

The Benefits and Pitfalls of Using an Autologous Dermal Flap (ADF) in Immediate Implant-Based Reconstruction

Natalia Garibotto*

South Eastern Sydney Local Health District,
Breast and Endocrine, Kogarah, NSW, Australia

*Corresponding author:

Dr. Natalia Garibotto

✉ ngaribot@gmail.com

Tel: +0401348688

MBBS, FRACS, 39 Ebsworth St, Mount Lawley, WA, 6050, South Eastern Sydney Local Health District, Breast and Endocrine, Kogarah, NSW, 9113111, Australia.

Citation: Garibotto N (2020) The Benefits and Pitfalls of Using an Autologous Dermal Flap (ADF) in Immediate Implant-Based Reconstruction. J Aesthet Reconstr Surg Vol.6 No.3:14

Abstract

Autologous dermal sling is a safe and effective option to facilitate immediate implant reconstruction for women undergoing mastectomy. This is feasible in women with moderate to large sized ptotic breasts with a need for skin reduction at the time of surgery. Breast reconstruction with flap surgery is the most complex breast reconstructive option. The surgeon transfers a section of skin, muscle, fat and blood vessels from one part of the body to the chest to create a new breast mound. Autologous reconstruction (sometimes called autogenous reconstruction) uses tissue -- skin, fat, and sometimes muscle -- from another place on the body to form a breast shape. The tissue (called a "flap") usually comes from the belly, the back, buttocks, or inner thighs to create the reconstructed breast. The physical effects of each type of autologous reconstruction are highly individual to one's body, range of motion, physical strength, and the normal day-to-day activities.

Keywords: Autologous dermal flap; Dermal sling; Breast reconstruction

Received: August 08, 2020; **Accepted:** September 21, 2020; **Published:** September 28, 2020

Introduction

The use of an autologous dermal sling created from the de-epithelialized skin of an inferior mastectomy flap is sometimes described as the Bostwick technique after it was described in a plastic surgery textbook in the 1990's [1]. This description covered an immediate implant with 2 layers of vascularised tissue after a 'Wise pattern' mastectomy with a free nipple graft. However, publications describing the use of an ADF have been published as early as the late 1970's [2]. A Medline search combined with reference list search was performed to describe the various published techniques in breast reconstruction using an ADF and the general benefits and pitfalls of the procedure.

Literature Review

Hansson et al. [3] published a systematic review on the number of techniques used and synthesised it down to 9 categories (**Table 1**). An ADF can be used in the technique above ('classic' dermal sling (DS)) or with a non-wise pattern mastectomy. It can be used in conjunction with a synthetic mesh or acellular dermal matrix (ADM), with or without an implant, or simply as a buttress for a suture line or T-junction. It can be used in a 1 stage or 2 stage reconstruction. One of the primary outcomes was to grade the

level of evidence in the literature that used an ADF in breast reconstruction using Oxford Centre for Evidence-Based Medline 2009 guidelines. Generally, the level of evidence in most of the studies used was of low to very low quality being mostly case and cohort studies. They could not find any randomised controlled trials for the use of any of these flaps. This is inherently difficult as there is no established standard technique for the use of ADF as a comparison. Furthermore, randomisation of patients would be difficult as they are highly selected to undergo this technique in the first place. However, the main conclusions were that the ADF was a good option in the patient with macromastia and significant ptosis. An ideal nipple to IMF length of 8-15 cm was suggested however this depends on size of end result. Unfortunately, most of the studies on the use of ADF are low level across the literature, not just in this systematic review (**Table 2**).

In many circumstances the use of an ADF negates the need for a synthetic mesh or matrix to provide implant coverage. These are often very expensive especially the human derived ADM. A literature review performed by a US group comparing ADM in patients undergoing a single staged immediate breast reconstruction demonstrated a cost benefit to using an ADF [4]. This cost benefit was durable with a complication rate of up to 20%. Most studies analysed in this paper quoted an average of

Table 1 Summary of the participants' demographics.

Age range (n=29)	28-40 yrs 7 (24.1%)	41-50 yrs 13 (44.8%)	51-60 yrs 9 (31.1%)
Household income (n=29)	N 10,000= - 50,000=.4 (13.8%)	N 51,000= .-N 100,000=.19 (65.5%)	Above N 100,000=.6 (20.7%)
Educational level (n=29)	Primary sch.29 (100%)	Secondary sch.26 (89.7%)	Tertiary educ.7 (24.1%)
No. of Rooms (n=29)	One bedroom 4 (34.5%)	Two bedroom 12 (41.4%)	One room flat 7 (24.1%)

The table shows low socioeconomic status with peak age range between 41-50 years.

