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The Impact Of Radiation And Chemotherapy On Outcomes In Tissue Expander-Based Breast Reconstructions

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Background:
Effects of neoadjuvant chemotherapy(NACT), adjuvant chemotherapy(ACT), and radiation(RAD) on the reconstruction process have not been studied fully.

Methods:
From January2012 to December2016 two surgeons at one hospital performed breast reconstructions with tissue expanders(TE) on 445 patients. Patients were split into eight cohorts based on cancer therapy: Group1(no treatment,n=193), Group2(NACT,n=43), Group3(ACT,n=55), Group4(NACT+ACT,n=13), Group5(NACT+RAD,n=60), Group6(ACT+RAD,n=37), Group7(NACT+ACT+RAD,n=20), Group8(RAD,n=24). Percentage of patients who chose flaps and percentage who lost reconstruction after TE explant were calculated. Among patients who received implants(n=268), percentages of patients with various complications were calculated. Numbers of surgeries at different stages in the reconstruction process were counted. ANOVA & Tukey-HSD were run.

Results:
Group6(8%) had the highest loss of reconstruction after TE explant(p=.05). Group7(80%) and Group5(61%) had the highest rates of patients choosing flaps without implant placement(p=0). Amongst patients receiving implants, percentages of patients with all complications were equal, except for TE exchange: Group6(15%) had the highest rate of TE exchange for new TE(p=.01). Amongst patients receiving implants, Group5(39.1%), Group6(35%), and Group8 (35.7%) had the highest percentages of patients undergoing at least one complication surgery before implant placement(p=.04). There were no significant differences in the percentage of patients undergoing at least one complication-related surgery after implant placement(p=.91) or percentage of patients undergoing at least one revision surgery(p=.75). Amongst patients receiving implants, mean number of total surgeries per patient was equivalent across groups(p=.12).

Table 1. Age, BMI, percentages of patients with comorbidities, percentage of patients who lost reconstruction, percentage of patients who opted for flap without implant placement.

Group	n	Age (yr)	BMI (kg/m^2)	% Patients with Smoking History	% Patients with Hypertension	% Patients with Diabetes	% Patients with other autoimmune	% Patients who lost reconstruction after TE explant	% Patients opting for flap **without** implant placement
1 (no treatment)	193	48.9*	26.3	25	22	6	7	2	27*
2 (NACT)	43	47.3*	27.6	23	21	5	12	0	37*
3 (ACT)	55	48.3*	26.3	33	16	5	2	0*	35* , **
4 (NACT+ACT)	13	46.0	23.8	0	23	0	0	0	23*
5 (NACT+RAD)	60	45.5*	27.7	20	21	11	5	0*	61**
6 (ACT+RAD)	37	51.9	27.9	27	32	0	5	8*	38*
7 (NACT+ACT+RAD)	20	45.1	26.7	20	30	15	5	0	80*
8 (RAD)	24	57.3*	25.0	38	38	0	4	0	42
F, p (ANOVA) Degrees of freedom (df) between groups = 7 Degrees of freedom (df) within groups = 437 p (Tukey-HSD) if applicable		.80, .59 *grp1 & 8: p=.01 *grp2 & 8: p=.01 *grp3 & 8: p=.02 *grp5 & 8: p=.01	1.4, .21	1.1, .22	.97, .45	1.6, .13	.82, .57	2.0, .05 *grp3 & 6: p=.05 *grp5 & 6: p=.04	6.2, 0 *grp1 & 7: p=0 *grp2 & 7: p=.02 *grp3 & 7: p=.01 *grp4 & 7: p=.02 *grp6 & 7: p=.03 **grp3 & 5: p=.04

Table 2. Percentages of patients with specific complications **amongst those who received implant**.

