Dermal fat graft from simultaneous abdominoplasty as an adjunct to revision aesthetic and reconstructive breast surgery: A poor man’s acellular dermal matrix?

F. Xie a, W.M. Nabulyato b, C.M. Malata b,c,d,*

a University of Cambridge School of Clinical Medicine, Cambridge, UK
b Department of Plastic & Reconstructive Surgery at Addenbrooke’s Hospital, Cambridge University Hospitals NHS Foundation Trust, Cambridge, UK
c Cambridge Breast Unit at Addenbrooke’s Hospital, Cambridge, UK
d Anglia Ruskin University Postgraduate Medical Institute, Cambridge & Chelmsford, UK

ARTICLE INFO

Article history:
Received 17 July 2014
Received in revised form 29 August 2014
Accepted 30 August 2014
Available online 16 September 2014

Keywords:
Dermal fat graft
Revision breast implant surgery
Acellular dermal matrix (strattice alloderm)
Abdominoplasty
Capsulectomy
Implant exchange
Breast implants
Health economics
Periareolar breast implant surgery

ABSTRACT

INTRODUCTION: The global use of acellular dermal matrices as an adjunct to tissue expander or implant-based breast reconstruction, by surgeons wishing to cover and support the inferior breast pole, has increased in frequency in the last two decades. However despite the reported enhanced cosmetic outcomes, issues regarding their cost effectiveness have led to their infrequent use within the UK National Health Service and the need for an equally efficacious but cheaper alternative.

PRESENTATION OF CASE: We report two patients requiring bilateral revision breast surgery for severely asymmetrical, tender, ptotic breasts and cosmetically poor abdomens. Both were denied assisted acellular dermal matrix reconstructive surgery on the state NHS system and unable to afford the private costs. We therefore utilised free dermal fat grafts, harvested from concomitant abdominoplasties to extend the pectoralis major muscle and smoothen surface irregularities.

DISCUSSION: Both patients achieved excellent cosmetic outcomes and aside from a small, spontaneously resolving abdominal site seroma in one patient, have remained free of any complications for over two years. This cost effective procedure is only feasible in patients with an adequate punnum who are amenable to the extra surgery and resultant scarring.

CONCLUSION: We herein report the use of free dermal fat graft in revision aesthetic and reconstructive surgery in a manner akin to recent acellular dermal matrix use. The comparable enhanced aesthetic outcomes, minimal complication rate and substantial cost savings merit dissemination to a global audience and encourage surgeons to consider this economic alternative.

© 2014 The Authors. Published by Elsevier Ltd. on behalf of Surgical Associates Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/3.0/).

1. Introduction

Acellular dermal matrices (ADMs) are increasingly being adopted world-wide as an adjunct to post-mastectomy breast reconstruction specifically to cover the inferior pole of breast prostheses and increase the volume of the subpectoral pockets.1 They have also been used to treat implant malpositioning, rippling and capsular contracture in aesthetic breast surgery.2 Despite the enhanced cosmetic outcomes, minimal recurrence and acceptable failure rates ADMs, such as Alloderm and Strattice, are not routinely available on the UK National Health Service (NHS) because of concerns regarding their cost-effectiveness. However, by utilising autologous dermis one can simulate the beneficial outcomes associated with ADMs and circumvent their costs. We report two patients in whom free dermal fat grafts (FDFGs), harvested from concomitant abdominoplasties, were used to optimise revision implant-based aesthetic and reconstructive breast surgery.

2. Presentation of cases

2.1. Patient 1

A 35-year-old female had undergone adjuvant chemotherapy and radiotherapy following subcutaneous mastectomies with axillary clearance and immediate bilateral implant-based breast reconstruction, for invasive carcinoma 21 months earlier at a district general hospital. She was referred by the medical oncologists for revision breast surgery to address severe malpositioned, painful,
asymmetrical breasts with double bubble deformities and loose skin (Fig. 1).

