

Compatibility of Strattice™ Matrix for Breast Reconstruction with Radiation Therapy

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Abstract

Introduction: Strattice™ is a porcine acellular dermal matrix used in breast reconstruction. It acts as a hammock for breast implants and to define the infra mammary fold.

Method: All patients who underwent Strattice™ based reconstruction from 2010-15 under the care of one breast surgeon were included in this study. The Strattice™ matrix was used to create the sub pectoral pouch in which the implant was placed. Patients were divided into 2 Groups based on radiation therapy to the breast either before or after surgery (Group A) and those who received no radiation at any stage (Group B). Data regarding indication for surgery, size of implant, follow up time and significant complications were collected and analyzed using Windows Excel. Statistical analysis was performed using Chi-Squared test to compare the complications between the 2 Groups. A subgroup analysis was performed based on either breast surgery with skin sparing mastectomy and immediate reconstruction (SSM and IR), delayed reconstruction (DR) or re-do reconstruction (RR).

Results: There were 76 cases with average age of 52 years (33-79). There were 30 cases in Group A and 46 in Group B. In Group A, 14 patients had IR, 15 DR and 1 RR. 3 patients had previous lumpectomy and radiation treatment for breast cancer followed by SSM and IR. In Group B, 25 had IR, 20 had DR and 1 had IR. The average size of implant used was 422 gms (195-765 gms). Follow up time was 27 months (1-62). In Group A there were 2 cases of infection, 1 case of capsule contracture and 2 wound breakdowns. 5 mastectomy flaps failed to stretch due to poor skin compliance secondary to radiation to the chest wall. There was 1 case of bottoming out of the implant in this Group requiring RR. In Group B, there was 1 case of extrusion requiring RR and 1 case of flap necrosis. Group A had more complications and implant loss than Group B and this was found to be statistically significant ($p < 0.0007$).

Conclusion: Strattice™ based breast reconstruction post radiotherapy carries higher risk of complications and abandoning due to non-compliant skin. This elevated risk should be emphasized to the patients and autologous flaps should be considered in these cases.

Keywords: Strattice™; Dermal matrix; Porcine mesh

Introduction

The term skin-sparing mastectomy (SSM) was first coined by Toth and Lappert in 1991. [1,2]. Its popularity soared and now implant based breast reconstruction is the most widely used method of post mastectomy breast reconstruction [3]. For a long time surgeons have been inserting implants in the submuscular pocket to provide a full tissue cover for these implants, but this method does not give a well-defined inframammary fold (IMF) [4-6]. The introduction of ADMs (acellular dermal matrix) in breast reconstruction resolved this issue as they create a well-defined IMF. Strattice™ is a porcine-derived acellular dermal matrix which is used as a 'hammock' to hold the implant in place and also provides full coverage to the implant.

There are a limited number of studies reporting the use of Strattice™ in breast reconstruction. The purpose of this study was to share the outcome of breast reconstructions performed using Strattice™ under the care of one surgeon in one hospital.

Patients and methods

Retrospective data collection was performed for all consecutive patients undergoing Strattice™ based reconstruction from July 2010 to September 2015. Patients were offered different reconstructive options based on the volume and cup size of their breasts. Those ladies with Cups A-C (200-500 gms) were offered Strattice™ based reconstruction. Patients with breast cup larger than C were offered reconstruction using dermal sling to reinforce the inframammary pole. Both groups were offered latissimus dorsi (LD)-based reconstruction as an alternative or reserve

procedure. Ultimately, it was the patient's decision as to which reconstruction they preferred.

Patients were divided into 2 Groups A and B; Group A comprised of women who had received radiation to the site of reconstruction (before or after reconstruction) and Group B included patients who had not received any radiation treatment.

These groups were further subdivided into patients who had skin sparing mastectomy and immediate reconstruction (SSM and IR), delayed reconstruction (DR) or re-do reconstruction using Strattice™ (RR).

In Group A, patients undergoing SSM and IR received radiation within 6-8 weeks' time after surgery if no chemotherapy was indicated. Where chemotherapy was to be given; radiation treatment was delayed till after chemotherapy treatment was over. Patients who had DR were advised to delay reconstruction for a minimum of 1 year following radiotherapy treatment. These patients underwent a basic clinical evaluation of their mastectomy flap by performing a 'pinch test' and 'eye balling' to assess for skin elasticity and for any obvious tissue damage due to radiation.

Significant complications such as implant loss, extrusion, failed procedures, infections and contractures were recorded. Complications were compared between the radiation and non-radiation groups using the Chi-Squared test.

Operative procedure

A single dose of Co-amoxiclav (or an alternative in cases of penicillin allergy) was administered at induction. Following

Table 1 Type of surgery.

Groups	Total	SSM +IR	DR	RR
Group A	30(39.4%)	14 3 had previous wide local excisions	15	1
Group B	46(60.5%)	25	20	1

SSM: Skin Sparing Mastectomy; IR: Immediate Reconstruction; RR: Re-do Reconstruction

The average size of implant used in both groups was 422g (195-765) and follow up time was 27 months (3-62). There were 36 non-smokers (62%), 17 ex-smokers (29.3%), 3 current smokers (5%) and smoking status of 2(3.4%) was unknown. There were 2 active smokers in Group A and 1 in Group B. The lady in Group B developed flap necrosis leading to implant loss.

