Mini Talk| Breast

Clinicopathologic and demographic factors that influence sentinel lymph node biopsy after neoadjuvant therapy for breast cancer

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Introduction/Background

Implementation of sentinel lymph node biopsy (SLNB) has been pivotal for de-escalation of the extent of surgery in the axilla. Trials have investigated the application of SLNB in the setting of neoadjuvant systemic therapy (NST) have not proven accuracy in this setting. Increasing the number of nodes is a common practice to increase the accuracy of SLNB. The purpose of this study is to investigate recent trends and factors that influence the number of lymph nodes (LNs) removed post neoadjuvant chemotherapy.

Methods:

The National Cancer Database (NCDB) was queried for breast cancer patients at least 18 years old treated with intent to cure from 2018-2019 who underwent sentinel lymph node biopsy (SLNB) without further axillary dissection at a Commission on Cancer (CoC)-accredited facility. The number of LNs retrieved during SLNB was computed for patients receiving NST and those having surgery upfront. Descriptive statistics, odds ratios (OR), and 95% confidence interval (CI) were estimated for the following demographic and clinicopathologic variables: age, race/ethnicity, metro area, type of treatment facility, breast sub-type, clinical stage, type of breast surgery, and number of SLNs resected. Multivariable logistic regression was used to analyze the odds of having 3-8 SLNs resected.

Results:

A total of 255,753 patients met inclusion criteria. Overall, the median (IQR) age was 63(53-70) years,76.1% patients were Non-Hispanic White, 66.7% were clinically stage I, and 63.8% were ER+/PR+/HER2 nonamplified, 39.8% were treated at a comprehensive community cancer program, and 65.9% underwent partial mastectomy. Overall, of the 25,748 patients that had SLNB post NST, 13,627 (52.9%) had 3-8 nodes resected compared to 89,809 of 230,005 (39.1%) of patients who had surgery upfront [p<0.001]. Multivariable binary logistic regression revealed the odds of 3-8 SLNs resected were 1.49 (95% CI: 1.45, 1.54) times greater in the NST group when adjusting for the following significant covariables: age, race/ethnicity, type of treatment facility, breast sub-type, and breast surgery (Table 2). In subsequent analysis of the NST group, the multivariable odds of 3-8 SLNs resected were 1.31 (95% CI: 1.23, 1.40) greater for clinical stage II and 1.81 (95% CI 1.65, 1.98) greater for clinical stage III.

Conclusion

SLNB following NST is a common practice despite negative large multi-institutional trials. Increasing the number of resected nodes is associated with NST, higher clinical stage and younger age at presentation.

Table 1. Simple and Multivariable logistic regression odds ratio of retrieving 3-8 lymph nodes on SLNBx

