

CASE REPORT

Autoderm: An Alternative Option for Immediate Primary Breast Reconstruction After Mastectomy—A Case Report

P. M. Valente, MBBS(Hons), BBioMedSc(Hons), MS; D. J. Hodgkinson, MBBS(Hons), FRSC(C), FACS

¹ The use of immediate breast reconstruction with
² prosthetic devices following mastectomy has
³ increased over the past decade.¹ In 2010, more than 93 000 breast reconstructions were undertaken in the United States, and in more than 80% (74 872) of those reconstruction was undertaken with prosthetic devices.² This significant change may be a reflection of a greater patient awareness of this modality, greater surgeon acceptance, and more women opting for immediate reconstruction after mastectomy or prophylactic subcutaneous mastectomy.³

Subcutaneous Mastectomy

Breast cancer affects 1 in 4 women diagnosed with cancer in the United States⁴ and rates in the top 3 of most common cancers among women.⁵ Surgical management has evolved from Halsted's⁶ initial description of a radical mastectomy in 1894, Urban's⁷ extended radical mastectomy in the 1960s, and Toth and Lappert's⁸ description of skin-sparing mastectomy in the early 1990s. Skin-sparing mastectomy includes resection of the nipple-areolar complex (NAC) with all breast parenchyma, with or without axillary clearance.⁹

However, the increased expansion of mammographic screening resulting in the detection of smaller and subtler primary invasive cancers¹⁰ as well as genetic testing of *BRCA1* and *BRAC2*¹¹ have led women to elect prophylactic conservative mastectomies in increasing numbers.^{12,13}

The quest for improved quality of life and the desire to preserve breast skin and the NAC to give women a superior body image^{14,15} have led to the technique of subcutaneous mastectomy with preservation of the NAC as initially described by Freeman.¹⁶ This procedure involves conservation of all breast skin, including the NAC, thereby providing the best natural envelope for reconstruction by preserving the nipple, inframammary fold, and breast contour.¹⁷

Postmastectomy Reconstructive Options

For breast microsurgeons, autologous tissue options for postmastectomy breast reconstruction using perforator flaps, such as the superficial or deep inferior epigastric perforator, or superior gluteal artery perforator flaps that preserve donor-site muscles have been preferred options.^{18,19} However, these surgeons face aesthetic hurdles in attempting to match the shape, size, symmetry, and color of the original breast.²⁰

Presently, prosthetic devices are available as shaped devices and in cohesive silicone gels,²¹ allowing immediate and 2-stage implant-based postmastectomy reconstruction, which has increased by 16% in the United States over the past 12 years.^{22,23} These innovations and advancements have served to provide women with safer and more effective prosthetic options for those considering reconstruction after mastectomy. Unfortunately, the cost to the patient and the health system and the possibility of complications remain significant determinants to patient and surgeon.^{25,26} Ringberg²⁷ reported an 8.4% early failure rate, whereas others report failure rates between 10% and 13%.²⁸

The anatomic limitation of the prosthetic device reconstruction (single or multiple stage) is coverage of the lower pole of these devices, especially when the pectoralis muscle is violated.²⁹ Implants placed in a

Received for publication January 7, 2015.

From the Australian College of Cosmetic Surgery (Dr Valente) and the Cosmetic and Restorative Surgery Clinic (Dr Hodgkinson), Double Bay, Australia.

Corresponding author: P. M. Valente, MBBS(Hons), BBioMedSc(Hons), MS, Australian College of Cosmetic Surgery, 20 Manning Rd, Double Bay, NSW 2028, Australia (e-mail: dr.pedrovalente@gmail.com).

