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Trends of axillary surgery in breast cancer patients with axillary lymph node metastasis: a comprehensive single-center retrospective study

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Purpose: Based on the results of previous trials, de-escalation of axillary surgery after neoadjuvant chemotherapy (NAC) has increased in patients with axillary lymph node (ALN) metastasis at presentation. This study aimed to review the trends of axillary surgery by time period and molecular subtype in patients with ALN metastasis.
Methods: We analyzed the rates of sentinel lymph node biopsy (SLNB) and ALN dissection (ALND) based on time period and subtype. The time period was divided into 3 subperiods to determine the rate of axillary surgery type over time (period 1, from 2009 to 2012; period 2, from 2013 to 2016; and period 3, from 2017 to July 2019).
Results: From 2009 to July 2019, 2,525 breast cancer patients underwent surgery. Based on subtype, the ALND rate of hormone receptor-positive (HR+)/human epidermal growth factor receptor 2-negative (HER2–) disease decreased by 13.0% from period 1 to period 3 (period 1, 99.4%; period 2, 97.5%; and period 3, 86.4%; $P < 0.001$). Conversely, the ALND rate in HR+/HER2+, HR–/HER2+, and triple-negative breast cancer (TNBC) significantly decreased by 43.7%, 48.8%, and 35.2% in period 1, period 2, and period 3, respectively ($P < 0.001$). In the patient group receiving NAC, HR+/HER2– had a significantly higher ALND rate (84.1%) than HR+/HER2+, HR–/HER2+, and TNBC (60.8%, 62.3%, and 70.7%, respectively; $P < 0.001$).
Conclusion: The SLNB rate in patients with ALN metastasis has increased over time. However, the ALND rate in HR+/HER2– was significantly higher than in other subtypes.
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Key Words: Lymphatic metastasis, Breast neoplasms, Neoadjuvant chemotherapy, Sentinel lymph node biopsy

INTRODUCTION

Breast cancer (BC) is a heterogeneous tumor that can be divided into several intrinsic molecular subtypes with different prognostic characteristics. Neoadjuvant chemotherapy (NAC) has become one of the standard treatments for BC with axillary lymph node (ALN) metastasis. Due to the intrinsic nature of BC, the response to NAC differs depending on the intrinsic subtype. Response to NAC was better in hormone receptor-negative (HR–)/human epidermal growth factor receptor 2 positive (HER2+) and triple-negative BC (TNBC) than in HR+/HER2– BC [1]. In addition, the correlation between pathologic complete

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response (pCR) of the tumor and reduction of the tumor burden in metastatic ALNs has been reported in several studies [2,3].

Based on the results of several clinical trials (Sentinel-lymph-node biopsy in patients with breast cancer before and after neoadjuvant chemotherapy [SENTINA], Sentinel node biopsy following neoadjuvant chemotherapy in biopsy proven node positive breast cancer [SN FNAC] study, and American College of Surgeons Oncology Group [ACOSOG] Z1071), de-escalation of axillary surgery after NAC has increased in patients with ALN metastasis before NAC [4-6]. In particular, HR−/HER2+ and TNBC have high axillary pCR rates after NAC in BC with ALN metastasis at presentation. Consequently, de-escalation of axillary surgery rate was higher in HR−/HER2+ and TNBC than in HR+/HER2− [7,8].

We hypothesized that ALN dissection (ALND) rate would be higher in HR+/HER2− BC patients with ALN metastasis than in other molecular subtypes. We aimed to review the trends of axillary surgery based on time period, molecular subtype, and NAC in patients with ALN metastasis at presentation.

METHODS

This study adhered to the ethical tenets of the Declaration of Helsinki and was approved by the Institutional Review Board of Samsung Medical Center (SMC) in Seoul, Korea (No. 2022-02-061). It was performed in accordance with the Declaration of Helsinki and written informed consent was waived due to its retrospective nature.

Patients

This retrospective study included patients identified from January 2009 to July 2019 with primary BC diagnosed with ALN metastasis at presentation from the SMC electronic medical recording system. The inclusion criteria were (1) female aged ≥20 years and (2) clinically ALN-positive primary BC confirmed based on fine-needle aspiration biopsy or core needle biopsy before NAC or surgery. The exclusion criteria were (1) males diagnosed with BC; (2) patients with clinically or radiologically ALN-positive BC but biopsy which was not proven or negative; (3) history of bilateral BC, inflammatory BC, ipsilateral BC recurrence, or contralateral BC recurrence; (4) history of previous axillary surgery; and (5) diagnosis of distant metastasis before treatment. The need for informed consent was waived due to the low risk associated with this investigation.

