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Breast

Evaluation of Dual-port versus Single-port Tissue Expanders in Postmastectomy Breast Reconstruction

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Background: Immediate tissue expander placement in postmastectomy breast reconstruction can be complicated by seroma or infection, requiring further imaging studies or interventions. This study compares dual-port tissue expanders, with both an aspiration and expansion port, with single-port expanders in terms of postoperative complications and further interventions.

Methods: Patients with immediate tissue expander placement from March 2019 to March 2020 were reviewed. Complications included seroma, infection, hematoma, necrosis, and malposition of the expander. Further intervention included aspiration, ultrasound imaging, interventional radiology (IR) drainage, or return to operating room.

Results: In total, 128 dual-port expanders were compared with 125 single-port expanders. Patients with single-port expanders were younger ($P = 0.022$) and of lower BMI ($P = 0.01$). There were no significant differences in key complications between these groups. In multivariate analysis, single-port expanders had a 3.4× higher odds of postoperative ultrasound imaging when controlling for texture, placement, and age ($P = 0.01$). Mean time to IR drain placement in the dual-port group was approximately 30 days after placement in single port (51.1 versus 21.4 days, $P = 0.013$). Thirty-four percent of dual-port expanders had at least one aspiration in clinic performed by plastic surgery, versus 2% of single port that required ultrasound-guided aspiration ($P < 0.001$).

Conclusions: There were no differences in key postoperative complications between the two expander cohorts. Dual-port expanders significantly reduced postoperative ultrasound imaging, and delayed IR drain placement. The added convenience of clinic aspirations likely reduced costs related to utilization of resources from other departments. *(Plast Reconstr Surg Glob Open 2021;9:e3703; doi: 10.1097/GOX.0000000000003703; Published online 15 July 2021.)*

INTRODUCTION

Breast reconstruction after mastectomy has well documented physical, mental, and emotional benefits in breast cancer patients.[1] In the United States, two-stage implant-based reconstruction remains the most commonly performed method, with 107,238 breast reconstructions performed in 2019, accounting for 70% of all reconstructions.[2] Implant-based reconstruction has numerous advantages, including predictable outcomes, ability to incorporate patient preference for implant size, and shorter operative time and recovery.[3,4] However, past studies have demonstrated infection, seroma, hematoma, and mastectomy flap and nipple necrosis as potential complications associated with implant-based reconstruction.[5–9] These outcomes are typically managed with some combination of antibiotics, further imaging, drain placement, operative washout, and potentially removal of the implant.[6] The two-stage approach has the potential to mitigate some of the negative outcomes associated with implants by initially placing less pressure on the mastectomy flap to allow the soft tissue time to heal before placement of the final implant.[1]

Widespread use of tissue expanders has resulted in advances in expander technology, including the advent of the dual-port (DP) tissue expander. While traditional tissue expanders contain a single expansion port for

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Fig. 1. The Sientra AlloX2 DP Tissue Expander.

injection or removal of saline, the AlloX2 tissue expander (Sientra, Santa Barbara, Calif.) was created with two ports; one for expansion and another for periprosthetic aspiration[10] (Fig. 1). The literature supports the potential advantage of DP expanders in managing seromas and infections, as the aspiration port allows for direct access to the periprosthetic milieu.[10–12] However, direct comparison between single and DP expanders in the literature has been sparse. The few studies that have compared the two types of expanders showed potentially reduced drain time, decreased image-guided drainage, and decreased postoperative pain in the DP group, but all tissue expanders were in the prepectoral plane with limited sample size.[11,13,14] We present our experience with the largest number of patients in the literature to date who underwent DP expander placement versus single-port (SP) expander placement. We further stratified patients by location of the expander in either the prepectoral or subpectoral planes.

METHODS

A retrospective review was performed of patients who underwent immediate tissue expander placement in two-stage breast reconstruction at the time of mastectomy from March 2019 to March 2020. Institutional review board approval was obtained before data collection. Any cases of delayed tissue expander placement or expander placement with concurrent autologous flap reconstruction were excluded. All cases were performed by one of the senior surgeons (M.P., R.F., E.K.) over the same time period. Patients were categorized into two groups: those who had conventional SP expander placement (Allergan Natrelle Style 133 or Sientra Dermaspan), and those who had DP expander placement (Sientra AlloX2).