DOI: 10.5992/AJCS-D-15-00001.1

complete prepectoral position after mastectomy have a tendency to displace superiorly and fail to create a natural ptotic breast shape.³⁰ Complication rates associated with this technique approach 40%³¹ and include loss of implant, capsular contracture, rippling of the implant, and mechanical shift of the implant.³² A major advantage for prosthetic reconstruction remains its cost, although up to 40% of patients may require revision surgery.³³

Acellular Dermal Matrix in Breast Reconstruction

In 1994, acellular dermal matrix (ADM), a bioprosthesis, was introduced for use in reconstruction of significant abdominal wall defects and in patients with burns.³⁴ It was not until 2005, however, that Breuing and Warren³⁵ introduced ADM for use in breast reconstruction. This soft tissue replacement has allowed surgeons to create customized breast pockets, thereby improving the overall breast symmetry and natural contour and shortening the reconstructive timeline in women of all ages and in a variety of breast volumes.^{36,37}

Many of these bioprosthesis have also been reported to have regenerative potential and are capable of revascularization, recellularization, and provision of a supportive scaffold upon which the patient's own cells can repopulate.³⁸ Currently, surgeons may select from 2 sources of ADM: (1) human-derived variants, such as FlexHD (Ethicon, Somerville, NJ), freeze-dried AlloDerm (LifeCell, Branchburg, NJ), Neoform (Mentor, Santa Barbara, Calif), and DermaMatrix (Synthes, West Chester, Pa); and (2) porcine-derived Permacol (Covidien, Boulder, Colo) and Strattice (LifeCell).³⁹ Studies comparing the different bioprosthesis ADM options remain rare.⁴⁰

When partial muscle coverage without ADM is performed after subcutaneous mastectomy, there is an increased risk of rippling and wrinkling along the lower pole, especially when the lower mastectomy skin flap is thin. This may also displace the implant laterally and inferiorly.⁴¹ In addition, there is an increased risk of device exposure in the event of delayed healing as well as a higher likelihood of seroma (pooled odds ratio, 3.9%; 95% confidence interval, 2.4–6.2), infection (pooled odds ratio, 2.7; 95% confidence interval, 1.1–6.4), and capsular contracture as found in the meta-analysis by Ho and colleagues⁴² and the review by Agrawal and colleagues.⁴³ Complexity is further increased in unilateral reconstruction when the surgeon attempts to match the unaffected side.

Although implants placed partially under pectoralis muscle coverage with ADM theoretically minimize rippling and wrinkling because of the added thickness, they also better define the natural breast landmarks, provide additional tissue support, and minimize device exposure in the event of delayed healing.⁴⁴ Vardanian et al⁴⁵ evaluated other parameters of ADM usage and reported a capsular contracture rate of 3.8% in the ADM cohort compared with 19.4% in the non-ADM cohort. In addition, there was less bottoming out (4.8% versus 12.4%), rippling (3.8% versus 10.9%), and mechanical shift (1.9% versus 9.3%) in the ADM cohort.

Selber et al⁴⁶ described the ideal bioprosthesis as “free from potentially antigenic material, reliable and rapidly repopulated by host cells, able to promote early revascularization, resistant to infection, easy to process” and “inexpensive or ideally free of cost.”



Figure 1. Preoperative markings on a 43-year-old female patient for bilateral subcutaneous prophylactic mastectomies.

Aesthetically, to create lower-pole fullness yet still provide complete tissue coverage, ADMs and fat grafting have been recruited into the complex decision-making process.⁴⁷ Acellular tissue matrices are associated with risks of infection (3.1%), explantation (1.5%), hematoma (1.5%), and seroma (4.6%)⁴⁸ as well as significantly high financial costs to the patient or health service providers.^{49,50} Hartzell and associates reported a cost of \$3536 to \$4856 per breast (depending on the thickness and size of the matrix).⁵¹

The purpose of this report is to propose an alternative option to primary breast reconstruction in patients undergoing prophylactic mastectomy using lower

abdominal donor dermal graft after de-epithelialization and creating an ideal lower pole sling to support the breast implant. Hudson and associates⁵² previously reported success with this technique.

Case Study

A 48-year-old woman (see Figures 1 and 2) with a body mass index of 26 elected to have a prophylactic subcutaneous nipple-sparing mastectomy and immediate reconstruction with saline implants after a history of numerous lumpectomies between 1993 and 2014 for epithelial atypia masses and scattered calcifications left her with significant deformed and distorted breast parenchyma. The patient had a family history