Axillary lymph node evaluation

Physical examination using ultrasonography, chest CT, or breast MRI was performed before NAC to evaluate whether ALN metastasis persisted. Node positivity was defined based on cytology on ultrasound-guided fine-needle aspiration or core needle biopsy.

Surgical intervention

Surgical resection (breast-conserving surgery or mastectomy) was performed for the primary lesion; if needed, sentinel lymph node biopsy (SLNB) followed by ALND or ALND was performed for patients with ALN metastasis. For SLNB, a combination of blue dye and radiolabeled colloid agents or a combination of indocyanine green and radiolabeled colloid agents was recommended to maximize the likelihood of SLN identification for patients receiving NAC.

Histopathologic examination

The pathologic stage was determined using the Union for International Cancer Control TNM classification, 7th edition. Histological types were classified as invasive ductal carcinoma (IDC), invasive lobular carcinoma (ILC), mixed types of IDC and ILC, and others. The estrogen receptor (ER), progesterone receptor (PgR), and HER2 statuses of the tumor were evaluated using immunohistochemical staining of breast specimens obtained from core needle biopsy. Based on the ER, PgR, and HER2 findings, the clinical tumor subtypes were categorized as follows: HR+/HER2– (ER-positive and/or PgR-positive and HER2-negative); HR+/HER2+ (ER-positive and/or PgR-positive and HER2-positive); HR−/HER2+ (ER-negative, PgR-negative, and HER2-positive); TNBC (ER-negative, PgR-negative, and HER2-negative).

Time period and statistical analysis

The time period was divided into 3 subperiods to determine the rate of axillary surgery type over time (period 1, from 2009 to 2012; period 2, from 2013 to 2016; and period 3, from 2017 to July 2019). Differences in clinicopathological characteristics among periods were assessed using the chi-square test, Fisher exact test, or Student t-test as appropriate. Summary statistics are presented as number (%) for categorical variables. Analyses were performed using the R program, ver. 4.1.2 (R Foundation for Statistical Computing). A P-value of <0.05 was considered statistically significant.

RESULTS

Patient characteristics

From January 2009 to July 2019, 2,525 BC patients with ALN metastasis underwent surgery at SMC. Patient demographics are presented in Table 1; 1,152 patients (45.6%) received NAC and 1,373 patients (54.4%) did not. The NAC rate was 26.0% in period 1, 39.9% in period 2, and 67.0% in period 3 ($P < 0.001$). In addition, the rate of NAC based on subtype was determined. The NAC rate was 29.4% in HR+/HER2−, 51.6% in HR+/HER2+, 69.3% in HR−/HER2+, and 71.1% in TNBC (Supplementary Table 1). The pathological N0 rate significantly increased over time ($P < 0.001$) as did the SLNB rate ($P < 0.001$).

Table 1. Patient demographics and characteristics (n = 2,525)