	<3 SLNs N (%)	3-8 SLNs N (%)	Unadjusted OR (95% CI)	P value	Multivariable OR (95% CI) N= 245,689
SLNBx schedule					
Upfront Surgery (Ref)	**140,196 (92.0)**	**89,809 (86.8)**	**1.00**		1.00
Post-neoadjuvant systemic therapy	**12,121 (8.0)**	**13,627 (13.2)**	**1.76 (1.71, 1.80)**	**<0.001**	**1.49 (1.45, 1.54)**
Age					
18-39	4,311 (2.8)	4,995 (4.8)	1.84 (1.76, 1.92)		---
40-49	18,810 (13.4)	16,635 (16.1)	1.40 (1.37, 1.44)		**1.30 (1.27, 1.34)**
50-59	34,151 (22.4)	24,643 (23.8)	1.15 (1.12, 1.17)		**1.11 (1.08, 1.13)**
60-69 (Reference)	49,683 (32.6)	31,280 (30.2)	1.00		1.00
70-79	36,184 (23.8)	20,850 (20.2)	0.92 (0.90, 0.94)		**0.93 (0.91, 0.96)**
80+	9,178 (6.0)	5,033 (4.9)	0.87 (0.84, 0.90)	**<0.001**	**0.88 (0.85, 0.91)**
Race/Ethnicity					
Non-Hispanic White (Ref)	117,713 (77.5)	76,811 (74.5)	1.00		1.00
Non-Hispanic Black	14,363 (9.5)	12,039 (11.7)	1.28 (1.25, 1.32)		**1.21 (1.18, 1.24)**
Hispanic/Latinx	11,583 (7.6)	8,630 (8.4)	1.14 (1.11, 1.18)		**1.05 (1.02, 1.08)**
Non-Hispanic Asian/Pacific Islander	6,847 (4.5)	4,738 (4.6)	1.06 (1.02, 1.10)		0.97 (0.93, 1.01)
Other	1,370 (0.9)	912 (0.9)	1.02 (0.94, 1.10)		0.95 (0.87, 1.03)
			---	**<0.001**	
Facility type					
Comprehensive Community Cancer Program (Ref)	63,705 (43.0)	6,621 (6.7)	1.00		1.00
Academic/Research Program	41,919 (28.5)	38,168 (38.8)	1.22 (1.20, 1.25)		**1.18 (1.15, 1.20)**
Integrated Network Cancer Program	31,770 (21.5)	30,738 (31.2)	1.20 (1.18, 1.23)		**1.19 (1.16,1.21)**
Community Cancer Program	10,612 (7.2)	22,914 (23.3)	1.04 (1.01, 1.08)	**<0.001**	**1.05 (1.02, 1.09)**
Biological profile					
DCIS	13,074 (8.6)	6,928 (6.7)	0.80 (0.77, 0.82)		**0.69 (0.67, 0.72)**
ER+/PR+/HER2- (Ref)	98,051 (64.4)	65,197 (63.0)	1.00		1.00
HER2+	8,758 (5.8)	7,274 (7.0)	1.25 (1.21, 1.29)		**1.07 (1.03, 1.10)**
TNBC	13,033 (8.6)	11,428 (11.1)	1.32 (1.28 (1.35)	**<0.001**	**1.07 (1.04,1.11)**
Unknown	19,401 (12.7)	12,609 (12.2)	0.98 (0.95, 1.00)		0.93 (0.91, 0.96)
Type of breast surgery					
Partial mastectomy	103,961 (68.3)	64,587 (62.5)	1.00		1.00
Mastectomy	48,321 (31.7)	38,826 (37.5)	1.29 (1.27, 1.31)	**<0.001**	**1.24 (1.22, 1.27)**

Mini Talk| Breast

Immune Gene Signature Changes in Breast Cancer Cryoablation— Potential Biomarkers of the Abscopal Effect

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Introduction/Background

Cryoablation is a non-surgical alternative to resection that utilizes rapid freeze-thaw cycles to kill cancer cells. Since the dead cells are not excised, tumor-derived antigens are preserved. We previously found that mice with bilateral high-risk metastatic breast tumors that underwent cryoablation of the primary tumor had enrichment of tumor-infiltrating lymphocytes in the non-treated, abscopal tumor, prolonging overall survival. This raises the question of which mechanisms are involved in cryoablation-promoted antitumor immunity. In this study, we used RNA-sequencing (RNA-Seq) to identify immune gene signatures associated with enhanced abscopal effect following cryoablation versus resection in a murine model of metastatic breast cancer.

Methods:

BALB/c mice were bilaterally, orthotopically implanted with 4T1-12B (luciferase-expressing) cells. Two weeks later, the left tumors were resected or cryoablated. One week posttreatment, the right tumors were removed to assess the abscopal immune response by RNA-Seq. Left tumors were resected at two weeks and used as baseline controls. FASTQ files were trimmed and aligned to GRCm39; read counts were analyzed with edgeR and resulting differentially expressed genes with Ingenuity Pathway Analysis. Tumor samples were stained for a comprehensive lymphoid panel. Flow data was acquired using a Cytek Northern Lights spectral analyzer and the NL-CLC flow running SpectroFlo CLC Software. Data was analyzed using FlowJo v10.81 software. GraphPad PRISM 9 software was used to generate graphs and perform statistical analysis.