Demographic, surgical, and postoperative variables were collected and compared between the two groups. Demographic variables recorded include age, race, ethnicity, body mass index, medical comorbidities (coronary artery disease, hypertension, diabetes, pulmonary disease, liver disease), tobacco use, history of prior breast reduction or augmentation, and cancer treatment (hormone therapy, neoadjuvant or adjuvant chemotherapy, radiation). Surgical characteristics included type of mastectomy (nipple sparing, skin sparing, modified radical), mastectomy incision (periareolar with or without lateral extension, inframammary fold (IMF), transverse, wise pattern, circumareolar), concurrent superior periareolar crescent mastopexy, lymph node dissection, use of acellular dermal matrix, expander texture, expander plane (prepectoral versus subpectoral), and intraoperative expander fill. Postoperative course was reviewed for duration of surgical drains, complications, and further interventions. Complications included seroma (defined as a volume >30 cm^3), hematoma, infection (requiring oral or intravenous antibiotics), expander malposition or leak, or return to operating room for any of the previous reasons. Further interventions of interest included additional postoperative ultrasound imaging, port aspiration in clinic (via the DP, when any suspicion for fluid collection), interventional radiology (IR) ultrasound-guided aspiration, or additional IR drain placement.

Categorical variables were assessed with chi square test or Fisher exact tests when appropriate. Continuous variables were assessed with the independent samples *T* test. Within cohort SP versus DP, analysis was performed for the prepectoral and subpectoral subgroups. Kaplan–Meier survival curves were created based on time to drain removal and time to IR drain placement and compared between groups with a log rank test. Multivariate logistic regression models were created for key postoperative outcomes controlling for expander type, texture, and pectoral placement as covariates. Cox proportional hazards regression was used for IR drain placement, controlling for texture. Median regression was used for the total drain days, controlling for expander type, texture, pectoral placement, age, BMI, mastectomy, and ADM use. As individual breasts were treated as independent observations, sensitivity analyses for all multivariable models were performed using bootstrap methods with resampling by patient to account for within-patient correlation. Hypothesis tests were two-sided, with a significance threshold of 0.05. Statistical analyses were performed using SPSS (IBM, Armonk, N.Y.), SAS (version 9.4), and Stata 16.

RESULTS

Demographics

A total of 153 patients were included in our study, comprising 253 breasts with tissue expander placement. An SP expander was used in 125 breasts, and a DP expander in 128 breasts. Patient in the SP group were slightly younger than those in the DP group (mean age 45 ± 10.8 versus 49 ± 10.9, $P = 0.022$), and had a lower BMI (23.7 ± 4.4 versus 25.8 ± 5.6, $P = 0.010$). The patients were mostly White at 59% and 70% in the SP and DP cohorts, respectively; there was greater Asian patient representation in the SP group (21% versus 8%) and greater Black/African American representation in the DP group (8% versus 1%). Otherwise, the two cohorts did not differ significantly in terms of demographics, comorbidities, prior breast surgical history, or cancer therapies (Table 1).

Table 1. Demographic Variables

Summary of Patient Characteristics in SP versus DP Tissue Expander Cohorts (n, %)			
	SP (n = 73)	DP (n = 80)	*P*
Age (Mean ± SD)	45.05 ± 10.79	49.13 ± 10.94	0.022*
BMI (Mean ± SD)	23.67 ± 4.34	25.79 ± 5.59	0.010*
Race			0.013*
White	43 (58.9)	56 (70.0)	
Black or African American	1 (1.4)	7 (8.8)	
Asian	16 (21.9)	7 (8.8)	
American Indian/ Alaska Native	0 (0)	0 (0)	
Native Hawaiian or Pacific Islander	0 (0)	2 (2.5)	
Unknown/declined to answer	13 (17.8)	8 (10.0)	
Ethnicity			0.087
Not Hispanic or Latino	61 (83.6)	74 (92.5)	
Hispanic of Latino	12 (16.4)	6 (7.5)	
Medical comorbidities			
Coronary artery disease	5 (6.8)	9 (11.3)	0.346
Hypertension	6 (8.2)	15 (18.8)	0.059
Diabetes	0 (0)	2 (2.5)	0.174
Lung disease (COPD, PF, ILD etc)	1 (1.4)	2 (2.5)	0.615
Liver disease (hepatitis, NAFLD, PBC etc)	0 (0)	0 (0)	
Tobacco use			0.171
Never smoker	63 (86.3)	61 (76.3)	
Former smoker	10 (13.7)	17 (21.3)	
Current smoker	0 (0)	2 (2.5)	
Prior breast augmentation	3 (4.1)	5 (6.3)	0.552
Prior breast reduction	5 (6.8)	11 (13.8)	0.164
Cancer therapy			
Hormone therapy	35 (47.9)	32 (40.0)	0.322
Neoajuvant chemotherapy	29 (39.7)	25 (31.3)	0.273
Prior radiation	2 (2.7)	7 (8.8)	0.115
Adjuvant chemo	22 (30.1)	20 (25.0)	0.477
Postmastectomy radiation	23 (31.5)	13 (16.3)	0.080