Variable	Period 1 from 2009–2012 (n = 665)	Period 2 from 2013–2016 (n = 987)	Period 3 from 2017–July 2019 (n = 873)	P-value
cT stage				<0.001
1	176 (26.5)	185 (18.7)	125 (14.3)	
2	352 (52.9)	554 (56.1)	531 (60.8)	
3	124 (18.6)	205 (20.8)	186 (21.3)	
4	13 (2.0)	43 (4.4)	31 (3.6)	
cN stage				0.005
1	314 (47.2)	399 (40.4)	359 (41.1)	
2	193 (29.0)	360 (36.5)	328 (37.6)	
3	158 (23.8)	228 (23.1)	186 (21.3)	
pT stage				<0.001
0 (Tis)	37 (5.6)	106 (10.8)	184 (21.0)	
1	236 (35.5)	300 (30.4)	311 (35.6)	
2	292 (43.9)	449 (45.5)	290 (33.2)	
3	94 (14.1)	129 (13.1)	83 (9.5)	
4	6 (0.9)	3 (0.3)	5 (0.6)	
pN stage				<0.001
0	73 (11.0)	174 (17.6)	296 (33.9)	
1	305 (45.9)	448 (45.4)	358 (41.0)	
2	167 (25.1)	229 (23.2)	140 (16.0)	
3	120 (18.0)	136 (13.8)	79 (9.0)	
Stage				<0.001
0	31 (4.7)	91 (9.2)	175 (20.0)	
1	29 (4.4)	73 (7.4)	115 (13.2)	
2	292 (43.9)	419 (42.5)	334 (38.3)	
3	313 (47.1)	404 (40.9)	249 (28.5)	
Histopathology				0.282
IDC	630 (94.7)	922 (93.4)	815 (93.4)	
ILC	14 (2.1)	26 (2.6)	29 (3.3)	
IDC + ILC	1 (0.2)	9 (0.9)	3 (0.3)	
Others	20 (3.0)	30 (3.0)	26 (3.0)	
Subtype				0.653
HR+/HER2−	350 (52.6)	523 (53.0)	472 (54.1)	
HR+/HER2+	106 (15.9)	162 (16.4)	127 (14.5)	
HR−/HER2+	78 (11.7)	135 (13.7)	116 (13.3)	
TNBC	131 (19.7)	167 (16.9)	158 (18.1)	
Breast surgery				0.002
BCS	369 (55.5)	482 (48.8)	491 (56.2)	
TM	296 (44.5)	505 (51.2)	382 (43.8)	
Axillary surgery				<0.001
SLNB	17 (2.6)	76 (7.7)	251 (28.8)	
SLNB followed by ALND	56 (8.4)	170 (17.2)	173 (19.8)	
ALND	592 (89.0)	741 (75.1)	449 (51.4)	
NAC				<0.001
No	492 (74.0)	593 (60.1)	288 (33.0)	
Yes	173 (26.0)	394 (39.9)	585 (67.0)	

Values are presented as number (%).
Based on pathologic T stage according to the American Joint Committee on Cancer (AJCC) 7th edition, T0 (Tis) includes ductal carcinoma *in situ* and no residual tumor (pCR) after NAC. Based on pathologic N stage according to the AJCC 7th edition, N0 includes no lymph node metastases and isolated tumor cell only, N1 includes micrometastases or macrometastases in 1–3 ALNs.
cT, clinical tumor; cN, clinical node; pT, pathological tumor; pN, pathological node; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; IDC + ILC, mixed types of IDC and ILC; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; TNBC, triple-negative breast cancer defined based on HR negativity and HER2 negativity in breast cancer; BCS, breast-conserving surgery; TM, total mastectomy; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; NAC, neoadjuvant chemotherapy.

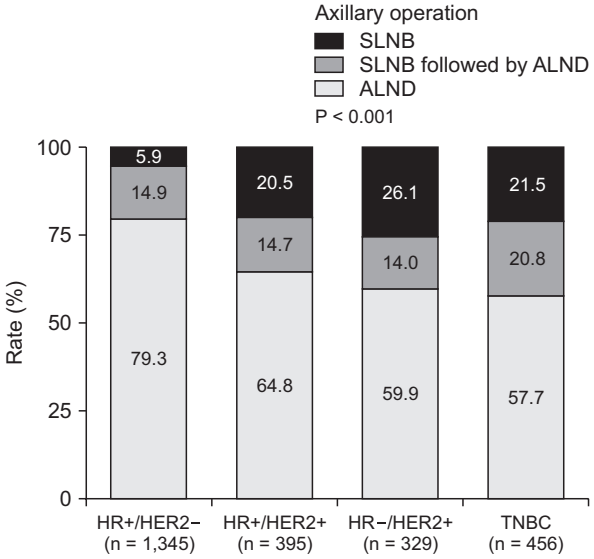

Fig. 1. Axillary surgery based on subtype. SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; TNBC, triple-negative breast cancer.

Trend of axillary surgery based on neoadjuvant chemotherapy status

The trend of axillary surgery based on subtype in all patients with or without NAC is shown in Fig. 1. The SLNB rate in HR+/HER2− was significantly lower than in other subtypes (5.9% in HR+/HER2−, 20.5% in HR+/HER2+, 26.1% in HR-/HER2+, and 21.5% in TNBC; P < 0.001). In addition, the axillary surgery trend of each subtype based on NAC status for each period is shown in Fig. 2A–C. In period 1, all patients without NAC underwent ALND in all subtypes, but the number was not statistically significant (P = 0.974). In addition, the HR+/HER2− subtype showed the lowest SLNB rate in the NAC group, although the difference was not significant (P = 0.317). In period 2, the SLNB rate of patients with or without NAC showed significant differences based on subtype. The HR+/HER2+ subtype showed the highest SLNB rate among the groups of patients who received NAC in period 2 (HR+/HER2+ was 30.2%, P = 0.002). In period 3, although not statistically significant, all patients with HR−/HER2+ subtype who did not receive NAC underwent ALND. However, the SLNB rate of HR+/HER2+ and HR−/HER2+ subtypes in patients with NAC exceeded 50%. The HR+/HER2− subtype had the lowest SLNB rate in period 3 compared with other subtypes (P < 0.001).