Results:

Cryoablated and resected tumors displayed differing overall gene signatures and global activation of distinct signaling pathways in abscopal tumors compared to baseline and each other. Following cryoablation, abscopal tumors demonstrated an upregulation of genes of various T cell populations and B cells compared to resection. This suggests that cryoablation uniquely affects lymphocyte status. We found differences in immune pathway signaling. Of note, genes that promote angiogenesis and immunosuppression (Cxcl2) or metastasis (Cx3cr1) were downregulated in abscopal tumors following cryoablation compared to resection. In contrast, genes involved in T and NK cell-mediated cytolysis (perforin 1, Prf1) and tumor suppression (Stat6 and Nlrp12) were upregulated. Flow cytometry showed that cryoablation augments infiltration of natural killer cells and activated T cells into abscopal tumors compared to resection.

Conclusion

We identified important pathways and genes involved in tumorigenesis and immune function, which may serve as biomarkers of the abscopal effect induced by cryoablation. Our findings suggest cryoablation reduces immunosuppression while enhancing T cell infiltration and cytotoxicity within abscopal tumors compared to resection. Future in silico and in vivo approaches will further define mechanisms by which cryoablation shapes the abscopal tumor immune landscape.

Mini Talk| Breast

Demographic Determinants of Pathologic Complete Response

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Introduction/Background

Pathologic complete response (PCR) is often utilized as a proxy for overall prognosis in breast cancer. Whereas significant differences in PCR are reported depending on biological tumor profiles, the role of demographic variables in such prediction is less clear.

Methods:

Prospective institutional database between January 2018 and September 2022 was queried to identify patients undergoing neoadjuvant chemotherapy (NAC). Data was gathered on completion of therapy, comorbidities, and final surgical pathology. Statistical analysis was conducted using R statistical software (version 4.1.3). Categorical variables were analyzed using $\chi 2$ or Fisher Exact test and continuous data was analyzed using t-tests with Welch-Satterthwaite correction. Multiple linear regressions were used to study interactions between therapy, ethnicity and obesity and PCR.

Results:

A total of 124 patients were offered NAC; 112 (90.3%) who underwent resection post-NAC were included in the analysis. Overall, 26 (23.2%) had PCR; four (14.8%) in ER+/HER2- group; 17 (65.4%) in HER2+ group; and 5 (19.2%) in TN group. Forty five (40.2%) patients were Hispanic; 62 (55.4%) were obese. Univariate analysis did not show significant association between ethnicity, obesity and ability to achieve PCR. The interaction model showed no association of obesity with PCR in non-Hispanics; however, Hispanic women with obesity had higher odds of residual disease (OR = 0.191 [0.029, 1.157]; p = 0.076). Hispanic women with normal BMI had higher odds of achieving pCR (OR = 4.16 [1.126, 16.868]; p = 0.036). The results were consistent even after controlling for confounding variables such as age, comorbidities, and clinical T and N stages.

Conclusion

Obesity is a risk factor for failure to achieve PCR in Hispanic women undergoing NAC. Studied with larger groups are needed to prove this observation. Additional studies on the role of BMI in drug resistance would be important among this ethnic minority.

Variable	Non-PCR (n = 86)	PCR (n=26)	t-statistic/ χ^2	p-value
Age	57.92 ± 12.40	58.81 ± 13.51	0.300	0.766
BMI	31.49 ± 6.29	31.17 ± 6.71	-0.121	0.904
Race				
White	79 (91.9%)	23 (88.5%)		0.695
Non White	7 (81.1%)	3 (11.5%)		
Ethnicity				
Hispanic	32 (37.2%)	13 (50.0%)	0.879	0.349
Non Hispanic	54 (62.8%)	13 (50%)		
Tumor Profile				
ER+	59 (68.6%)	13 (50.0%)	2.254	0.133
HER2+	30 (34.9%)	17 (65.4%)	6.425	**0.011**
Triple neg	20 (23.3%)	5 (19.2%)	0.027	0.870
Clinical Tumor stage T1 T2 T3 T4	 24 (27.9%) 33 (38.4%) 21 (24.4%) 4 (4.7%)	 6 (23.0%) 9 (34.6%) 8 (30.8%) 3 (11.5%)		0.86
Clinical Node stage N0 N1 N2 and above	 42 (48.8%) 39 (45.3%) 2 (2.3%)	 12 (46.2%) 14 (53.8%) 0 (0)		0.520