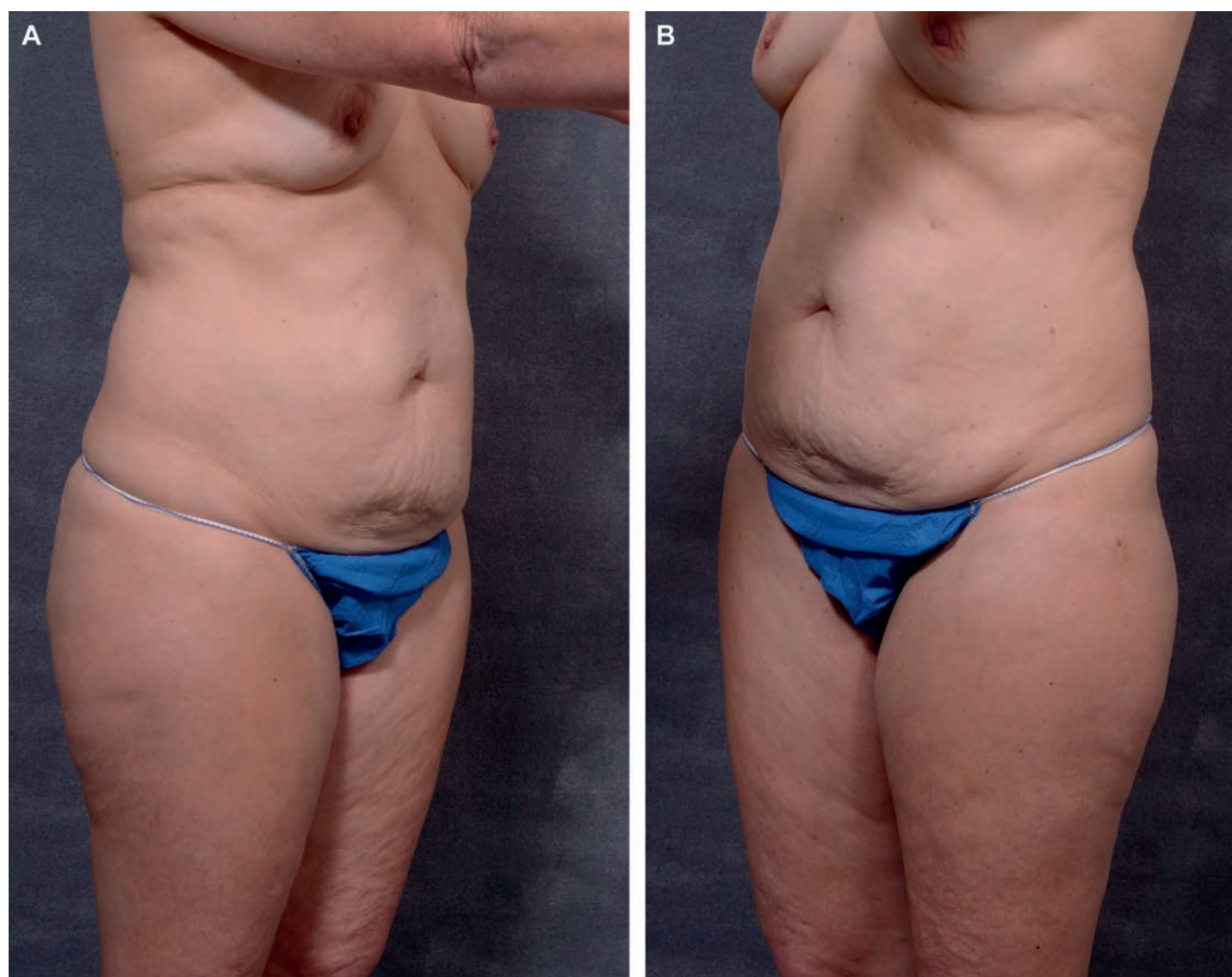


Figure 2. Preoperative right and left oblique views of the patient.



Figure 3. (A) Intraoperative photograph after bilateral subcutaneous mastectomies and preplanned markings of the lower abdominal autodermal graft donor site. (B) De-epithelization of the abdominal dermal graft.

of breast cancer, and rheumatoid arthritis and hypothyroidism were also noted.