Types of axillary surgery based on NAC status are shown in Fig. 3. Almost all patients who did not receive NAC underwent ALND, although a statistically significant difference was not observed based on subtype (P = 0.685). After NAC, the SLNB rate increased in all subtypes but was significantly lower in HR+/HER2− than in the other subtypes (15.9% in HR+/HER2−, 39.2% in HR+/HER2+, 37.7% in HR−/HER2+, and 29.3% in TNBC; P < 0.001).

Axillary surgery based on time period

The trend of axillary surgery in each subtype based on time period is shown in Table 2. In period 1, the SLNB rate was the lowest among all subtypes (0.6% in HR+/HER2−, 2.8% in HR+/HER2+, 6.4% in HR−/HER2+, and 5.3% in TNBC; P = 0.014). However, the SLNB rate increased for all subtypes in period 3 but was lower in HR+/HER2− than in other subtypes (13.6% in HR+/HER2−, 46.5% in HR+/HER2+, 55.2% in HR−/HER2+, and 40.5% in TNBC; P < 0.001). As shown in Fig. 4, the axillary surgery trend for each subtype was compared by time period. The difference in SLNB rate between period 1 and period 3 was 13.0% in HR+/HER2−, 43.7% in HR+/HER2+, 48.8% in HR−/HER2+, and 35.2% in TNBC. Regarding the trend of axillary surgery over time, the SLNB rate significantly increased in all subtypes and each time period as shown in Supplementary Fig. 1 (2.6% in period 1, 7.7% in period 2, and 28.8% in period 3; P < 0.001).

Axillary surgery in HR+/HER2− subtype based on neoadjuvant chemotherapy

When comparing axillary surgery based on clinical nodal (cN) stage in the HR+/HER2− subtype in Table 3, the SLNB rate was significantly higher in patients who received NAC than in patients who did not receive NAC in cN1 (P < 0.001). No patient who did not receive NAC underwent SLNB in cN2 or cN3 (P < 0.001). The axillary surgery trend in HR+/HER2− subtype based on NAC is shown in Table 4. The SLNB rate of patients who received NAC was higher than that of subjects without NAC in the HR+/HER2− subtype (15.9% in patients who received NAC and 1.7% in patients who did not receive NAC, P < 0.001). Breast-conserving surgery (BCS) and total mastectomy (TM) rates were compared based on NAC for HR+/HER2− patients who underwent SLNB followed by ALND (Table 5). The ratio of BCS to TM was the same in both groups whether patients received NAC or not. The BCS rate was higher than the TM rate, but the difference was not significant (61.4% in BCS and 38.6% in TM).

DISCUSSION

In this study, increased SLNB rate and decreased ALND rate over time were observed in BC patients with ALN metastasis at presentation. The SLNB rate in HR+/HER2− increased only 13%, while the rate in other subtypes increased by more than 40%, although that patients with HR+/HER2− BC have a better prognosis. In this study, HR+/HER2− BC patients with axillary metastasis underwent invasive axillary surgery more frequently.