Mini Talk| Breast

Breast Cancer Treatment Disparities in a Rural Setting: Breast Conserving Therapy versus Mastectomy

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Introduction/Background

Randomized controlled trials have shown that survival rates are comparable for patients with early-stage breast cancer who undergo breast-conserving therapy (BCT) or mastectomy. As a result the rates of BCT have increased nationwide over the last few decades, yet a significant portion of women continue to have mastectomies. Many factors can affect a woman's choice of surgical treatment such as access to radiation centers, socioeconomic status, insurance status and living in certain geographic regions. The purpose of this study is to identify the determinants of surgical breast cancer treatment among women residing in rural communities.

Methods:

Data was prospectively obtained from patients with breast cancer diagnosed between 2012 and 2017 at single health care system in East Texas. Demographics, barriers to care, support services offered, pre-treatment services, type of cancer, and stage of cancer were analyzed to identify trends among patients who received breast conserving therapy and patients who qualified for breast conserving therapy and chose to have a mastectomy.

Results:

In total, 162 patients had a mastectomy with 16.1% receiving the surgery due to patient preference. Of the 124 patients who qualified for BCT, 79% received BCT, 21% received a mastectomy. Patients opting for a mastectomy were younger (58 vs. 65), p-value <0.05. With every one-year increase in age the patient was 5% more likely to choose BCT. When a patient reported no financial support, they were 2.7 times more likely to choose a mastectomy. A positive correlation was found between patients who chose mastectomy and received psychosocial services, p-value <0.05. Among patients who received genetic evaluation, those who were screened were more likely to choose BCT (61.9% vs. 26.9%) and those who were tested were more likely to choose a mastectomy (38% vs. 69.2%).

Conclusion

Among all surgeries, women undergoing mastectomy presented with more advanced disease and reported more socioeconomic barriers compared to those undergoing BCT. Conversely, women who underwent BCT were more likely to have health insurance. Our findings confirm the increasing utilization of BCT, particularly in the southern United Sates. The subset of women who were clinically eligible, opted to pursue BCT in almost 80% of cases, one of the highest rates reported in the literature. Further analysis of this group showed BCT was more likely in older patients, those with financial support, and women who received genetic screening. Having a multidisciplinary approach to treating breast cancer, including a local coordinator who councils and educates patients, contributes to our ability to pursue breast conserving measures in rural and geographically distant communities.

Table 4. Characteristics of 124 patients by breast conserving therapy and patient preference mastectomy.

	Total	Breast Conserving Therapy 98 (79)	Patient Preference Mastectomy 26 (21)	P-value	Crude Odds Ratio 95% CI
Age at diagnosis, mean (sd)	64 (12)	65 (11)	58 (14)	<0.05	0.95 (0.92 to 0.99)
Died, n (%)	2 (1.6)	2 (2)	0 (0)		
Marital status, n (%)					
Single	20 (16.5)	15 (15.6)	5 (20)		
Married	66 (54.6)	52 (54.2)	14 (56)		
Divorced	8 (6.6)	5 (5.2)	3 (12)		
Widowed	27 (22.3)	24 (25)	3 (12)		
Race/ethnicity, n (%)					
White	94 (75.8)	74 (75.5)	20 (76.9)		
Black	16 (12.9)	13 (13.3)	3 (11.5)		
Hispanic/Latino	13 (10.5)	10 (10.2)	2 (11.5)		
Asian	1 (0.8)	1 (1)	0 (0)		
Insurance status, n (%)					
Uninsured	14 (11.3)	9 (9.2)	5 (19.2)		
Partially insured	19 (15.3)	16 (16.3)	3 (11.5)		
Insured	91 (73.4)	73 (74.5)	18 (69.2)		
Barriers, n (%)					
No barriers	47 (37.9)	36 (36.7)	11 (42.3)		
No insurance	14 (11.3)	9 (9.2)	5 (19.2)		
Inadequate insurance	23 (18.6)	19 (19.4)	4 (15.4)		
Lack of medical resources	17 (13.7)	13 (13.3)	4 (15.4)		
No transportation	3 (2.4)	2 (2)	1 (3.9)		
No support services	22 (17.7)	16 (16.3)	6 (23.1)		
Comorbidities	34 (27.4)	29 (29.6)	5 (19.2)		
Compliance	8 (6.5)	6 (6.1)	2 (7.7)		
No social support	17 (13.7)	11 (11.2)	6 (23.1)		
No financial support	25 (20.2)	16 (16.3)	9 (34.6)	<0.05	2.71 (1.03 to 7.15)
Fixed income	16 (12.9)	15 (15.3)	1 (3.9)		
Non-US citizen	2 (1.6)	1 (1.0)	1 (3.9)		
Total number of barriers, median (IQR)	1 (2)	1 (2)	1 (2)		