*Indicates statistically significant values.

Table 2. Operative Variables

Summary of Operative Characteristics in SP versus DP Tissue Expander Cohorts (n, %)			
Surgery Characteristic	SP (n = 125)	DP (n = 128)	*P*
Mastectomy			0.005*
Nipple sparing	117 (93.6)	105 (82.0)	
Skin sparing	8 (6.4)	23 (18.0)	
Mastectomy incision			0.072
Periareolar	32 (25.6)	25 (19.5)	
Periareolar with lateral extension	17 (13.6)	14 (10.9)	
IMF	68 (54.4)	67 (52.3)	
Transverse	8 (6.4)	19 (14.8)	
Wise pattern with circumareolar	0 (0)	3 (2.3)	
Concurrent crescent mastopexy	49 (39.2)	43 (33.6)	0.354
Placement			0.001*
Pre-pectoral	18 (14.4)	42 (32.8)	
Sub-pectoral	107 (85.6)	86 (67.2)	
Expander texture			<0.001*
Textured	69 (55.2)	0 (0)	
Smooth	56 (44.8)	128 (100)	
Acellular dermal matrix			0.008*
None	2 (1.6)	2 (1.6)	
Alloderm	89 (71.2)	111 (86.7)	
Dermacell	34 (27.2)	15 (11.7)	

*Indicates statistically significant values.

Surgical Characteristics

More patients in the SP group underwent nipple sparing mastectomy compared with the DP group (94% versus 82%, $P = 0.005$) (Table 2). Concurrent mastopexy or mastectomy incision did not differ between the two groups; more than 50% in each group underwent mastectomy via an IMF incision. Significantly more SP expanders were placed in the subpectoral plane, whereas more DP expanders were placed in the prepectoral plane (subpectoral SP 86% versus DP 67%; prepectoral SP 14% versus DP 33%; $P = 0.001$). All DP expanders were smooth by design, but 55% of SP expanders were textured ($P < 0.001$). The two groups did not differ in the use of acellular dermal matrix, but the type of matrix did differ (Alloderm: SP 71% versus DP 87%, Dermacell: SP 27% versus DP 11%, $P = 0.008$).

Postoperative Complications

There were no significant differences between the two cohorts in key complications, including expander malposition or leak, infection, hematoma, nipple or mastectomy flap necrosis, or return to operating room (Table 3). Kaplan–Meier drain-free survival curves further supported lack of significant difference ($P = 0.968$) (Figs. 2, 3).

Subgroup analysis of SP versus DP when stratified by prepectoral versus subpectoral expander placement (Table 4) showed a significantly lower infection rate for the dual-port prepectoral subgroup than for the single-port prepectoral subgroup (4% versus 22%, $P = 0.039$). The dual-port subpectoral (DPSP) subgroup similarly had a significantly lower infection rate (20% versus 25%, $P = 0.014$) and hematoma rate (1% versus 4%, $P = 0.015$) than the single-port subpectoral (SPSP) cohort, but had a higher rate of flipped expanders (13% versus 4%, $P = 0.020$) and IR drain placement (9% versus 5%, $P = 0.012$). No IR drains were placed in prepectoral reconstructions, whereas 13 IR drains were placed in the subpectoral subset. Significantly more drains were placed in the DPSP cohort compared with the SPSP (9% versus 5%, $P = 0.012$). The mean delay in postoperative days to IR drain placement was also significantly longer in the DPSP subgroup than in the SPSP subgroup (51 days versus 21 days, $P = 0.013$). Ultrasound imaging took place more often in the SPSP and single-port prepectoral subgroups than in the DPSP and dual-port prepectoral subgroups ($P < 0.05$). Total drain days, which included drains placed in the operating room and IR drains if applicable, did not differ significantly between the SP and DP groups. An estimated 45 patients underwent some form of aspiration, with higher rate of aspiration in the DP group (all performed in plastic surgery clinic) compared with the SP group (aspiration by IR) (33.6% (43/128) versus. 1.6% (2/125), $P < 0.001$); this held statistical significance in the subpectoral cohort ($P < 0.001$).

