Donato Casella
Breast Unit, Department of Oncologic and Reconstructive Breast Surgery, "Breast Unit Integrata di Livorno, Cecina, Piombino, Elba, Azienda USL Toscana Nord Ovest", Italy

Marco Marcasciano
Plastic Surgery Unit, Department of Surgery "P Valdoni", Sapienza University, Rome, Italy

Emanuele Cigna
Plastic Surgery Unit, Dipartimento di Ricerca Traslazionale e delle Nuove Tecnologie in MEdicina e Chirurgia, Università degli Studi di Pisa, Pisa, Italy

Diego Ribuffo
Plastic Surgery Unit, Department of Surgery "P Valdoni", Sapienza University, Rome, Italy

Department of Surgery "Valdoni", Unit of Plastic and Reconstructive Surgery, "Sapienza" University of Rome, Viale del Policlinico, 155, 00161, Rome, Italy

DOI of original article: https://doi.org/10.1016/j.bjps.2017.06.012

https://doi.org/10.1016/j.bjps.2017.08.023

Delayed erythematous skin reaction with SERI(R)-assisted direct to implant breast reconstruction

Dear sir,

Introduction

Direct to implant reconstruction (DTI) using meshes following mastectomy is a safe and viable option for patients who require an alternative to autologous techniques.[1] The surgical support scaffold, SERI(R) (Allergan Inc., USA) was designed to bridge the gap between synthetic and biological meshes in this field.[2] It is made of the bioprotein, BIOSILK(C), purified from silk fibres and knitted into a 3D-scaffold. We present our short-term results for SERI(R)-assisted DTI reconstruction from a retrospective multi-centre case series. We highlight a delayed erythematous reaction with this mesh resulting in mesh and implant loss.

Methods

Patients were recruited from four European centres for Plastic Surgery from 2013 to 14. Each surgeon had an audited series of 100 cases of non-ADM/mesh supported implant reconstruction predating the study with an implant loss rate of <5%. A standardised technique and protocol for SERI(R) in DTI reconstruction was used by the surgeons in accordance with manufacturer guidelines and training. Following mastectomy, a subpectoral pocket was developed and SERI(R) sutured to the chest wall forming an implant pocket in a standardised technique.[1] Early complications (<3 months) were defined as: infection, seroma, haematoma, skin flap necrosis, wound dehiscence, revision surgery, loss of SERI(R), loss of implant (explantation of implant without exchange).

Results

67 patients (110 reconstructed breasts) with a mean age of 45 years (SD 10.2) were included in the study. All reconstructions used cohesive silicone implants (*Natrelle™*, Allergan Inc., USA). The majority of patients received conservative implant sizing (mean volume 352 ml, SD 103) to match the mastectomy weight (mean 344 g, SD 165). Mean follow-up after reconstruction was 7.7 months (SD 0.6). All complications occurred within three months of surgery (Table 1). Thirty-one breasts had complications within this period with an overall complication rate of 28%. Complications included seroma (4.5%), haematoma (1.8%), wound dehiscence (1.8%) and skin flap necrosis (1.8%). Implant loss and SERI(R) loss were 10% and 17.3% respectively. Both implant loss and SERI(R) losses were due to a delayed erythematous skin reactions.

Twenty breasts (18.2%) developed delayed erythematous skin reactions after DTI with SERI(R). Skin reactions were limited to the site of the SERI(R) scaffold (Figure 1). Reactions were observed from week until week 13 (mean 7 weeks). All cases were initially managed conservatively. All patients were apyrexial with normal inflammatory markers and sterile blood cultures. When reactive fluid was aspirated, an oily consistency was noted. Fluid analysis revealed high triglyceride and cholesterol content, interpreted as degradation of subcutaneous fat.

In severe cases of lower pole inflammation, the skin flap perfusion was compromised (having shown no signs of

Table 1 Early complication rate with immediate implant breast reconstruction using SERI® scaffold.

	Breasts $n = 110$ n (%)
Complications (total)	31 (28.2%)
Infection	0 (0%)
Seroma	5 (4.5%)
Haematoma	2 (1.8%)
Nipple necrosis	0 (0%)
Skin flap necrosis	2 (1.8%)
Wound dehiscence	2 (1.8%)
Explantation of implant	11 (10%)
Explantation of SERI scaffold	19 (17.3%)
Delayed erythematous skin flap reaction	20 (18.2%)