In Group A, 3 patients had previous wide local excision and radiotherapy treatment to the breast. 2 of these patients had recurrence of cancer and therefore underwent mastectomy and Strattice™ based reconstruction. The 3rd patient

Table 2 Complications of Strattice™ reconstruction.

underwent bilateral breast reductions before undergoing SSM and IR. The significant complications in both groups are shown in **Table 2**. Total complications accounted for 39.8% in all the patients undergoing Strattice™ based reconstruction (33% in Group A and 6.5% in Group B). Total implant losses in both groups due to surgical related complications were 21% (Group A 16.66% and Group B was 4.44%).

Patients who have had a DR underwent inflation of the expander and this was replaced with implants after full expansion was achieved. The procedure of skin stretching was abandoned if skin became tight and shiny, and there was suspicion of failed inflation.

Results

There were 76 cases with an average age of 52 years (33-79). A breakdown of the type of surgery in both groups is shown in **Table 1**.

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Groups	Capsule contracture	Extrusion	Infection	Bottoming out	Wound breakdown	Flap necrosis	Abandoned procedures (Non-compliant skin)	Total complications	Total implant loss
Group A	1	-	1	1	2	-	5	11 (33%)	5(16.66%)
Group B	-	1	1 Implant replaced	-	-	1	-	3 (6.5%)	2(4.44%)

A breakdown of successful and failed procedures including complications leading to loss of reconstruction is shown in

Table 3. Group A had more failures than Group B and this was found to be statistically significant ($p < 0.0007$).

Table 3 Success vs. failed procedures.

Groups	Radiation (Group A)	No Radiation (Group B)
Successful	n=20	n=44
Failures	n=10	n=2
Total	n=30	n=46
N = number of cases		

Discussion

Acellular dermal matrix (ADM) was introduced in 1994 and has been used to replace the use of soft tissue in reconstructive procedures [7,8]. The first use of human acellular dermis was reported by Breuing in 2005 for breast reconstruction [9]. Strattice™ is an acellular porcine dermal matrix which becomes vascularised upon incorporation into surrounding healthy tissue. This technique has gained popularity due to its minimal donor site morbidity as seen in autologous flap reconstruction.

The most commonly reported complications after Strattice™ procedure are seroma, infection, mastectomy flap necrosis, and implant loss but the incidences vary widely among different studies. In our report, we compared our results of breast reconstructions to those of other studies. We had total of 2 cases of breast infections (2.6%). One patient belonged to Group A and lost her implant whereas the lady from Group B underwent insertion of a new implant after infection had settled. We had only 1 case of flap necrosis (2%) and this was seen in a heavy smoker nearly 5 months after her reconstruction while she was receiving chemotherapy treatment. Chun et al. [10] reported flap necrosis in 23.4% of cases and infection in 8.9%, out of a study group of 269 patients. Fewer complications were seen in Rawalani's report on 121 patients [11] where 7.4% cases developed infection and 6.6% developed flap necrosis. However his study showed a higher complication rate in patients undergoing adjuvant breast radiation (30.7%) when compared to patients that did not have radiation (13.7%). These results are similar to ours; we had a much higher complication rates in radiation group than in the non-radiation group (33.3% in Group A vs. 6.5% in Group B). This is due to the damage caused by radiation to skin

and its appendages hence affecting the wound healing process [12,13].

We abandoned the procedure in 5 cases due to inability to stretch the mastectomy flap. This poor compliance was due to fibrosis and loss of elasticity of skin caused by these gamma rays [14,15].

Our total implant losses due to surgical complications were 21% (Group A 16.66% and Group B 4.44%). These results are comparable to losses as high as 28% as reported by Parks et al. [6]. Similarly Barber et al. [16,17] have shown the reconstruction loss rate was as high as 47.6%.

We noted that within Group A; there were more complications in DR group than the SSM and IR group. This is due to the fact that Strattice™ was used in a hostile environment (previous radiation treatment) and this led to significant complications including abandoning of the procedure due to non-compliant skin, wound breakdown and implant loss. In contrast, there was only 1 case of capsule contracture seen in SSM and IR group and all the other 10 SSM and IR survived radiation treatment. This is a phenomenon noted by many authors, including Breuing et al. [18], who showed that reconstructions using ADM-assisted tissue expanders resisted the effects of radiation better than reconstructions using standard tissue expanders. Similarly, a study by Basu et al. have emphasised on the protective effect of acellular matrix and in reducing the formation of capsule formation [19].

Finally, we performed 2 re-do procedures using Strattice™ after the primary reconstruction had failed and found this to be a safe option in such cases.

Conclusion

In this particular study, we concluded that appropriate patient selection is the key to successful reconstruction. Strattice™ based breast reconstruction post radiotherapy carries higher risk of complications and abandoning due to non-compliant skin. This should be emphasized to the patients and autologous flaps should be considered in these cases.

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