from mastectomy flap necrosis (Table 2).

Table 1. Demographics Table

Demographics by Patient	Mean (Total 49)
Age (y)	53.5 (range: 32–77)
BMI (kg/m^2)	25 (range 19–37)
Active smoking	1 (2.0%)
Diabetes	1 (2.0%)
Hypertension	18 (36.7%)
Prior radiation	3 (6.1%)
Neoadjuvant chemotherapy	15 (30.6%)
Bilateral mastectomy	37 (75.5%)
Unilateral mastectomy	12 (24.5%)

Table 2. Complications

Postoperative Data	86 Total Breast Reconstructions
Infection	2 (2.3%)
	1 of 2 salvaged with washout and implant replacement
Wound dehiscence	0 (0.0%)
Mastectomy flap necrosis	5 (5.8%)
	3 of 5 salvaged with debridement, washout, and implant replacement
Seroma	0 (0.0%)
Hematoma	1 (1.2%)
Reconstructive failure	3 (3.5%)
	1 of the 3 went on to successful autologous reconstruction; the other 2 declined further surgery
Overall complications	8 (9.3%)
Follow-up time average (d)	118

Of note, the single active smoker patient had mastectomy flap necrosis with failure of implant reconstruction. She ultimately went on to receive successful autologous reconstruction. The other 2 patients with reconstruction failures declined further reconstruction. There were no instances of wound dehiscence or seroma.

DISCUSSION

There are multitudes of meshes and matrices to choose from for use in breast reconstruction. Examples include human-derived ADMs and animal-derived ones, as well as synthetic permanent meshes and synthetic absorbable ones. However, the ideal material needs to be biocompatible, strong, cost-effective, and have minimal foreign body response.[9] Absorbable meshes seem to satisfy all these criteria and have seen an increase in popularity.[10] This study reports our experience with TIGR mesh as internal support during implant-based primary prepectoral breast reconstruction.

This study was a retrospective review of 49 patients during an 11-month period in 2023. Example postoperative pictures are shown in Figure 3. There was a 2.3% infection rate, which is on the lower end of 0%–27% reported rate in the literature.[11] There were no issues of wound

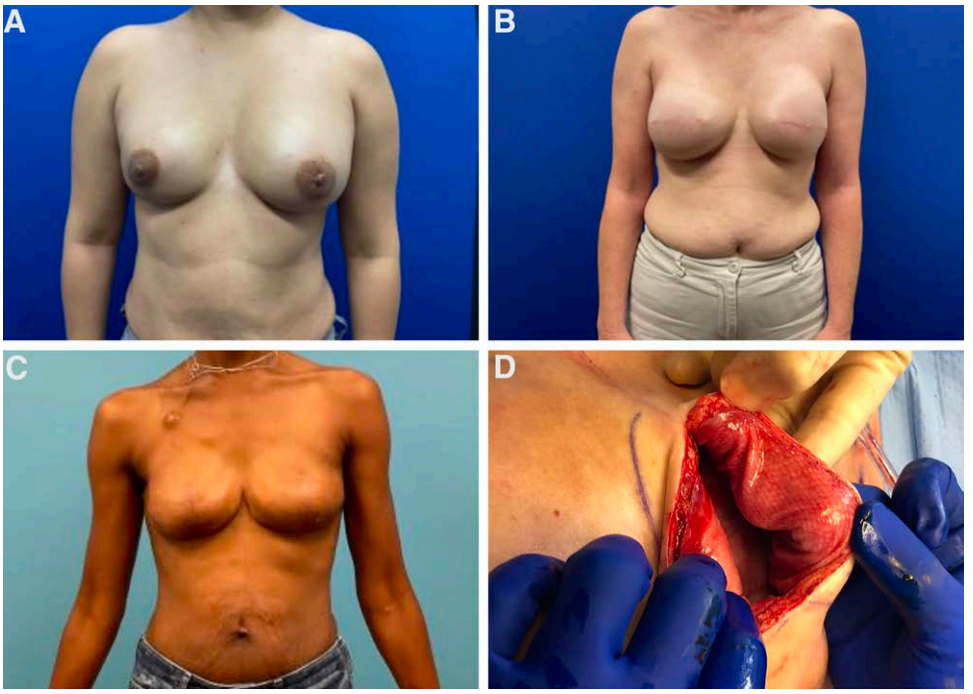

Fig. 3. TIGR results. A, Ten-month follow-up from direct-to-implant nipple sparing with TIGR mesh. B, Six-month follow-up from direct-to-implant skin-sparing mastectomy with TIGR mesh. C, Four-month follow-up from tissue expander skin-reducing mastectomy with autoderm flap and TIGR mesh. D, Well-incorporated mesh at 3 months return for second-stage reconstruction.

dehiscence. There was an 5.8% rate of mastectomy flap necrosis, which is in line with reported data (Table 2). However, studies have shown that there does not appear to be a correlation between mesh or ADM type and flap necrosis rate.[12] There were no seromas and only 1 hematoma, again in line with the lower end of reported data for breast reconstruction. Overall, this supports a very promising safety outcome for TIGR mesh when used in implant-based primary, prepectoral breast reconstruction.