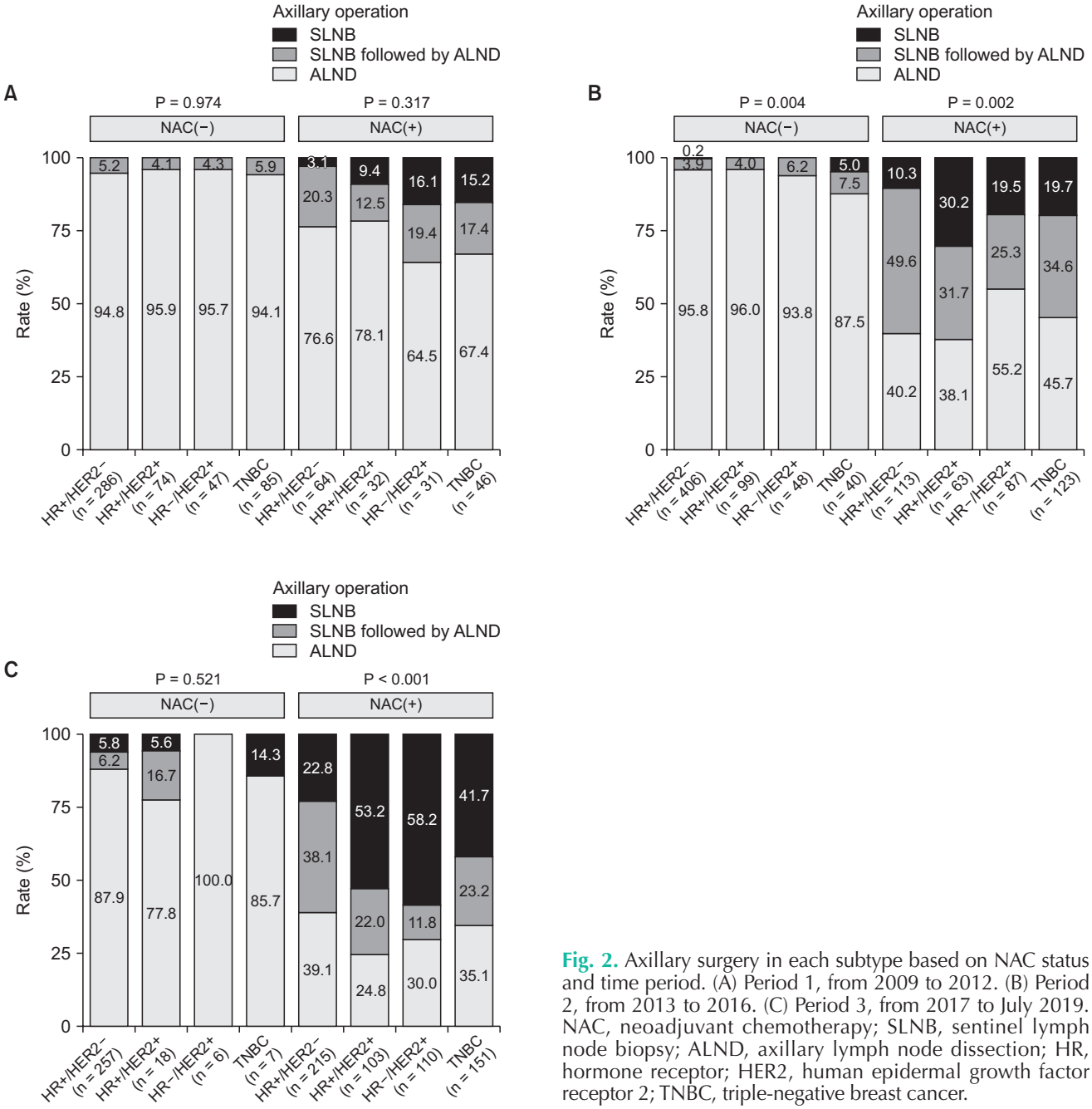

Fig. 2. Axillary surgery in each subtype based on NAC status and time period. (A) Period 1, from 2009 to 2012. (B) Period 2, from 2013 to 2016. (C) Period 3, from 2017 to July 2019. NAC, neoadjuvant chemotherapy; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; TNBC, triple-negative breast cancer.

The SLNB rate was high in patients with HR+/HER2+ or HR−/HER2+ subtype who received NAC. In addition, the SLNB rate significantly increased over time in patients with HR+/HER2+ or HR−/HER2+ subtype, which may be due to targeted therapy such as trastuzumab and/or pertuzumab for HER2.

Because sensitivity to chemotherapy differs based on subtype, knowledge of molecular subtypes could help determine the probability of de-escalating axillary surgery after NAC. In several studies, pCR in TNBC was as high as 45% after NAC and was as high as 50.3% in HR−/HER2+ with addition of the HER2-targeted agent trastuzumab [9,10]. The addition of carboplatin in TNBC and pertuzumab in HR−/HER2+ BC improved the pCR rate by 53.2% and 64%, respectively [11,12]. Although TNBC and HR−/HER2+ had unfavorable outcomes compared with HR+/HER2−, the patients underwent less aggressive surgery due to a higher probability of pCR to NAC. Although the overall prognosis is favorable in patients with HR+/HER2−, a low pCR rate was associated with more aggressive axillary surgery than in other subtypes.