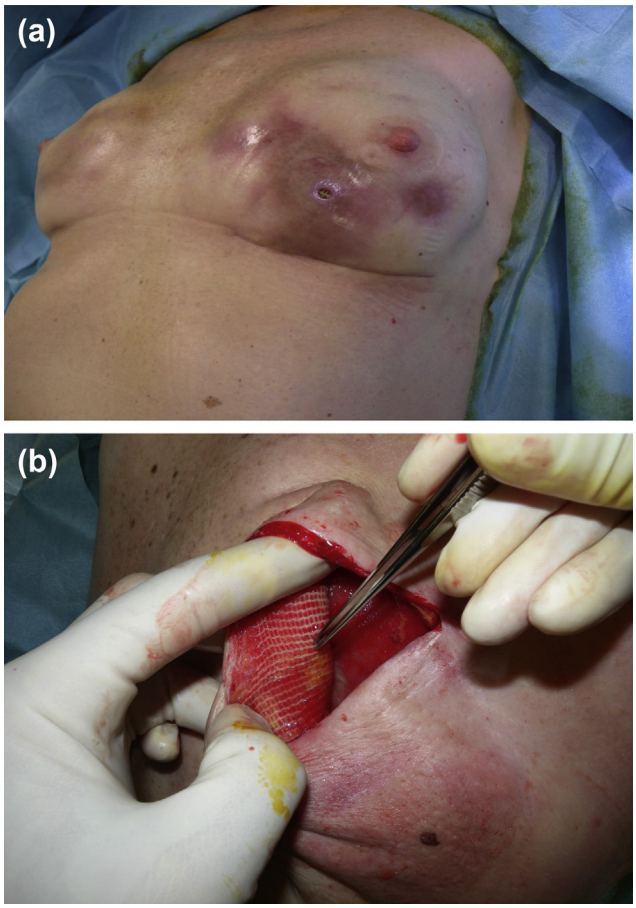

Figure 1 (a) Delayed erythematous skin reaction with SERI(R) scaffold in direct-to-implant breast reconstruction; (b) Intra-operative appearances of SERI(R) scaffold post implant-reconstruction in cases of erythematous skin reaction — it was noted that in these cases the SERI(R) was not integrated into host tissues and was easily removed.

ischaemia previously) and surgical intervention was required. The intra-operative finding was a creamy exudate between the SERI(R) and the overlying mastectomy flap, which was largely denuded of subcutaneous fat. All patients with implant loss had delayed autologous or implant reconstructions without further complication.

Discussion

In this study, SERI(R) has been used as a substitute to dermal matrix in DTI breast reconstruction following mastectomy. Although not powered to calculate significance in complication rates, we observed a clinically significant complication of a delayed erythematous skin reaction in patients with SERI(R) reconstruction resulting in scaffold and implant loss. The BIOSILK(C) in SERI(R) scaffold undergoes a purification process to produce a scaffold made of >95% fibroin filament. Delayed hypersensitivity reactions to silk sutures have been observed.[3] Sterile abscesses were observed at eight to twelve weeks requiring surgical re-intervention.

Dermal matrix associated implant losses are typically observed within the acute post-operative period (<2 weeks). In contrast, SERI(R)-associated skin flap erythema was observed in our study a mean of seven weeks post-operatively. Skin loss appeared to occur during scaffold integration and may represent a delayed hypersensitivity reaction to the residual antigenic silk protein Sericin within SERI(R) (<1% after purification).

In patients requiring implant explantation and removal of SERI(R), the scaffold was not integrated into the mastectomy flap and cultures were negative. This is in contrast to reports of delayed infection with SERI(R) reconstruction[4] where positive cultures for *Pseudomonas aeruginosa* were obtained. "Red breast syndrome" has been reported with mesh reconstruction, its aetiology remains unclear.[5]

Early surgical intervention is important in cases of delayed erythematous skin reaction. An immediate strategy of exploration, removal of SERI(R) and washout with exchange of implants was successful. This salvage strategy reduced reconstruction losses to 10% versus a SERI(R) loss of 17%. Cases where skin breakdown had occurred were unable to be salvaged in this manner due to implant exposure.

Conclusion

Larger prospective studies and randomised controlled trials are required to fully assess complication rates and the delayed erythematous skin reaction in our study. Close monitoring is advised for patients with SERI(R)-assisted DTI breast reconstruction to monitor and manage this complication.

Ethical approval

This study conformed to the Declaration of Helsinki and was performed with local centre ethical approval.

Conflict of interest

RR: Consultancy fee from Allergan.
CK: Consultancy fees from Allergan. Fees for preparing scientific events from Serag Wiesner. Received payment for conducting clinical trials from Allergan.
JF: Consultancy fee, Allergan.
DM: Received payment for conducting clinical trial from Allergan.
MS: Received payment for conducting clinical trial from Allergan.

References

1. Sbitany H, Langstein HN. Acellular dermal matrix in primary breast reconstruction. *Aesthet Surg J* 2011;**31**(7 Suppl):30S—7S. http://dx.doi.org/10.1177/1090820X11417577.
2. Jewell M, Daunch W, Bengtson M, Mortarino E. The development of SERI® Surgical Scaffold, an engineered biological scaffold. *Ann N Y Acad Sci* 2015;**1358**:44—55. http://dx.doi.org/10.1111/nyas.12886.