Table 2 Summary of access to breast reconstruction surgery services.

Parameters	Yes	No
Awareness	10 (34.5%)	19 (65.5%)
Affordability	4 (13.8%)	25 (86.2%)
Accessibility	2 (6.9%)	27 (93.1%)
Availability	3 (10.3%)	26 (98.7%)
Accommodation	4 (13.8%)	25 (86.2%)

There is a correlation between poor accessibility with Penchansky and Thomas parameters

10.5% complication rate compared to 11% with an ADM. This benefit is further strengthened by the fact that most women undergoing an ADF have a higher BMI, which is an independent risk factor for complications [5]. This is because the breast needs to be sufficiently large in order to use the inferior mastectomy flap as an ADF. This study did demonstrate a reduced rate of infection, seroma and hematoma rate with the use of an ADF however mastectomy skin necrosis and explanation were higher. An ADF was still not recommended in smokers, however smoking increasing the risks of complications in all breast cosmetic and reconstructive procedures [6].

Discussion

In general however, most of the reviewed literature supported the fact that using an ADF resulted in lower complications overall and was safe and effective in select patients [7,8]. Ladizinsky et al. [1] had an overall complication rate of 23.5%. The highest being in the patients who smoked, had a BMI>35 and had a direct to implant reconstruction. A further risk factor was a volume of breast excised >700 g [9]. The use of a tissue expander to reduce the tension on the mastectomy flap correlated with a lower flap necrosis rate. The patient population that benefited the most were the BRCA group undergoing bilateral prophylactic mastectomy. They surmised the lack of lymph node biopsy; younger age and less co-morbidities lended well to a good outcome and so may be ideal in this patient population. Other studies with smaller series published favourable results with low complication rates using an ADF [10-13]. The use of a non-autologous acellular dermal matrix has been associated with an increase in infection rate, especially in patients with a high BMI which is the patient population that usually benefit the most from and ADF [5] (**Table 3**).

The T-junction of a wise pattern mastectomy is prone to wound breakdown and loss or extrusion of implant if used to reconstruct the breast. An ADF can be used as vascularised tissue to cover the implant and provide a scaffold for epithelialization and a buffer to wound breakdown or flap necrosis particularly in the t-zone. The rate of implant exposure and extrusion was lower when an ADF was used in this circumstance [14]. Similarly, preservation of the

Table 3 Summary of breast reconstruction surgery information.

Description	Yes	No
Horror stories that scare them	22 (75.9%)	7 (24.1%)
It is expensive	27 (93.1%)	2 (6.9%)
Not included in NHS	29 (100%)	-
Will you like to perform BR?	10 (34.5%)	19 (65.5%)
Have you seen a person after BR?	1 (3.4%)	28 (96.6%)
Do you like post reconstructed breast?	2 (6.9%)	Not seen

NHS: National Health Insurance Scheme, BR: Breast Reconstruction.
This information does not favour breast reconstruction

nipple during a nipple sparing mastectomy in a large ptotic breast has a higher risk of nipple and skin flap necrosis. This is due to the excessive length of vascular pedicle to the extremity of the breast. Lavin et al. developed a novel technique using a bipedicle dermal flap. A skin reducing wise pattern utilising an inferior pedicle is marked. The inferior pedicle and usual area of skin excision is de-epithelialised. The nipple sparing mastectomy is performed through an incision through the lateral edge of de-epithelialised skin. A subpectoral implant is placed and the skin flaps are sutured over the de-epithelialised skin. The vascularity of the ADF or nipple is rarely compromised due to the wide inferior vascular pedicle [15]. Most papers describing the use of an ADF preserving the nipple do so by a free nipple graft over de-epithelialised skin in the upper flaps in the pre-marked position.

The disadvantage of ADF most often quoted is the limitation to the large and ptotic breast and this is true of the classic DS as a large amount of tissue is required to cover the implant. A nipple to inframammary fold distance of greater than 8 cm and a nipple to sternal notch greater than 25 cm are the ideal dimensions for an adequate ADF [10]. Nair et al. [16] however used ADF in medium and small non-ptotic breast but employed an expander rather than permanent implant to achieve the desired size subverting this limitation. There was no discussion however about later exchange of the expander implant, which leads one to think that they used the expander as a permanent implant. Modern expanders are not designed to stay in long term and need to be exchanged for a permanent implant. Hammond et al. [17] and others [18] also employed the use of ADF in a 2 staged reconstruction using a tissue expander in the early 2000. They reported using the lateral end of the inframammary wound to exchange to a permanent implant at a later stage. This did not appear to compromise the ADF or the implant.