Group	n	Infection requiring IV antibiotics	Necrosis requiring operation	TE Exchange to new TE	TE or implant rupture	Seroma	Hematoma	Anatomic Implant rotation	DVT	PE	other
1 (no treatment)	134	5.2	4.5	1.5*	.8	6.7	5.2	5.2	0	0	12.7
2 (NACT)	27	3.7	11.1	0*	0	14.8	3.7	0	0	0	0
3 (ACT)	36	11.1	0	0*	2.8	8.3	0	11.1	0	0	0
4 (NACT+ACT)	10	0	0	0	0	0	0	0	0	0	0
5 (NACT+RAD)	23	4.4	8.7	4.4	4.4	17.4	4.4	4.4	0	0	13.0
6 (ACT+RAD)	20	15	10	15*	0	15	15	5.0	0	0	5.0
7 (NACT+ACT+RAD)	4	0	0	0	0	0	0	0	0	0	25
8 (RAD)	14	7.1	0	0	0	21.4	7.1	7.1	0	0	0
F , p (ANOVA) df between groups = 7 df within groups = 260 p (Tukey HSD) – if applicable		.80, .59	1.1, .39	2.6, .01 *grp1 & 6: p=.003 *grp2 & 6: p=.01 *grp3 & 6: p=.01	.55, .78	1.2, .32	1.0, .40	.70, .68	n/a	n/a	.19, .98

Table 3. Mean numbers of surgeries and percentages undergoing different types of surgeries **amongst patients who received implant.**

Group	n	Mean number of complication surgeries before implant placement	Mean number of Complication surgeries after implant placement	Mean number of revision surgeries	Mean total number of surgeries	**Percentage** of patients with at least one complication-related surgeries before implant placement	**Percentage** of patients with at least one complication-related surgery after implant placement	**Percentage** of patients with at least one revision surgery
1 (no treatment)	134	.2	.06	0.6	2.9	19.4	5.2	46.3
2 (NACT)	27	.1	.04	0.6	2.7	11.1	3.7	55.6
3 (ACT)	36	.1	.03	0.6	2.8	16.7	2.8	44.4
4 (NACT+ACT)	10	0	0	0.3	2.4	0	0	30.0
5 (NACT+RAD)	23	.4	.17	0.6	3.3	39.1	4.4	52.2
6 (ACT+RAD)	20	.6	0	0.6	3.3	35.0	0	45.0
7 (NACT+ACT+RAD)	4	0	0	1	3.0	0	0	75.0
8 (RAD)	14	.2	0	.4	2.7	35.7	0	35.7
F , p (ANOVA) df between groups = 7 df within groups = 260 ***Tukey-HSD showed no specific intergroup differences***		2.5, .02	.70, .67	.46, .86	1.7, .12	2.1, .04	.49, .91	.61, .75

Table 4. Age, BMI, and percentages of comorbidities **amongst patients who received implant.**

Group	n	Age	BMI	**Percentage** with history of smoking	**Percentage** of patients with hypertension	**Percentage** of patients with diabetes	**Percentage** of patients with other autoimmune
1 (no treatment)	134	47.5	24.3	23	20	2.2	5.2
2 (NACT)	27	47.9	24.6	19	22	3.7	7.4
3 (ACT)	36	47.5	24.4	33	11	2.8	2.8
4 (NACT+ACT)	10	43.7	22.0	0	10	0	0
5 (NACT+RAD)	23	46.6	24.1	8.7	17	4.4	8.7
6 (ACT+RAD)	20	48.5	24.6	25	25	0	5
7 (NACT+ACT+RAD)	4	34.8*	29.7	0	50	25	0
8 (RAD)	14	55.9*	23.2	36	36	0	7.1
F, p (ANOVA) df between groups = 7 df within groups = 260 p (Tukey-HSD), if applicable		2.1, .04 *grp7 & 8: p=.02	1.1, .39	1.6, .15	1.0, .41	1.4, .22	.30, .95

Conclusions:

Given that Group6 had the highest percentage of lost reconstructions, highest rate of TE exchange, and second highest percentage of patients undergoing at least one complication-related surgery, extra care should be taken when guiding these patients through the reconstruction process. However, insignificant differences across other complication measures should allow surgeons and patients to remain cautiously optimistic about pursuing tissue expander-based reconstruction concurrently with cancer therapies.

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