In multivariate analysis controlling for texture and prepectoral placement, dual or SP status was not significantly associated with seroma ($P = 0.07$), return to operating room ($P = 0.35$), superficial nipple necrosis ($P = 0.29$), full nipple necrosis ($P = 0.17$) or IR drain placement ($P = 0.85$) (Table 5). There were no significant associations in sensitivity analyses accounting for within-patient correlation. SP expanders did show a 3.4× higher odds of requiring postoperative ultrasound imaging than dual port when controlling for texture,

Table 3. Postoperative Variables

Summary of Postoperative Outcomes in SP versus DP Tissue Expander Cohorts (n, %)	SP (n = 125)	DP (n = 128)	*P*
Leaking expander	3 (2.4)	2 (1.6)	0.632
Flipped expander	4 (3.2)	11 (8.6)	0.069
Seroma >30 cm^3	11 (8.8)	16 (12.5)	0.341
Any aspiration	2 (1.6)	43 (33.6)	<0.001*
IR ultrasound-guided aspiration (no drain)	2 (1.6)	0 (0)	<0.001*
Plastic clinic aspiration #1	0 (0)	43 (33.6)	
Plastic clinic aspiration #2	0 (0)	21 (16.4)	
Plastic clinic aspiration #3	0 (0)	10 (7.8)	
Ultrasound #1	35 (28.0)	12 (9.4)	<0.001*
Ultrasound #2	10 (8.0)	4 (3.1)	<0.001*
Ultrasound #3	4 (3.2)	0 (0)	0.027*
Further ultrasound	2 (1.6)	0 (0)	0.151
IR drain placed	5 (4.0)	8 (6.3)	0.720
Mean days to IR drain placement	21.4 ± 6.0	51.1 ± 21.5	0.013*
Infection	31 (24.8)	20 (15.6)	0.069
Initial oral antibiotic treatment	39 (31.2)	23 (18.0)	0.049*
initial IV antibiotic admission	5 (4.0)	6 (4.7)	
Admission for IV Abx	16 (12.8)	14 (10.9)	0.061
Operating room management	6 (4.8)	5 (3.9)	0.727
Replaced TE	1 (0.8)	0 (0)	0.311
Explanted TE	5 (4.0)	5 (3.9)	0.969
Hematoma	4 (3.2)	1 (0.8)	0.134
Operating room evacuation	1 (0.8)	1(0.8)	
Necrosis			
Mastectomy flap superficial-partial thickness	7 (5.6)	3 (2.3)	0.184
Mastectomy flap full thickness	2(1.6)	3 (2.3)	0.671
Nipple superficial-partial thickness	17 (13.6)	10 (7.8)	0.136
Nipple full thickness	8 (6.4)	9 (7.0)	0.841
Operative management	11 (8.8)	10 (7.2)	0.129
Return to operating room for any reason (leak, flip, hematoma, infection, necrosis)	18 (14.4)	14 (10.9)	0.407
Final reconstruction plan			0.037*
Implant-based	110 (88.0)	97 (75.8)	
Autologous	5 (4.0)	16 (12.5)	
Reconstruction complete	79 (63.2)	71 (55.5)	0.211
Loss of reconstruction	2 (1.6)	1 (0.8)	
Patient elected for removal/takedown	1 (0.8)	0 (0)	
Study follow-up (mean days ± SD)	206.0 ± 102.68	144 ± 79.30	<0.001*
Total mean drain days ± SD	20.8 ± 11.02	20.7 ± 10.98	0.981

*Indicates statistically significant values.

prepectoral placement, age, and ADM use [odds ratio (OR) 3.42, 95% confidence interval (CI) 1.3–8.9, P = 0.01; sensitivity analysis OR 3.42, 95% CI 1.02–11.4, P = 0.046]. Ultrasound imaging odds were also increased almost 4× in subpectoral placement (OR 3.931, 95% CI 1.09–14.15, P = 0.0365). Interestingly, subpectoral placement increased odds of infection by 2.7 and return to operating room by 5.3 when compared with prepectoral expanders when controlling for texturing and expander port status. All flipped expanders were in the subpectoral plane, but multivariate analysis revealed no correlation with texturing or type of expander when controlling for the other.