Bilateral subcutaneous mastectomies were undertaken through submammary incisions (see Figure 3A). Reconstruction was done with submuscular, smooth, round Moderate Plus Profile Saline implants of 400 mL (Mentor, Irving, Tex) filled to 440 mL bilaterally. Abdominal laxity and diastasis were noted preoperatively, and formal abdominoplasty and double-layer plication of the diastasis recti were undertaken through a mini-abdominoplasty incision. A dermal graft of 15 cm by 20cm was harvested from the apron and sutured around the lower pole of the implant (see Figure 3B). The dermal graft was anchored to the inframammary fold and the pectoralis major border (see Figure 4). Multilayer closure over drains was performed for all wounds. The total operating time was 4.5 hours, and recovery was uneventful.

Nine months after reconstruction the patient had obtained soft, symmetrical, and anatomical reconstructed

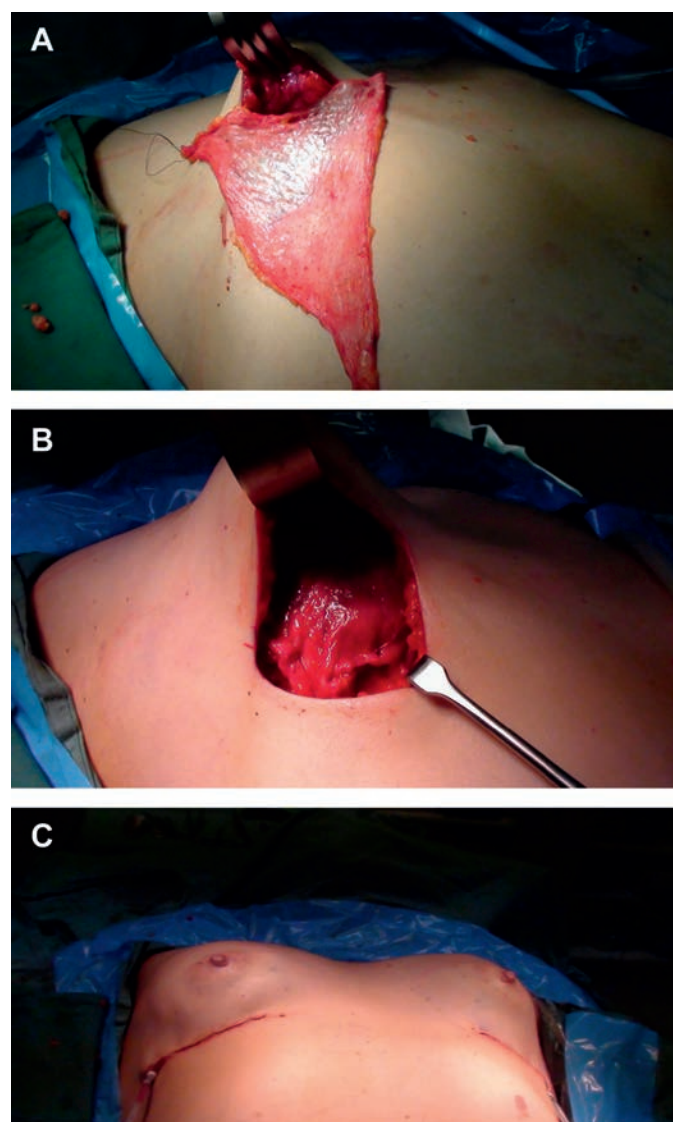


Figure 4. (A) Inset of abdominal dermal graft and plication to lower border of pectoralis major border. (B) Inset of lower dermal graft border into the inframammary crease once the saline implant was inserted and inflated. (C) Closure of the inframammary incision over drains bilaterally after reconstruction.

breasts with full lower poles. The abdominal wound healed successfully (see Figures 5 through 7).

Discussion

The use of immediate breast reconstruction after prophylactic mastectomy has increased over the past decade. With the advent of nipple-sparing mastectomy adding to the complexity of the decision-making process,