Mini Talk| Surgical Oncology

Disparities in Timeliness of Breast Cancer Treatment in a Rural Setting

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Introduction/Background

Evidence-based benchmarks have been established to assess the quality of breast cancer care, as delays in treatment are associated with poor clinical outcomes. We sought to identify factors affecting timeliness of care among breast cancer patients of a rural East Texas health care system.

Methods:

Patients from rural East Texas with invasive breast cancer were identified and followed prospectively between 2012 and 2017. Timeliness of care was evaluated for the following three intervals: diagnostic imaging to biopsy, biopsy to surgical treatment, and mammogram to surgical treatment. According to the National Consortium of Breast Centers (NCBC), this is defined as achieving diagnostic imaging to needle biopsy within 7 days, needle biopsy to surgical treatment within 14 days, and mammogram to surgical treatment within 28 days. Correlations between the demographic and clinical factors that influence timely initiation of treatment of our population were evaluated against the NCBC recommendations.

Results:

In total, 278 cases were identified over the 5-year study period. The mean (SD) age was 62 (13) with a majority being insured (64.5%). Only 49.5% met the NCBC recommended timeline from diagnostic imaging to biopsy, 13.3% from mammogram to surgical treatment, and 10.3% from biopsy to surgical treatment. Pairwise comparisons suggested that a delay in the "diagnostic imaging to biopsy" interval or "biopsy to surgical treatment" interval significantly predicted delays in other intervals ($p=0.001$ and $p<0.001$, respectively). Cox hazard ratio revealed that Hispanics were more likely to present late, with stage 3 cancer (29.6% vs. 8.8 %, $p=0.001$) at the time of diagnosis. Disease-specific mortality was 4.5 times higher for Hispanics when compared to white patients (95% CI [1.08 to 18.86], $p=0.02$).

Conclusion

Nationwide, a multitude of factors including race, ethnicity, and access to care are known to influence timeliness of breast cancer treatment. Our East Texas population had a significant delay in the initiation of treatment. Our data shows that failure to be timely in "diagnostic imaging to biopsy" or "biopsy to surgical treatment" intervals significantly predicts treatment delays in other phases of care. It is also known that breast cancer patients who do not receive timely diagnosis and treatment have higher mortality rates. This notion is reinforced by our data, specifically in the Hispanic population. Knowledge of factors that influence the timeliness of breast cancer treatment may allow for targeted interventions in the future for patients at greater risk of delays in care.