DISCUSSION

The results of our study show no significant differences between single and DP tissue expanders in terms of key postoperative complications for patients undergoing breast reconstruction. When stratified by expander placement relative to the muscle plane, patients who had DP expanders placed in the prepectoral plane had a significantly lower infection rate than those who had SP expanders in the prepectoral plane and tended to have less seroma formation and fewer days with a drain; these findings are consistent with Momeni's initial experience with this device.[11] Although Wormer, Baker, and others illustrated why current practices have moved toward more prepectoral reconstruction with decreased pain and functional limitations,[15,16] there are still patients for whom subpectoral reconstruction is appropriate, including those with larger breasts, a history of radiation, or with other concern for quality of mastectomy skin flaps. Our study provides the first series of patients with DP expanders in the subpectoral plane, and showed the rate of infection was significantly lower for the DP group. Interestingly, increased seroma, expander flipping, and IR drain placement was observed in the DPSP subgroup. Although this may be due to the smoothness of the DP expander compared with the mixed texturing of the SP expanders, when controlling for all covariates, there were no significant differences observed. Additionally, when controlling for expander type and texturing, the odds of infection were doubled in the subpectoral plane. Thus from our data it can be concluded that when the right patient warrants subpectoral reconstruction, the DP expander significantly decreases chance of infection.

Although in theory, the DP expander allows access to the periprosthetic space, our results suggest that when placed below the muscle the aspiration port does not adequately evacuate seroma and negate radiology intervention as would be expected, as the majority of IR drains were placed in the DPSP cohort. This may be related to ineffective aspiration when in the subpectoral plane as the inferiorly based drain port may be occluded by surrounding tissue or ADM, or posterior collections on the chest wall which preclude adequate drainage despite gravity and manual pressure. It may also be attributed to the learning curve for providers in effectively aspirating the periprosthetic space. Furthermore, all flipped expanders were in the subpectoral plane, and increased in the DPSP cohort. Any association disappeared when controlling for expander and texture, which would imply flipping was not associated with these characteristics but rather something else related to the subpectoral space.

For both prepectoral and subpectoral reconstruction, the dual-port expanders significantly reduced the need for postoperative ultrasound imaging, with over 3x increased odds with SP expanders when controlling for plane placement and texturing. Additionally, 40% of DP cases were conveniently aspirated in plastic surgery clinic to evaluate for seroma when any suspicion for fluid collection on examination. This convenience aspiration has the potential to avoid the need for ultrasound imaging, radiology interpretation, and management delay, thereby not only improving utilization of resources but also saving time and costs for all parties

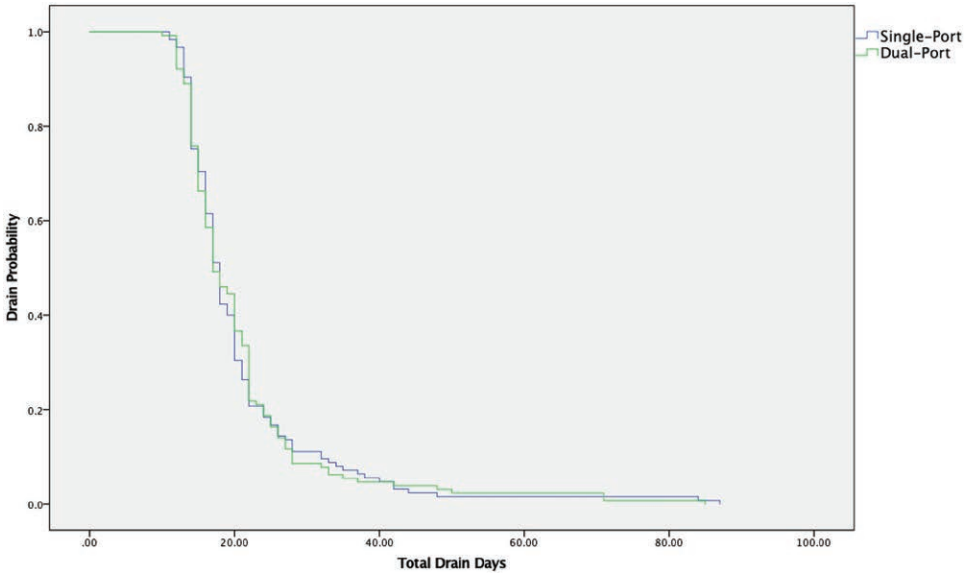

Fig. 2. Kaplan–Meier survival curve for time to drain removal ($P = 0.968$).