Because NAC has become the standard treatment for patients with clinically ALN-positive BC, especially HR−/HER2+ and TNBC, the results of several clinical trials showed SLNB can be

performed in patients who converted to clinically ALN-negative BC after NAC [4-6]. However, the patients did not achieve the primary endpoint of a false-negative rate (FNR) of <10%. The authors recommended SLNB with removal of ≥3 ALNs using the dual method for SLN identification. When the number of retrieved ALNs was ≥3, the FNR was <10% [13]. In a study by Myers et al. [14], axillary pCR in HR−/HER2+ and TNBC occurred in 55% and 44% of patients with cN1 and in 57% and 64% of subjects with cN2 and cN3, respectively. The results indicate that patients who have HR−/HER2+ or TNBC may be suitable candidates for less invasive axillary surgery. In a study by Laot et al. [15], axillary pCR in HR−/HER2+ and TNBC occurred in 69% and 74%, respectively, of patients regardless of axillary node metastasis. The authors also found a higher rate of axillary pCR in HR−/HER2+ and TNBC, similar to previous studies [9,16]. These results demonstrated that SLNB in patient with HR−/HER2+ or TNBC could be used as an alternative to ALND and were concordant with the present study. Furthermore, the FNR for SLNB was lower in HR−/HER2+ and TNBC than in HR+/HER2− (3.2% in HR−/HER2+, 10.5% in TNBC, and 42.1% in HR+/HER2−; P = 0.003) [17].

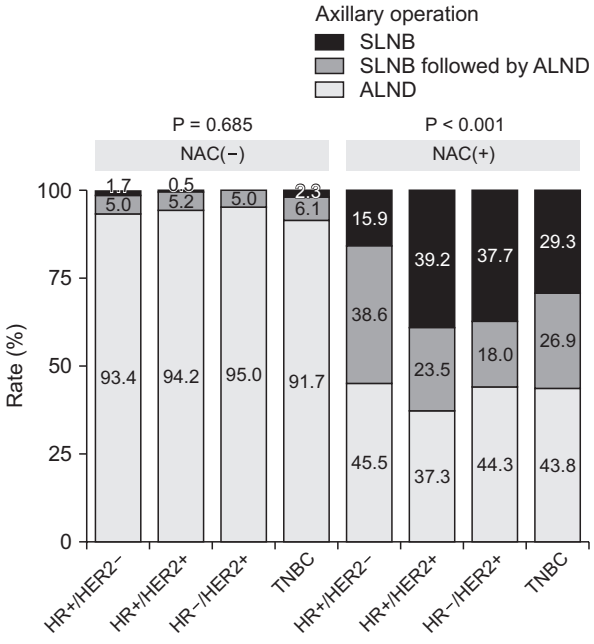

Fig. 3. Axillary surgery in each subtype based on neoadjuvant chemotherapy status. NAC, neoadjuvant chemotherapy; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; TNBC, triple-negative breast cancer.

According to the MINDACT trial, among women with HR+/HER2− BC and 1–3 positive ALNs who were at high clinical risk and low genomic risk of recurrence, the 5-year rate of survival without distant metastasis was 1.5 percentage points lower in subjects who did not receive chemotherapy than in patients who did receive chemotherapy [18]. The RxPONDER trial showed that postmenopausal women with 1–3 positive ALNs and a recurrence score of 0–25 could waive adjuvant chemotherapy with no significant difference in invasive disease-free survival (DFS) and distant relapse-free survival [19]. Consequently, patients with HR+/HER2− BC and 1–3 positive ALNs might not have to receive adjuvant chemotherapy. Therefore, patients with HR+/HER2− BC and clinical ALN metastasis should be carefully selected for receiving NAC.

Factors to predict favorable response to NAC in HR+/HER2− are younger age, premenopausal status, high histological grade, and higher Ki-67 expression [20]. Oncotype DX RS (Genomic Health, Inc.) is emerging as a test to identify the possibility of pCR after NAC in HR+/ HER2− BC. A high Oncotype DX