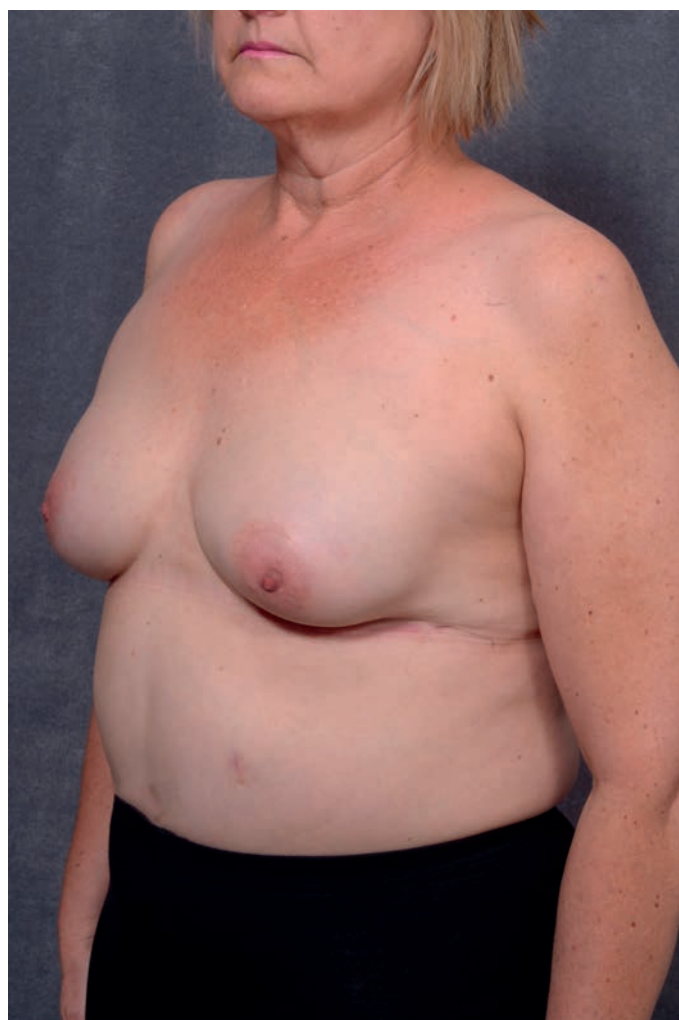


Figure 5. *Nine month postoperative oblique view of the patient after bilateral subcutaneous mastectomies with subpectoral saline implants and autodermal graft harvest from the lower abdomen.*



Figure 6. *Nine month postoperative right lateral view of the patient after bilateral subcutaneous mastectomies with subpectoral saline implants and autodermal graft harvest from the lower abdomen.*

implant-based breast reconstruction in the setting of advances of breast conservative therapy for those with locally advanced breast cancer is now a surgical option.

The introduction of implants and ADMs into breast reconstruction has allowed surgeons to create customized breast pockets for implants, shorten the reconstructive timeline, and improve the aesthetics. However, these bioprosthesis are not without significant risks of infections and seroma, and there are financial burdens to both patient and the health system.

This report demonstrates that autologous dermal grafts harvested from lower abdominal skin may be

used as an alternative to high-cost ADM in the setting of prophylactic mastectomies.

The ideal patient is one who electively chooses to have reconstruction with a prosthetic device and who has a lax abdomen that would benefit from an abdominoplasty. The de-epithelialized tissue, which is normally discarded, can supply the appropriate amount of dermis needed to secure the lower border of the pectoralis major and re-contour the breast lower pole while securing to the inframammary fold with low complication rates and significant patient satisfaction and safety.



Figure 7. Nine month postoperative AP view of the patient after bilateral subcutaneous mastectomies with subpectoral saline implants and autodermal graft harvest from the lower abdomen.