involved. At Sientra list pricing, a DP expander costs 500 dollars more than a SP expander; however, our data suggest that this initial additional cost may be extremely cost-effective in the long-term. Additionally, having direct access to the periprosthetic space allows for better diagnostic ability than imaging because the aspirate can be cultured to tailor antibiotic therapy. However, this technique is subject to operator error and potential inability to aspirate through the drain port, as was reflected by the increased IR drains placed in the subpectoral DP subgroup. This may suggest fluid collecting in a space that is not well accessed by the DP expander, despite theoretical access to the periprosthetic space. The total number of drain days, which included drains placed in the operative room and additional IR drains, did not differ significantly between groups. Typically, our protocol for drain removal requires output less than 30 cm^3 per day for three consecutive days. This may however be more reflective of our follow-up practice, where patients are typically seen at 1, 2, and 3 weeks postoperatively, with the majority of drains removed at the 2-week visit.

We did find that overall, DP expanders delayed overall placement of IR drains up to 30 days postoperatively. This suggests that the initial operative drains were kept in place on average for a shorter time in DP patients relative to SP patients, given the inherent aspiration port available. However, our findings indicate that the aspiration port did not preclude eventual IR drain placement. In our practice, the aspiration port is not routinely aspirated unless there was clinical suspicion for fluid collection; so further study may be warranted for adoption of routine aspiration.

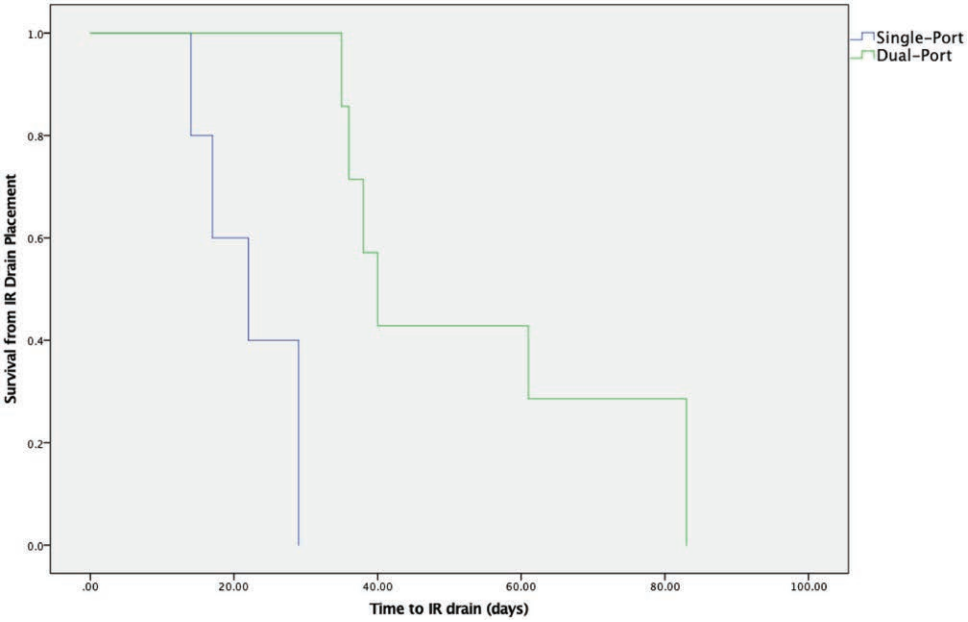

Fig. 3. Kaplan–Meier survival curve for time to IR drain placement ($P < 0.001$).