Nava et al. [10] then adopted the single stage reconstruction with a direct to permanent implant in 2006 which is widely quoted in much of the following literature [7,19,20]. They have published further papers on this technique [21] always using a sub-pectoral pocket. The ADF is sutured to the lower end of the pectoralis major muscle. A pre-pectoral approach can be used if combined

with a mesh or acellular dermal matrix. Caputo et al. [22] created a pocket using a porcine derived acellular dermal matrix to provide superior pole coverage to an implant sutured to an inferior ADF and the pec major muscle. Avoidance of dissection of the sub-muscular plane resulted in less postoperative pain with no animation artefact on contraction of pec major muscle while achieving a good cosmetic outcome. Implant loss due to T-junction breakdown was not experienced in this small study. This was again attributed to the coverage of the implant in the lower pole with well vascularised ADF.

The use of an ADF in patients who have had neoadjuvant or previous chemotherapy or radiotherapy has yet to be fully investigated and would be of great value with the increasing use of reverse sequencing. Autologous tissue reconstruction is usually favoured if reverse sequencing is used due to the perceived high rate of capsular contractures with implant-based reconstruction.

References

- 1 Ladizinsky AD, Sandholm HP, Jewett TS, Shahzad TF, Andrews TK (2013) Breast Reconstruction with the Bostwick Autoderm Technique. *Plast Reconstr Surg* 132 (2): 261-270.
- 2 Biggs MT, Brauer OR, Wolf EL (1977) Mastopexy in conjunction with subcutaneous mastectomy. *Plast Reconstr Surg* 60 (1): 1-5.
- 3 Hansson E, Jepsen C, Hallberg H (2019) Breast reconstruction with a dermal sling: A systematic review of surgical modifications. *J Plast Surg Hand Su* 53 (1): 1-13.
- 4 Krishnan MN, Chatterjee MA, Van Vliet GM, Powell MS, Rosen FJ et al. (2013) 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* 131 (5): 953-961.
- 5 Liu AS, Kao HK, Reish RG, Hergrueter CA, May JW, et al. (2011) Postoperative complications in prosthesis-based breast reconstruction using acellular dermal matrix. *Plast Reconstr Surg* 127 (5): 1755-1762.
- 6 Goltsman D, Munabi NC, Ascherman JA (2017) The association between smoking and plastic surgery outcomes in 40,465 patients: An analysis of the American College of Surgeons National Surgical Quality Improvement Program data sets. *Plast Reconstr Surg* 139 (2): 503-511.
- 7 Goyal A, Wu JM, Chandran VP, Reed MWR (2011) Outcome after autologous dermal sling-assisted immediate breast reconstruction. *BJS* 98 (9): 1267-1272.
- 8 Irwin GW, Black A, Refsum SE, McIntosh SA (2013) Skin-reducing mastectomy and one-stage implant reconstruction with a myodermal flap: A safe and effective technique in risk-reducing and therapeutic mastectomy. *J Plast Reconstr Aesthet Surg* 66 (9): 1188-1194.
- 9 Inbal A, Gur E, Lemelman BT, Barsuk D, Menes T, et al. (2017) Optimizing patient selection for direct-to-implant immediate breast reconstruction using wise-pattern skin-reducing mastectomy in large and ptotic breasts. *Aesthet Plast Surg* 41 (5): 1058-1067.
- 10 Nava BM, Cortinovis QDU, Ottolenghi QDJ, Riggio QDE, Pennati QDA, et al. (2006) Skin-Reducing Mastectomy. *Plast Reconstr Surg* 118 (3): 603-610.
- 11 Mongrial et al. recorded a 23% capsular contracture rate in their 5 year follow up after neoadjuvant radiotherapy [23]. A recent review however found that the rate of complications after neoadjuvant radiotherapy is no higher than adjuvant radiotherapy even when an implant based reconstruction is used [24]. Most were implants placed with a latissimus dorsi flap for coverage [25]. The use of an ADF may be beneficial in this circumstance; however it is still relying on coverage of the implant with irradiated tissue [26].
- 11 Peker F, Yuksel F, Karagoz H, Ozturk S (2015) Breast reconstruction using de-epithelialized dermal flap after vertical-pattern skin-sparing mastectomy in macromastia. *ANZ J Surg* 85 (1-2): 64-68.
- 12 Ross GL (2012) One stage breast reconstruction following prophylactic mastectomy for ptotic breasts: The inferior dermal flap and implant. *J Plast Reconstr Aesthet Surg* 65 (9): 1204-1208.
- 13 King ICC, Harvey JR, Bhaskar P (2014) One-stage breast reconstruction using the inferior dermal flap, implant, and free nipple graft. *Aesthet Plast Surg* 38 (2): 358-364.
- 14 Corban J, Shash H, Safran T, Sheppard-Jones N, Fouda-Neel O (2017) A systematic review of complications associated with direct implants vs. tissue expanders following Wise pattern skin-sparing mastectomy. *J Plast Reconstr Aesthet Surg* 70 (9): 1191-1199.
- 15 Lewin R, Jepsen C, Hallberg H, Hansson E (2018) Immediate breast reconstruction with a wise pattern mastectomy and NAC-sparing McKissock vertical bipedicle dermal flap. *J Plast Reconstr Aesthet Surg* 71 (10): 1432-1439.
- 16 Nair A, Jaleel S, Abbott N, Buxton P, Matey P (2010) Skin-Reducing mastectomy with immediate implant reconstruction as an indispensable tool in the provision of oncoplastic breast services. *Ann Surg Oncol* 17 (9): 2480-2485.
- 17 Hammond DC, Capraro PA, Ozolins EB, Arnold JF (2002) Use of a skin-sparing reduction pattern to create a combination skin-muscle flap pocket in immediate breast reconstruction. *Plast Reconstr Surg* 110 (1): 206-211.
- 18 Halls JM (2012) Superiorly based single mastectomy flap with inferiorly based dermal flap and anchorage of the inframammary crease procedure for immediate breast reconstruction in patients with ptosis. *Plast Reconstr Surg* 130 (4): 632e-633e.
- 19 De Vita R, Pozzi M, Zoccali G, Costantini M, Gullo P, et al. (2015) Skin-reducing mastectomy and immediate breast reconstruction in patients with macromastia. *J Exp Clin Cancer Res* 34 (1): 120.
- 20 Dietz J, Lundgren P, Veeramani A, O'Rourke C, Bernard S, et al. (2012) Autologous inferior dermal sling (autoderm) with concomitant skin-envelope reduction mastectomy: An excellent surgical choice for women with macromastia and clinically significant ptosis. *Ann Surg Oncol* 19 (10): 3282-3288.
- 21 Nava MB, Ottolenghi J, Pennati A, Spano A, Bruno N, et al. (2012)