3. Rossitch Jr E, Bullard DE, Oakes WJ. Delayed foreign-body reaction to silk sutures in pediatric neurosurgical patients. *Childs Nerv Syst* 1987;**3**(6):375—8.
4. Almesberger D, Zingaretti N, Di Loreto C, Massarut S, Pasqualucci A, PArodi PC. Seri™: a surgical scaffold for breast reconstruction or for bacterial growth? *J Plast Reconstr Aesthet Surg* 2015;**68**(6):870—1. http://dx.doi.org/10.1016/j.bjps.2015.02.012.
5. Ganske I, Hoyler M, Fox SE, Morris DJ, Lin SJ, Slavin SA. Delayed hypersensitivity reaction to acellular dermal matrix in breast reconstruction: the red breast syndrome? *Ann Plast Surg* 2014;**73**(Suppl. 2):S139—43. http://dx.doi.org/10.1097/SAP.0000000000000130.

Rachel C. Rolph
Department of Plastic and Reconstructive Surgery, Guys and St Thomas' NHS Foundation Trust, London, SE1 7EH, UK

E-mail address: r.rolph1@nhs.net

R. Douglas Macmillan
Nottingham Breast Institute, City Hospital Campus, Hucknall Road, Nottingham, NG51PB, UK

Carolin Nestle-Kraemling
Department of Gynecology, Obstetriques and Senology, Evangelisches Krankenhaus (EVK) Düsseldorf, Kirchfeldstr. 40, 40217 Düsseldorf, Germany

Michael Scheflan
Atidim Medical Centre, 10 Habarzel Street, Tel-Aviv, 69710, Israel

Jian Farhadi
Department of Plastic and Reconstructive Surgery, Guys and St Thomas' NHS Foundation Trust, London, SE1 7EH, UK

https://doi.org/10.1016/j.bjps.2017.08.024

Preventing the complications of tissue expansion using fat grafting under expanded skin

Dear Sir,

We read with great interest the brief clinical report entitled "Preventing the complications of tissue expansion using fat grafting under expanded skin" by Jiang et al.[1] The authors demonstrate for the first time a technique improving the texture of expanded skin and preventing expansion failure by lipofilling into the ischemic region of the expanded flap. We would like to congratulate the authors for their primary work to make the skin expansion can be smoothly completed. Improving expansion efficiency and decreasing complications of expansion are always the subjects that we have thought a great deal about and worked intensively on. Herein, we would like to come up with our own thoughts about this technique.

The early signs, such as skin thinning, telangiectasia, embolism and striae, usually indicate that ischemia has already occurred to the affected area of the expanded skin. In these circumstances, what we generally do is that extracting some saline out of the expander with the aim of decreasing the tension on the expanded skin and then suspending the expansion for a certain time. In the past, lots of methods and medicines have been applied in experiments in order to enhance vascularization and decrease complications of expanded tissue, but at last they seem to be lack of clinically confirmed effects. Until now, there has rare reports of directly injecting some compositions into the ischemic region of expanded flap.

The injecting (tunneling) procedure using a cannula, to some degree, plays a role of releasing the tissue. Since the expanded soft tissue has already been under tension and ischemia, it is unclear whether the releasing effect caused by tunneling has any negative influence on the expanded skin. In addition, this procedure may also damage the microcirculation to some extent. It is also unknown whether the tunneling procedure can make the expanded flap more ischemic.

As observation in clinical work, expanded soft tissue is less likely to get complications if the tissue is thick enough. By this point, increasing the thickness of the ischemic tissue through fat injection makes sense. However, the adipose tissue which has been grafted into the flap may increase the tension on the expanded skin, especially when the volume of the expander is not reduced. Moreover, the fat grafting procedure can lead to inflammatory response which is also a repair process. During the early phase of this period, the tissue undergoes edema which may further exacerbate the tension. Although termination of expansion is carried out after fat grafting, the increased tension may aggravate the ischemia.

The fat tissue after being transplanted into the expanded flap will undergo remodeling which means that survival and death of adipocytes co-occur. The fat cells, as well as the progenitor cells, will get nutrients and oxygen from the surrounding environment. However, would this kind of competition with the peripheral tissue drive the already ischemic flap into a worse situation? Furthermore, the grafted fat tissue may have a low viability in the ischemic flap. The regression of the necrotic adipocytes is unknown. It is also uncertain whether the dead fat cells have any side effects on the expanded skin.

In their report, the expansion restarted at least 1 week after fat transplantation. It is known that the remodeling process of transplanted fat tissue lasts for several months. Either the influence of expansion on the grafted fat or the effect of this kind of fat on the expanded flap is unclear.

As to the attempt of reducing complications of expansion using fat grafting, there are too many issues which are unknown. All these need further research. We do believe that the authors have already started their further associated studies.