2.2. Patient 2

A 31-year old female had undergone bilateral cosmetic subglandular breast augmentation (with 280 g silicone gel implants) for severe hypoplasia at a different hospital 11 years prior to referral. She presented with asymmetrical, tender, hard and severely deformed breasts associated with Baker Grade IV capsular contractures, as well as significant weight loss in the preceding two years.

2.3. Surgical technique

Using inferior periareolar incisions bilateral total capsulectomies and explantations were performed. Following creation of new subpectoral pockets, anatomical cohesive silicone gel implants (450 g Patient 1; 400 g Patient 2) were then inserted and their inferolateral portions covered with de-epithelialised dermo-fat grafts (measuring about 10 cm × 6 cm) harvested from abdominoplasties performed simultaneously. The grafts were secured to the inframammary folds and the inferolateral borders of the pectoralis major muscle with continuous 2/0 PDS sutures using buried knots. A suction drain was used in each breast prior to standard wound closure. In the patient illustrated the nipples were repositioned by de-epithelialisation and superior transposition (with 3/0 monocryl). The patients had their drains removed prior to discharge from hospital.

3. Results

Both patients had no peri/early post-operative complications and achieved excellent cosmetic outcomes of their revised breasts and donor abdomens (Fig. 1). A minor abdominal donor site seroma was noted but this resolved spontaneously by three weeks. Two years after surgery there has been no clinical reduction in the dermal fat graft thickness as demonstrated by the lack of altered inframammary fold positions, recurrent palpable or visible rippling. Furthermore all four breasts have so far remained free of recurrent capsular contracture, infection, flap necrosis and explantation.

Fig. 1. Pre and post-operative appearances of patient 1 following revision reconstructive breast surgery and simultaneous Fleur-de-Lys abdominoplasty, used as a source of free dermo-fatgrafts. Note the bilaterally deformed, asymmetrical reconstructed breasts with 'double-bubble' deformities and severe capsular contracture. The markedly significant abdominal skin laxity and large post-partum diastasis recti are obvious.
4. Discussion

Revision breast implant surgery (be it aesthetic or reconstructive) often entails implant exchange, but the often-required total capsulectomy frequently accentuates implant palpability, rippling and poor inferolateral support. In slim patients with poor soft tissue coverage (as in the patients herein reported) correction of the implant palpability and rippling can be achieved by soft tissue coverage using muscle flaps such as the latissimus dorsi (LD). However, bilateral LD flap harvest carries a not-insignificant morbidity and is therefore eschewed in aesthetic surgery and used infrequently in revision reconstructive surgery. Both patients were ideal candidates for ADM implant coverage and support with each 10 cm × 16 cm piece costing £2600, lacked the £5200 funding required for strattice based bilateral surgery. Autologous dermis with an average complication rate of 11% vs. 10.5% with ADMs, therefore served as an effective alternative and eliminated the expenses accrued from purchasing additional operative products. Autologous dermis has predominantly been used as an inferior dermal flap in patients undergoing immediate breast reconstruction following prophylactic mastectomy of large, ptotic breasts. This inferiorly based but well vascularised tissue is likely to be unsuitable in patients with previous scarring or small to moderate sized breasts, requiring revision surgery.

The concept of autologous fat transplants has been present since the 1800s, with the first transplants propagated by van der Meulen in 1889. Works by Neuber and Lexer followed, with Czerny going on to describe the successful transfer of a lipoma from the buttock to the breast of a patient in 1895. Despite the plethora of literature that followed, fat grafting once thought to be a simple technique, fell out of favour because of the variable outcomes associated with fatty tissues resorptive tendency. Peer’s 1950 scientific report on open incision techniques showed that 50% of small autogenous transplanted fat tissue remained stable at one year and stimulated the limited worldwide use of dermal fat grafting. The advent of liposuction reignited the interest in fat grafting owing to the ease of access and application of a viable by-product. It took until the 1990s for Coleman (inspired by successful and reproducible fat grafting techniques in the face and hands) to bring fat grafting to the breast, into vogue. Despite the hiatus in its evolution (owing to concerns over confounding radiological findings and risks of neoplasm), fat grafting has since become the leading technique in plastic and reconstructive breast surgery due to the capability of processed liposaprate (PLA) cells to differentiate into various cell lineages in-vitro.