Conclusion

The use of an ADF in implant-based breast reconstruction is a cost effective, safe and reliable method in women with a range of breast sizes. The ADF can be tailored to breast size and reconstruction method using a wide variety of techniques with less complication rates and lower cost.

- Skin/nipple sparing mastectomies and implant-based breast reconstruction in patients with large and ptotic breast: Oncological and reconstructive results. *The Breast* 21 (3): 267-271.
- 22 Caputo GG, Marchetti GA, Dalla Pozza GE, Vigato GE, Domenici GL, et al. (2016) Skin-reduction breast reconstructions with prepectoral implant. *Plast Reconstr Surg* 137 (6): 1702-1705.
- 23 Monrigal E, Dauplat J, Gimbergues P, Le Bouedec G, Peyronie M, et al. (2011) Mastectomy with immediate breast reconstruction after neoadjuvant chemotherapy and radiation therapy. A new option for patients with operable invasive breast cancer. Results of a 20 years single institution study. *Eur J Surg Oncol* 37 (10): 864-870.
- 24 O' Halloran N, McVeigh T, Lowery A, Martin J, Kerin M (2017) Neoadjuvant Chemo-radiation Therapy and Breast Reconstruction - The Potential for Superior Cosmetic Outcomes in the Treatment of Breast Cancer. *Br J Surg* 104 (SS6): 124.
- 25 Giacalone P, Rathat G, Daures J, Benos P, Azria D, et al. (2010) New concept for immediate breast reconstruction for invasive cancers: feasibility, oncological safety and esthetic outcome of post-neoadjuvant therapy immediate breast reconstruction versus delayed breast reconstruction: A prospective pilot study. *Breast Cancer Res Treat* 122 (2): 439-451.
- 26 Haydon N, Southwell-Keely J, Moisisidis E (2014) 'Imbricated dermal flap': A novel technique for autologous augmentation in immediate breast reconstruction after skin-sparing mastectomy. *Eur J Surg Oncol (EJSO)* 40 (6): 673-675.