Table 2. Axillary surgery based on subtype over time

Surgery	HR+/HER2−	HR+/HER2+	HR−/HER2+	TNBC	P-value
Period 1, from 2009 to 2012	(n = 350)	(n = 106)	(n = 78)	(n = 131)	0.014
SLNB	2 (0.6)	3 (2.8)	5 (6.4)	7 (5.3)	
SLNB followed by ALND	28 (8.0)	7 (6.6)	8 (10.3)	13 (9.9)	
ALND	320 (91.4)	96 (90.6)	65 (83.3)	111 (84.7)	
Period 2, from 2013 to 2016	(n = 523)	(n = 162)	(n = 135)	(n = 167)	<0.001
SLNB	13 (2.5)	19 (11.7)	17 (12.6)	27 (16.2)	
SLNB followed by ALND	74 (14.1)	24 (14.8)	25 (18.5)	47 (28.1)	
ALND	436 (83.4)	119 (73.5)	93 (68.9)	93 (55.7)	
Period 3, from 2017 to July 2019	(n = 472)	(n = 127)	(n = 116)	(n = 158)	<0.001
SLNB	64 (13.6)	59 (46.5)	64 (55.2)	64 (40.5)	
SLNB followed by ALND	98 (20.8)	27 (21.3)	13 (11.2)	35 (22.2)	
ALND	310 (65.7)	41 (32.3)	39 (33.6)	59 (37.3)	

Values are presented as number (%).
HR, hormone receptor; HER2, human epidermal growth factor receptor 2; TNBC, triple-negative breast cancer; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection.