Table 4. Prepectoral versus Subpectoral Subgroup Analyses

	Prepectoral			Subpectoral		
Placement of Expander	**SP (n = 18)**	**DP (n = 42)**	***P***	**SP (n = 107)**	**DP (n = 86)**	***P***
Post mastectomy radiation	4 (22.2)	14 (33.3)	0.075	35 (32.7)	7 (8.1)	<0.001*
ADM use	12 (88.9)	40 (95.2)	0.366	107 (100)	86 (100)	
Leaking expander	0 (0)	0 (0)		3 (2.8)	2 (2.3)	*0.835*
Flipped expander	0 (0)	0 (0)		4 (3.7)	11(12.8)	*0.020**
Seroma >30 cm^3	3 (16.7)	2 (4.8)	*0.126*	7 (6.5)	14 (16.3)	*0.031**
Any aspiration	1 (5.6)	9 (21.4)	*0.131*	1 (0.9)	34 (39.5)	*<0.001**
IR ultrasound-guided aspiration (no drain)	1 (5.6)	0 (0)	*0.037**	1 (0.9)	0(0)	*<0.001**
Plastic clinic aspiration	0 (0)	9(21.4)		0(0)	34(39.5)	
Ultrasound #1	4 (22.2)	1 (2.4)	*0.011**	31 (29.0)	11(12.8)	*0.009**
Ultrasound #2	1 (5.6)	0 (0)	*0.123*	9 (8.4)	4(4.7)	*0.010**
Ultrasound #3	1 (5.6)	0 (0)	*0.123*	3(2.8)	0(0)	*0.011**
IR drain placed	0 (0)	0 (0)		5 (4.7)	8 (9.3)	*0.012**
Mean days to IR drain placement	NA	NA		21.4 ± 6.02	51.1 ± 21.52	*0.013**
Infection	4 (22.2)	2 (4.8)	*0.039**	27 (25.2)	18 (20.9)	*0.014**
Hematoma	0(0)	0 (0)		4 (3.7)	1 (1.2)	*0.015**
Necrosis						
Mastectomy flap superficial-partial thickness	0 (0)	0 (0)		7 (6.5)	3 (3.5)	*0.341*
Mastectomy flap full thickness	0 (0)	0 (0)		2 (1.9)	3 (3.5)	*0.482*
Nipple superficial-partial thickness	2 (11.1)	2(4.8)	*0.366*	15 (14.0)	8 (9.3)	*0.315*
Nipple full thickness	2 (11.1)	0 (0)	*0.028**	6 (5.6)	9 (10.5)	*0.210*
Return to operating room for any reason	2 (11.1)	0 (0)	*0.028*	16 (15.0)	14 (16.3)	*0.801*
Total mean drain days	19.2 ± 7.10	17.7 ± 4.73	*0.345*	21.0 ± 11.56	22.2 ± 12.75	*0.505*
Mean days to initial drain removal	19.2 ± 7.10	17.7 ± 4.73	*0.345*	21.0 ± 11.56	22.2 ± 12.75	*0.505*

*Indicates statistically significant values.

Table 5. Univariate and Multivariate Logistic Regression Analysis of Key Postoperative Outcomes