References

1. Albornoz CR, Cordeiro PG, Farias-Eisner G, et al. Diminishing relative contraindications for immediate breast reconstruction. *J Am Coll Surg*. 2014;219:788–795.
2. American Society of Plastic Surgeons. Report of the 2010 Plastic Surgery Statistics, 2010. Available at: www.plasticsurgery.org/Documents/news-resources/statistics/2010-statistics/Patient-Ages/2010-reconstructive-demographics-breast-surgery-statistics.pdf. Accessed March 18, 2015.
3. Albornoz CR, Bach PB, Mehrara BJ, et al. A paradigm shift in U.S. breast reconstruction: increasing implant rates. *J Plast Reconstr Surg*. 2013;131:15–23.
4. Murthy V, Chamberlain RS. Nipple-sparing mastectomy in modern breast practice. *Clin Anat*. 2013;26:56–65.
5. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013. *CA Cancer J Clin*. 2013;63:11–30.
6. Halsted WS. The results of operations for the cure of cancer of the breast performed at the Johns Hopkins Hospital from June, 1889, to January, 1894. *Ann Surg*. 1894;20:497–555.
7. Urban JA. Extended radical mastectomy for breast cancer. *Am J Surg*. 1963;106:399–404.
8. Toth BA, Lappert P. Modified skin incisions for mastectomy: the need for plastic surgical input in pre-operative planning. *J Plast Reconstr Surg*. 1991;87:1048–1053.
9. Spears SL, Carter ME, Schwarz K. Prophylactic mastectomy: options and reconstructive alternatives. *J Plast Reconstr Surg*. 2005;115:891–909.
10. Sibbering DM, Galea MH, Morgan DAL, et al. Selection criteria for breast conservation in primary operable invasive breast cancer. *Eur J Cancer*. 1995;31A:2191–2195.
11. Metcalfe KA, Semple JL, Narod SA. Time to reconsider subcutaneous mastectomy for breast cancer prevention? *Lancet Oncol*. 2005;6:431–434.
12. Nahabedian MY, Tsangaris TN. Breast reconstruction following subcutaneous mastectomy for cancer: a critical appraisal of the nipple-areola complex. *J Plast Reconstr Surg*. 2006;117:1083–1090.
13. Cocquyt VF, Bloondeel PN, Depypere HT, et al. Better cosmetic results and comparable quality of life after skin-sparing mastectomy and immediate autologous breast reconstruction compared to breast conservative treatment. *Br J Plast Surg*. 2003;56:462–470.
14. Al-Ghazal S, Fallowfield L, Blamey R. Does cosmetic outcome from treatment of primary breast cancer influence psycho-social morbidity? *Eur J Surg Oncol*. 1999;25:571–573.
15. Veronesi U, Cascinelli N, Mariani L, et al. Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. *N Engl J Med*. 2002;347:1227–1232.
16. Freeman BS. Subcutaneous mastectomy for benign breast lesions with immediate or delayed prosthetic replacement. *J Plast Reconstr Surg*. 1962;30:676–682.
17. Crowne JP, Kim JA, Yetman R, Banbury J, Patrick RJ, Baynes D. Nipple-sparing mastectomy: technique and results of 54 procedures. *Arch Surg*. 2004;139:148–150.
18. Nahabedian MY. Acellular dermal matrices in primary breast reconstruction: principles, concepts, and indications. *J Plast Reconstr Surg*. 2012;130(suppl 2):44S.

19. Malata CM, McIntosh SA, Purushotham AD. Immediate breast reconstruction after mastectomy for cancer. *Br J Surg*. 2000;87:1455–1472.

20. Bloondeel PN. One hundred free DIEP flap breast reconstructions: a personal experience. *Br J Plast Surg*. 1999;52:104–107.

21. Al-Ghazal SK, Blamey RW. Subcutaneous mastectomy with implant reconstruction: cosmetic outcome and patient satisfaction. *Eur J Surg Oncol*. 2000;26:137–141.

10 22. Hartmann LC, Schaid DJ, Woods JE, Crotty JP, Myers JL, Arnold PG. Efficacy of bilateral prophylactic mastectomy in women with a family history of breast cancer. *N Engl J Med*. 1999;340:77–84.

23. Rosenberg MH, Palaia DA, Cahan A, Arthur K, DeLuca-Pytell D, Bonanno PC. Breast reconstruction with or without human acellular dermal matrices: a single-clinic, review of esthetic outcomes and risk factors for complications. *Am J Cosmet Surg*. 2014;31:7–17.

11 24. Cheung KL, Blamey RW, Robertson JFR, Elston CW, Ellis IO. Subcutaneous mastectomy for primary breast cancer and ductal carcinoma in situ. *Eur J Surg Oncol*. 1997;23:343–347.

12 25. Redfern AB, Hoopes JF. Subcutaneous mastectomy: a plea for conservatism. *J Plast Reconstr Surg*. 1978;62:706.

13 26. Cheung KL, Blamey RW, Robertson JFR, Elston CW, Ellis IO. Subcutaneous mastectomy for primary breast cancer and ductal carcinoma in situ. *Eur J Surg Oncol*. 1997;23:343–347.