Although most of the current data on prepectoral reconstruction in the literature concerns biologic ADMs, there has been a push to study more meshes. Early studies have shown that there are no significant differences in complication rates for ADMs versus meshes in prepectoral reconstruction.[13]

There exist more data on subpectoral mesh reconstruction. Vicryl mesh has been studied, with a recent meta-analysis showing a 22% complication rate,[6] and another meta-analysis showing a 3% complication rate.[14] TIGR has also been studied, with the 2 largest TIGR studies reporting around a 23% overall complication rate in subpectoral breast reconstruction,[13,10] which is above the 9.3% overall complication rate seen in this study though still within the generally reported complication rate of prosthetic breast reconstruction. Quinn et al[15] also studied TIGR usage in breast reconstruction after nipple-sparing mastectomy and found a 9% infection rate and 9% reconstruction failure rate. These are above the 2.3% infection and 3.5% failure rates seen in this study but again on the lower end of reported breast complication rates. Additionally, Pompe et al[8] studied TIGR usage in breast reconstruction after mastectomy and found a 1.7% infection rate and 5.0 % skin necrosis rate. These are very similar to the 2.3% infection and 5.8% necrosis rate seen in this study as shown in Table 2.

LIMITATIONS

This study is limited by its design as a single surgeon's retrospective case series. The patients in this study had an average BMI of 25 kg/m^2 and infrequent comorbidities, which may not be reflective of other patient populations. Additionally, this study has no long-term data more than 6 months, so late complication data such as implant malposition and capsular contracture, which generally occur more long-term, are yet to be seen.

CONCLUSIONS

TIGR mesh has good short-term outcomes when used in implant-based primary, prepectoral breast reconstruction. In this retrospective review, the infection and complication rates were comparable to the lower end of reported data in implant-based breast reconstruction. Additionally, at the senior author's hospital site, there are considerable cost savings in TIGR mesh versus ADMs. Although a 15 × 20 piece of TIGR currently costs $3000, a comparable piece of AlloDerm costs $9000 at the senior author's hospital. There should be future studies looking at its long-term data, specifically implant malposition and capsular contracture rate. There should also be future studies looking at cost savings analysis. The authors anticipate the popularity of synthetic meshes will continue to grow in

prepectoral breast reconstruction, and the literature in this field of study will continue to grow in parallel.

Jonathan Nguyen, MD
Private Practice
975 Johnson Ferry Road, Suite 100
Atlanta, GA 30342
E-mail: jonathantnguyen9@gmail.com
IG: nguyenplasticsurgery

DISCLOSURES

Dr. Nguyen is key opinion leader with Novus Scientific and Kerecis. The other author has no financial interest to declare in relation to the content of this article.

REFERENCES

1. Kim JYS, Mlodinow AS. What's new in acellular dermal matrix and soft-tissue support for prosthetic breast reconstruction. *Plast Reconstr Surg.* 2017;140:30S–43S.
2. Boháč M, Danišovič Ľuboš KJ, Dragúňová J, et al. What happens to an acellular dermal matrix after implantation in the human body? A histological and electron microscopic study. *Eur J Histochem.* 2018;62:2873.
3. Smitgh JM, Broyles JM, Guo Y, et al. Human acellular dermis increases surgical site infection and overall complication profile when compared with submuscular breast reconstruction: an updated meta-analysis incorporating new products. *J Plast Reconstr Aesthet Surg.* 2018;71:1547–1556.
4. De Blacam CMB, Momoh AO, Colakoglu S, et al. Cost analysis of implant-based breast reconstruction with acellular dermal matrix. *Ann Plast Surg.* 2012;69:516–520.
5. Logan Ellis H, Asaolu O, Nebo V, et al. Biological and synthetic mesh use in breast reconstructive surgery: a literature review. *World J Surg Oncol.* 2016;14:121.
6. Faulkner HR, Shikowitz-Behr L, McLeod M, et al. The use of absorbable mesh in implant-based breast reconstruction: a 7-year review. *Plast Reconstr Surg.* 2020;146:731e–736e.
7. Hjort H, Mathisen T, Alves A, et al. Three-year results from a preclinical implantation study of a long-term resorbable surgical mesh with time-dependent mechanical characteristics. *Hernia.* 2012;16:191–197.
8. Pompe S, Evangelidou D, Arelli F, et al. The use of TIGR matrix in breast aesthetic and reconstructive surgery: is a resorbable synthetic mesh a viable alternative to acellular dermal matrices? *Clin Plast Surg.* 2018;45:65–73.
9. Becker H. Update on the use of synthetic mesh in reconstructive and cosmetic breast surgery. *Aesthetic Plast Surg.* 2020;44:1128–1129.
10. Hallberg H, Rafnsdottir S, Selvaggi G, et al. Benefits and risks with acellular dermal matrix (ADM) and mesh support in immediate breast reconstruction: a systematic review and meta-analysis. *J Plast Surg Hand Surg.* 2018;52:130–147.
11. DeLong MR, Tandon VJ, Bertrand AA, et al. Review of outcomes in prepectoral prosthetic breast reconstruction with and without surgical mesh assistance. *Plast Reconstr Surg.* 2021;147:305–315.
12. Murphy D, O'Donnell JP, Ryan EJ, et al. Immediate breast cancer reconstruction with or without dermal matrix or synthetic mesh support: a review and network meta-analysis. *Plast Reconstr Surg.* 2023;151:563e–574e.
13. Reitsamer R, Peintigner F, Klaasen-Federspiel F, et al. Prepectoral direct-to-implant breast reconstruction with complete ADM or synthetic mesh coverage – 36 months follow-up in 200 reconstructed breasts. *Breast.* 2019;48:32–37.
14. Rodriguez-Unda N, Leiva S, Cheng HT, et al. Low incidence of complications using polyglactin 910 (Vicryl) mesh in breast reconstruction: a systematic review. *J Plast Reconstr Aesthet Surg.* 2015;68:1543–1549.
15. Quinn E, Barry M, Kell M. Immediate implant reconstruction using absorbable TIGR mesh after nipple-sparing mastectomy. *Eur J Plast Surg.* 2019;43:279–284.