Successful fat grafting is a complex procedure requiring recipient site definition with meticulous patient and subtype (autogenous, free dermal, fat flaps or injection) selection. Dermal fat grafts harvested from abdominal donor sites without a formal abdominoplasty have been used as an adjunct to conservation breast surgery in reconstructing lumpectomy defects. However, when a large amount of dermis is required, as in our cases of bilateral surgery, an abdominoplasty is preferable but one should keep in mind the benefits and disadvantages of both ADMs and autologous dermis as in Fig 2 (Table 1).

Fortunately both our patients were amenable to an abdominoplasty-type procedure having developed cosmetically poor abdomens as a result of significant weight loss and previous pregnancies. This proved a more attractive operation for them when combined with repair of postpartum diastasis recti. Rather than discard the excess skin (as in a cosmetic abdominoplasty), it was used as a free dermal graft source to both cover and support the implants and mimic an uplift (the latter in patient 1). However, an abdominoplasty to harvest dermal fat grafts is only feasible in patients with an adequate pannus or who have no objection to this extra surgery and additional scarring.

Autologous fat grafts can also be harvested in a manner akin to liposuction, with work by Asken and Johnson reporting viability rates of 90% with non-traumastraumatised specimens. A recent study analysing the complication rates of 1000 patients, had undergone the Klinger autologous fat graft technique (similar to the Coleman protocol but utilises 18-G needles rather than cannulas) showed complication rates of 8.9%, noting better graft survival and increased rooting as compared with traditional techniques. These cases were similar to our own but with less impressive post-operative aesthetic outcomes.

After over two years both patients have remained complication free and are happy with the outcomes. Our work is supported by results from Selber et al. but we note that whilst our breasts have remained free from complications thus far (they reported 13.9% complication rates—including mastectomy skin flap necrosis and tissue expander exposure), our donor sites did not (minor seroma resolved). We therefore disagree with their hypothesis that there is a reduced inflammatory response as compared with ADM use alone, because the ‘added operation’ described in both reports will increase the body’s inflammatory response and thus lymphocytic infiltration.

The use of free dermal fat grafts in this case has conferred the most cost benefit and affirmed that ADMs are less cost effective then autologous dermal flap reconstruction when; complication rates are less than 20% and the “incremental cost utility ratio is based at $261720 per quality adjusted life years gained”. Therefore despite the myriad of clinical applications and favourable aesthetic outcomes offered by ADM use, substantial cost savings can be gained from the appropriate substitution of free dermal fat grafts in well selected patients.

5. Conclusion

The use of ADMs in revision and aesthetic breast surgery confers high costs on patients and institutions, hence their lack of

| Advantage                                      | Autologous dermis | Allogenic dermis            |
|------------------------------------------------|------------------|----------------------------|
| More biocompatible                            | Can be performed in thin patients |
| More likely to be retained as free graft      | Does not necessitate 'additional' incisions, therefore fewer scars and complications |
| Cheap                                          | Quicker procedure |
| Readily available                              | More likely to achieve adequate coverage of prosthesis |
| Can simultaneously improve abdominal cosmesis |                  |
| Better concealment of rippling and wrinkling  |                  |

Disadvantage

| Abdominal harvest                              | May lose tensile strength |
| therefore means no transverse rectus abdominis | Expensive                |
| musculocutaneous flap or a deep inferior epigastric artery perforator flap when harvested | 'Foreign' object therefore greater risk of rejection |
| Higher incidence of seroma                     | Query greater inflammatory response |
routine use within the state run NHS. We believe the true cost of ADM use (which varies by type, company, institutional contractual agreements and international standards among other things) will be above the financial means of the global majority, thus necessitating a more cost effective alternative. FDFGs have well known applications in head & neck surgery, lip reconstruction and immediate breast reconstruction, but to our knowledge this is the first reported description of their use in revision aesthetic and reconstructive surgery in a manner akin to recent acellular dermal matrix use. Our two cases eloquently illustrate how dermal fat grafts can effectively substitute as the “poor man's ADM” when the latter is not financially feasible.