27. Ringberg A. Subcutaneous mastectomy—surgical techniques and complications in 176 women. *Eur J Plast Surg*. 1990;13:7–15.

28. Al-Ghazal SK, Blamey RW. Subcutaneous mastectomy with implant reconstruction: cosmetic outcome and patient satisfaction. *Eur J Surg Oncol*. 2000;26:137–141.

29. Davila AA, Mioton LM, Chow G, et al. Immediate two-stage tissue expander breast reconstruction compared with one-stage permanent implant breast reconstruction: a multi-institutional comparison of short-term complications. *J Plast Surg Hand Surg*. 2013;47:344–349.

30. Rosenberg MH, Palaia DA, Cahan AC, Arthur KS, DeLuca-Pytell DM, Bonanno PC. Breast reconstruction with or without human acellular dermal matrices: a single-clinic review of esthetic outcomes and risk factors for complications. *Am J Cosmet Surg*. 2014;31:7–17.

31. Martin L, O'Donoghue JM, Horgan K, Thrush S, Johnson R, Gandhi A. Acellular dermal matrix (ADM) assisted breast reconstruction procedures: joint

guidelines from the Association of Breast Surgery and the British Association of Plastic, Reconstructive and Aesthetic Surgeons. *Eur J Surg Oncol*. 2013;39:425–429.

32. Vardanian AJ, Clayton JL, Roostaeian J, et al. Comparison of implant based immediate breast reconstruction with and without acellular dermal matrix. *J Plast Reconstr Surg*. 2011;128:403e–10e.

33. Hvilsom GB, Friis S, Frederiksen K, et al. The clinical course of immediate breast implant reconstruction after breast cancer. *Acta Oncol*. 2011;50:1045–1052.

34. Wainwright DJ. Use of an acellular allograft dermal matrix (AlloDerm) in the management of full-thickness burns. *Burns*. 1995;21(4):243–248

35. Breuing KH, Warren SM. Immediate bilateral breast reconstruction with implants and inferolateral AlloDerm slings. *Ann Plast Surg*. 2005;55:232–239.

36. Selber JC, Clemens MW, Oates S, Baumann DP. Autoderm: An alternative bioprosthetic for breast reconstruction. *J Plast Reconstr Surg*. 2013;131: 985–987.

37. Salzberg CA. Focus on technique: one-stage implant-based breast reconstruction. *J Plast Reconstr Surg*. 2012;60:1214–1218.

38. Nahabedian MY. Acellular dermal matrices in primary breast reconstruction: principles, concepts and indications. *J Plast Reconstr Surg*. 2012;130(suppl 2):44S. 14

39. Kim JYS, Long JN, Davilla A. Breast reconstruction with acellular dermis. Medscape. Updated October 3, 2013. Available at: <http://emedicine.medscape.com/article/1851090-overview>. Accessed March 18, 2015. 15

40. Rosenberg MH, Palaia DA, Cahan AC, Arthur KS, DeLuca-Pytell DM, Bonanno PC. Breast reconstruction with or without human acellular dermal matrices: a single-clinic review of esthetic outcomes and risk factors for complications. *Am J Cosmet Surg*. 2014;31:7–17. 16

41. Fisher J, Maxwell P, Woods J. Surgical alternatives in subcutaneous mastectomy reconstruction. *Clin Plast Surg*. 1988;15:667–671. 17

42. Ho G, Nguyen TJ, Shahabi A, Hwang BH, Chan LS, Wong A. A systematic review and meta-analysis of complications associated with acellular dermal matrix-assisted breast reconstruction. *Ann Plast Surg*. 2012;68:346–356. 18

43. Agrawal A, Sibbering DM, Courtney CA. Skin sparing mastectomy and immediate breast reconstruction: a review. *Eur J Surg Oncol*. 2013;39:320–328.