	Univariate Analysis			Multivariate Analysis		
Infection	**OR**	**95% CI**	***P***	**OR**	**95% CI**	***P***
SP versus DP (ref dual)	1.781	0.952–3.332	0.0710	1.505	0.6202–3.652	0.3661
Smooth versus textured (ref textured)	0.445	0.234–0.849	0.0139*	0.707	0.285–1.757	0.4556
Sub pec versus prepec (ref prepec)	2.736	1.105–6.777	0.0296*	3.423	1.113–10.523	0.0317*
Age	1.033	1.003–1.064	0.0327*	1.038	1.005–1.0725	0.0245*
Alloderm versus Dermacell	1.595	0.668–3.805	0.2927	2.212	0.888–5.512	0.0884
Seroma						
SP versus DP (ref dual)	0.609	0.265–1.399	0.2421	0.253	0.0559–1.141	0.0737
Smooth versus textured (ref textured)	0.827	0.342–2.000	0.6729	0.299	0.0603–1.482	0.1394
Sub pec versus prepec (ref prepec)	1.342	0.484–3.729	0.5717	1.399	0.482–4.058	0.5367
Return to operating room						
SP versus DP (ref dual)	1.370	0.649–2.890	0.4088	0.570	0.1768–1.835	0.3458
Smooth versus textured (ref textured)	0.426	0.199–0.913	0.0282*	0.360	0.1103–1.178	0.0912
Sub pec versus prepec (ref prepec)	5.337	1.237–23.037	0.0248*	4.620	1.042–20.478	0.0440*
Ultrasound						
SP versus DP (ref dual)	3.844	1.887–7.833	0.0002*	3.424	1.323–8.860	0.0112*
Smooth versus textured (ref textured)	0.271	0.140–0.525	0.0001*	0.692	0.282–1.699	0.4220
Sub pec versus prepec (ref prepec)	3.100	1.167–8.238	0.0233*	3.931	1.090–14.175	0.0365*
Age	1.019	0.989–1.051	0.2171	1.033	0.998–1.070	0.0643
Alloderm versus Dermacell	2.100	0.780–5.650	0.1418	3.643	1.287–10.313	0.0149*
Flipped expander						
SP versus DP (ref dual)	0.352	0.108–1.135	0.0805	0.394	0.084–1.839	0.2360
Smooth versus textured (ref textured)	2.546	0.556–11.587	0.2266	1.241	0.169–9.097	0.8321
Superficial nipple necrosis						
Single versus dual port (ref dual)	1.857	0.815–4.232	0.1406	0.42962	0.091–2.034	0.2868
Smooth versus textured (ref textured)	0.251	0.111–0.569	0.0009*	0.13871	0.030–0.644	0.0117*
Sub pec versus prepec (ref prepec)	1.894	0.628–5.712	0.2568	1.25067	0.386–4.052	0.7092
Full nipple necrosis						
SP versus DP (ref dual)	0.90408	0.337–2.423	0.8411	0.22696	0.028–1.844	0.1653
Smooth versus textured (ref textured)	0.50903	0.186–1.395	0.1894	0.18088	0.021–1.528	0.1163
Sub pec versus prepec (ref prepec)	2.4435	0.543–11.004	0.2450	2.24709	0.475–10.635	0.3073
	Univariate analysis			**Multivariate analysis**		
IR drain placement	**Hazard Ratio**	**95% CI**	***P***	**Hazard Ratio**	**95% CI**	***P***
SP versus DP (ref dual)	0.621	0.203–1.901	0.4043	0.877	0.233–3.307	0.8465
Smooth versus textured (ref textured)	2.229	0.494–10.066	0.2973	2.030	0.339–12.155	0.4380

*Indicates statistically significant values.

Additionally, only two IR ultrasound-guided aspirations were performed which did not leave a drain in place; both were of smooth SP expanders—one prepectoral and one subpectoral. Presumably a drain was not left in place because the volume was too low. These cases likely could have been aspirated in clinic if they were DP expanders.

Our study had several limitations. First, we analyzed retrospective data for patients who underwent tissue expander placement from March 2019 to March 2020 with follow-up until August of 2020; this includes a window of time in which elective surgeries were restricted and in-person follow-up limited due to COVID-19. Second, the patients were not randomized; so choice of expander and plane of insertion was primarily driven by surgeon preference on the basis of patient characteristics. We postulate that the two groups analyzed are comparable, given the lack of demonstrable differences between them in preoperative demographic and clinical variables, but there could be differences between the groups that we did not capture in this analysis, given its retrospective nature and various decisions specific to the operating surgeon. Finally, our sample size was relatively robust and comparable for comparison of DP and SP groups, but our sample sizes decreased substantially on further subgroup analysis, to the point that the prepectoral textured subgroup included only four cases, which could contribute to lack of power in our analysis.

CONCLUSIONS

Our study is the largest sample to date in which prepectoral and subpectoral tissue expander outcomes using traditional SP expanders were compared with outcomes of DP Sientra AlloX2 expanders. The two groups did not differ in key postoperative complications. However, despite decreasing infection rates, there were increased seromas, expander flipping, and IR drain placement in the DP subpectoral subgroup compared with similarly placed SP expanders. These differences were not seen on multivariate analysis, suggesting no relation when controlling for texturing and plane placement. In the prepectoral plane, DP expanders were associated with fewer postoperative complications. DP expanders significantly reduced the need for postoperative ultrasound imaging, and delayed IR drain placement up to 30 days. This, combined with added convenience of in-clinic aspirations, likely reduced costs related to utilization of resources from other departments, which in itself strongly supports the use of DP expanders in postmastectomy breast reconstruction.

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