Conflict of interest
None.

Funding
None.

Ethical approval
Not applicable.

Author contribution
The authors herein have seen and agree to the submitted version of the paper and bear responsibility for it. All authors have read the International Journal of Surgery Case Reports “For Authors—Author Information” and are fully concordant with the instructions and accept the conditions posed. All authors have seen and agreed to the submitted version of the paper, and bear responsibility for it. We confirm that the work is original and has not been published or submitted for publication simultaneously. In addition we agree if accepted the paper will not be published elsewhere in the same or similar form in English or any other language without written consent of the copy right holder.

References
1. Breuing KH, Warren SM. Immediate bilateral breast reconstruction with implants and inferolateral AlloDerm slings. Ann Plast Surg 2005;55(3):232–9.
2. Spear SI, Seruya M, Clemens MW, Teitelbaum S, Nahabedian MY. Acellular dermal matrix for the treatment and prevention of implant-associated breast deformities. Plast Reconstr Surg 2011;127(3):1047–58.
3. Krishnan NM, Chatterjee A, Van Vliet MM, Powell SG, Rosen JM, Nigriny JF. A comparison of acellular dermal matrix to autologous dermal flaps in single-stage, implant-based immediate breast reconstruction: a cost-effectiveness analysis. Plast Reconstr Surg 2013;131(5):953–61.
4. Ross GL. One stage breast reconstruction following prophylactic mastectomy for pectoral breasts: the inferior dermal flap and implant. J Plast Reconstr Aesthet Surg 2012;65(9):1204–8.
5. Neuber F. Fettransplantation Bericht über die Verhandlungen der Dt Ges f Chir Zbl Chir 1893;22:66.
6. Lexer E. Ueber freie fettransplantation. Klin Therap Wehnschr 1911;18:53.
7. Czerny V. DreiplastischeOperationen. III. Plastischer Ersatz der Brustdrüse durchein.
8. Peer IA. Loss of weight and volume in human fat grafts. Plast Reconstr Surg 1950;5:217.
9. Coleman SR. Structural fat grafting. In: Thorne Charles H, editor. Grabb and Smith's plastic surgery. sixth ed. Philadelphia: Lippincott Williams & Wilkins, a Wolters Kluwer Business; 2007. p. 480–5 (Copyright © 2007, Chapter 47).
10. Züko PA, Zhu M, De Ugarte DA, et al. Human adipose tissue is a source of multipotent stem cells. Mol Biol Cell 2002;13:4279–95.
11. Kijima Y, Yoshinaka H, Owaki T, Aikou T. Early experience of immediate reconstruction using autologous free fat graft after breast conservational surgery. J Plast Reconstr Aesthet Surg 2007;60(5):495–502.
12. Hudson DA, Adams KG, Adams S. Autologous dermal graft in breast reconstruction. Ann Plast Surg 2012;68(Mar (3)):253–6.
13. Asken S. Autologous fat transplantation: macro and macro techniques. Am J Cosmet Surg 1987;4:111–21.
14. Johnson GW. Body contouring by macroinjection of autogenous fat. Am J Cosmet Surg 1987;4(2):103–9.
15. Maione L, Vinci V, Klinger M, Klinger FM, Cavigioli F. Autologous fat graft by needle: analysis of complications after 1000 patients. Ann Plast Surg 2014;(Jul) [Epub ahead of print] PMID 25003414.
16. Selber JC, Clemens MW, Oates S, Baumann DP. Autoderm: an alternative bioprosthetic for breast reconstruction. Plast Reconstr Surg 2013;131(May (5)):985–7.

Open Access
This article is published Open Access at sciedirect.com. It is distributed under the IJSCR Supplemental terms and conditions, which permits unrestricted non commercial use, distribution, and reproduction in any medium, provided the original authors and source are credited.