44. Namnoum JD. Expander/implant reconstruction with AlloDerm: recent experience. *J Plast Reconstr Surg*. 2009;124:387–394.
45. Vardanian AJ, Clayton JL, Roostaeian J, et al. Comparison of implant-based immediate breast reconstruction with and without acellular dermal matrix. *J Plast Reconstr Surg*. 2011;128:403e–410e.
46. Selber JC, Clemens MW, Oates S, Baumann DP. Autoderm: an alternative bioprosthesis for breast reconstruction. *J Plast Reconstr Surg*. 2013;131:985–987.
47. Gurunluoglu R, Gurunluoglu A, Williams SA, Tebockhorst S. Current trends in breast reconstruction: survey of American Society of Plastic Surgeons 2010. *Ann Plast Surg*. 2013;70:103–110.
48. Bindingavele V, Gaon M, Ota KS, Kulber DA, Lee DJ. Use of acellular cadaveric dermis and tissue expansion in postmastectomy breast reconstruction. *J Plast Reconstr Aesthet Surg*. 2007;60:1214–1218.
49. Spear SL, Parikh PM, Reisin E. Acellular dermis-assisted breast reconstruction. *Aesthetic Plast Surg*. 2008;32:418–425.
50. Haynes DF, Kreithen JC. Vicryl mesh in expander/implant breast reconstruction: long-term follow-up in 38 patients. *J Plast Reconstr Surg*. 2014;134:892–899.
51. Hartzell TL, Taghinia AH, Chang J, Lin SJ, Slavin SA. The use of human acellular dermal matrix for the correction of secondary deformities after breast augmentation: results and costs. *J Plast Reconstr Surg*. 2010;126:1711–1720.
52. Hudson DA, Adams KG, Adams S. Autologous dermal graft in breast reconstruction. *Ann Plast Surg*. 2012;68:253–256.

Authors QueriesJournal: **AJCS**

Paper:

Title: **Autoderm: An Alternative Option for Immediate Primary Breast Reconstruction After Mastectomy—A Case Report**

Dear Author

During the preparation of your manuscript for publication, the questions listed below have arisen. Please attend to these matters and return this form with your proof. Many thanks for your assistance

Query	Reference	Query Remarks
1	Author: This article has been lightly edited for grammar, style, and usage. Please compare it with your original document and make changes on these pages. Please limit your corrections to substantive changes that affect meaning. If no change is required in response to a question, please write “OK as set.” in the margin. Copy editor	
2	Author: OK to change “post” to “after” in the article title? “Post” is a prefix and thus needs to be attached to a word, not left standing alone. Copy editor	
3	Author: Please provide an abstract for the article. What was labeled an abstract appears to be the introduction and does not describe the case. Note that references may not appear in the abstract. Copy editor	
4	Author: In paragraph 2 of the Acellular Dermal Matrix in Breast Reconstruction section, was AlloDerm the only freeze-dried option? The punctuation was not clear. Copy editor	
5	Author: In paragraph 1 of the Case History, please clarify whether the patient had rheumatoid arthritis and hypothyroidism or whether a family history of the conditions was present. Copy editor	
6	Author: When trying to locate the volume and page numbers for reference 1, I discovered that the article is from a different journal. Please check the changes. Copy editor	
7	Author: Per style Web citations need a date accessed. For reference 2 I added today’s date for a placeholder. Please update with the date you accessed. Copy editor	
8	Author: Please confirm that the ending page number is correct as added for reference 16. Copy editor	
9	Author: Please add the ending page number for reference 18 or confirm that it’s a one-page article or abstract. Copy editor	
10	Author: Please confirm that the ending page number is correct as added for reference 22. Copy editor	
11	Author: Reference 24 is not cited in the text. Please cite or delete and renumber the subsequent references. Copy editor	
12	Author: Please add the ending page number for reference 25 or confirm that it’s a one-page article. Copy editor	
13	Author: Reference 24 and reference 26 are the same. Please delete the duplicate and renumber the references in text as needed. Copy editor	
14	Author: Please confirm that reference 38 is a one-page article or abstract. Copy editor	
15	Author: Per style Web citations need a date accessed. For reference 39 I added today’s date for a placeholder. Please update with the date you accessed. Copy editor	
16	Author: References 30 and 40 are the same. Please delete reference 40 and renumber as appropriate. Copy editor	
17	Author: Please confirm that the ending page number is correct as added for reference 41. Copy editor	
18	Author: Please confirm that the authors are correct as added for reference 42. Copy editor	
19	Author: Hyphens were added to the title of reference 50 after checking the reference online. OK as shown? Copy editor	
20	Author: In the caption for Figure 7, please write out AP. Copy editor	