Mini Talk| Surgical Oncology

Prehabilitation to Reduce Postoperative Pulmonary Complications (PPCs) in Surgical Oncology Patients

Kayla Callaway
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Introduction/Background

Oncological surgeries tend to be complex and exact a heavy toll on patients. With incisions extending up to the diaphragm, these procedures can alter lung mechanics and disrupt diaphragmatic function, putting these patients at increased risk for Postoperative Pulmonary Complications (PPCs) – pneumonia, unplanned intubation, and prolonged ventilation. PPCs have been linked to increased length of stay (LOS) and higher readmission rates. A preoperative standardized multimodal assessment of patient fitness for surgery is urgently needed given the significant potential for cardiac and pulmonary complications after surgery. Most oncological surgeries can be planned to allow for pre-operative customized physical, nutritional and psychological preparation. Enhanced recovery protocols have contributed to early recovery from surgery, but their focus is largely on in-hospital care and immediate post-operative care, which does not acknowledge the role of the patient in improving outcomes. Standardized multimodal prehabilitation, conversely, places the emphasis on the patient by targeting individual risk factors.

Methods:

Standardized multimodal prehabilitation protocols are implemented pre-operatively. The regimen 1) screens oncological surgery patients for frailty and sarcopenia (2) provides customized multimodal nutritional, physical, and psychosocial therapies during the 2-8 weeks preoperative window. PPCs, LOS and readmission rates are then obtained. The outcomes from the intervention cohort (with multimodal prehabilitation) are compared to the data from the control cohort (without multimodal prehabilitation) to assess the effectiveness of the program.

Results:

Multidisciplinary multimodal prehabilitation has demonstrated a decrease in PPCs as well as lower LOS and readmission rates in surgical patients (Table 1).

Conclusion

PPCs in postoperative oncological surgery patients can impair patient recovery due to increased LOS and readmission rates. Multimodal prehabilitation can help decrease complications and improve patient outcomes. Further studies are needed to determine the most effective screening method for sarcopenia and the optimal duration of multimodal prehabilitation. Studies should also characterize the complex interaction between sarcopenia, prehabilitation, multimodal cancer therapy, and cancer-specific outcomes. Multimodal prehabilitation has the potential to improve outcomes not only in oncological surgical patients but in a variety of elective complex abdominal surgeries.

Metrics	Baseline n = 18 (no Prehab) June 2021-Dec 2021	Prehab n= 6 June 2021-Mar 2022
Average Length of stay (ALOS)* Expected ALOS (Vizient) LOS index	12.22 7.36 1.66	7.33 8.97 0.82
Any Post-operative Pulmonary complications (PPC*) (%)	3/18 (16.7%)	0/6 (0%)
Blood transfusions intra op – total number of occurrences (%)	4/18 (22.2%)	0/6 (0%)
Readmission Rate 30 days (%)	2/18 (11.1%)	0/6 (0%)

Mini Talk| Surgical Oncology

Practice Pattern Differences Contribute to Disparities In Surgery for Resectable Gastric Cancer

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Introduction/Background

Surgery is the standard of care for locoregional gastric adenocarcinoma. However, rates of surgery receipt in Texas remain low. We examined factors associated with non-receipt of surgery and reasons for lack of surgical care.

Methods:

We conducted a retrospective review of adult patients diagnosed with SEER localized or regional stage gastric adenocarcinoma between 2004 – 2019 in the Texas Cancer Registry (TCR). Chi-square tests were used to compare categorical group differences. The impact of various demographic factors on likelihood of non-receipt of surgery, and on provider non-recommendation as the reason for no surgery, were assessed with logistic regression.

Results:

Our cohort consisted of 9,115 patients(36% no surgery). The percent of patients receiving surgery did not significantly increase over the study period. Uninsured patients and those residencing in a US-Mexico border county were significantly more likely to not undergo surgery (OR 1.64, 95% CI 1.37-1.97 and OR 1.36, 95% CI 1.13-1.64; respectively) . The most common reasons for non-receipt of surgery were provider non-recommendation (79%), co-morbidities (8%), and patient/family refusal (4%). Border county residents were significantly more likely to have provider non-recommendation be the reason for lack of surgery as part of first-line treatment (OR 1.89, 95% CI 1.27-2.81).

Conclusion

Rates of surgery in Texas for resectable gastric cancer remain low. Border county residents are significantly less likely to receive surgery, and differences in provider practice patterns may be driving this disparity. Further studies are needed to identify specific contributing mechanisms to improve healthcare equity.