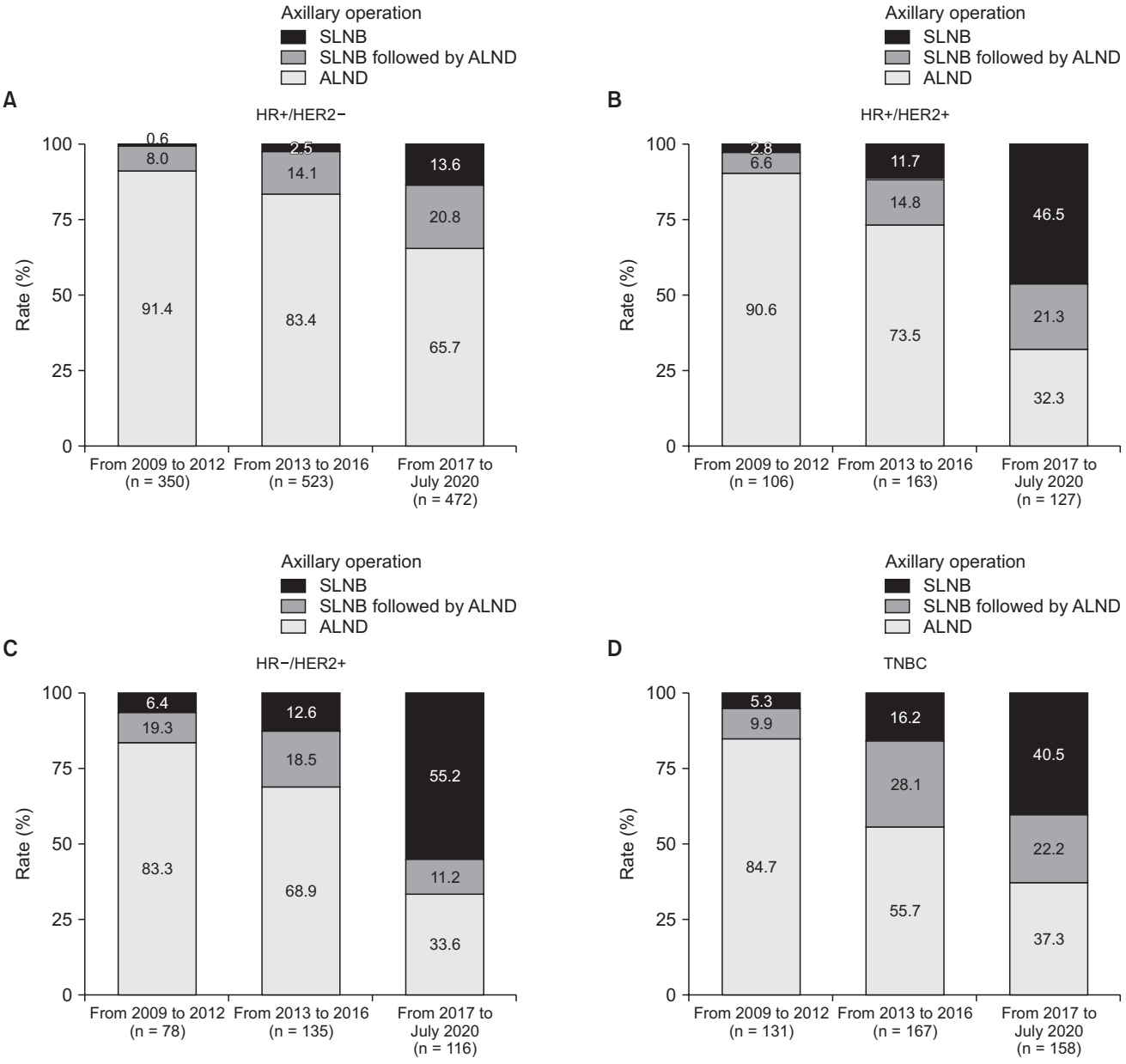

Fig. 4. Axillary surgery in each subtype based on time period. HR, hormone receptor; HER2, human epidermal growth factor receptor 2; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; TNBC, triple-negative breast cancer.

RS score (> 30) was associated with pCR in patients with HR+/HER2− BC after NAC. Oncotype DX RS score was also an independent predictor of axillary pCR in patients; a high Oncotype DX RS score (> 30) can be expected in 27.5% of axillary pCR in HR+/HER2− patients [21,22]. MammaPrint and BluePrint assay (Agendia B.V.) are other genomic tests to predict which patients may have a higher probability of pCR with NAC. A MammaPrint high risk score was strongly associated with an increased likelihood of pCR ($P < 0.001$) [23]. Preoperative genomic analysis of patients with clinically positive ALNs is a promising approach to improve clinical decision-making in axillary management. Another approach to improve pCR is neoadjuvant endocrine therapy (NET) implemented as an alternative to NAC. HR+/HER2− BC may respond equally or better to endocrine therapy than chemotherapy [24,25]. In the PALLET trial, the results of adding palbociclib (cyclin-dependent kinase inhibitor) to letrozole showed a 3.3% pCR in postmenopausal women with HR+/HER2− and a tumor at least 2.0 cm in size. Because the results showed a low pCR rate, ALND after NET is not a feasible option in patients with HR+/HER2− BC.

In current guidelines, the National Comprehensive Cancer

Table 3. Axillary surgery in HR+/HER2− subtype based on cN stage

NAC	cN stage								
	1			2			3		
	Yes (n = 103)	No (n = 514)	P-value	Yes (n = 179)	No (n = 266)	P-value	Yes (n = 114)	No (n = 169)	P-value
Surgery			<0.001			<0.001			<0.001
SLNB	18 (17.5)	16 (3.1)		27 (15.1)	0 (0.0)		18 (15.8)	0 (0.0)	
SLNB followed by ALND	41 (39.8)	33 (6.4)		77 (43.0)	10 (3.8)		35 (30.7)	4 (2.4)	
ALND	44 (42.7)	465 (90.5)		75 (41.9)	256 (96.2)		61 (53.5)	165 (97.6)	

Values are presented as number (%).
HR, hormone receptor; HER2, human epidermal growth factor receptor 2; NAC, neoadjuvant chemotherapy; cN, clinical node; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection.

Table 4. Axillary surgery based on NAC status in HR+/HER2− subtype

NAC	Yes (n = 396)	No (n = 949)	P-value
Surgery			<0.001
SLNB	63 (15.9)	16 (1.7)	
SLNB followed by ALND	153 (38.6)	47 (5.0)	
ALND	180 (45.5)	886 (93.4)	

Values are presented as number (%).
HR, hormone receptor; HER2, human epidermal growth factor receptor 2; NAC, neoadjuvant chemotherapy; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection.

Table 5. Breast surgery based on NAC status in SLNB followed by ALND in HR+/HER2− subtype

NAC	Yes (n = 329)	No (n = 70)
Breast surgery		
BCS	202 (61.4)	43 (61.4)
TM	127 (38.6)	27 (38.6)

Values are presented as number (%).
NAC, neoadjuvant chemotherapy; SLNB, sentinel lymph node biopsy; ALND, axillary lymph node dissection; HR, hormone receptor; HER2, human epidermal growth factor receptor 2; BCS, breast-conserving surgery; TM, total mastectomy.

Network recommends trying SLNB if clinical ALN was negative following NAC (ycN0) administered to patients with clinical ALN metastasis [26]. However, the discrepancy between ycN0 and pathologic node (ypN) positivity is not clearly described in the guidelines [27]. The guidelines also do not suggest whether SLNB is possible in clinically ALN-positive HR+/HER2− BC patients. To decrease the discrepancy, tailored axillary surgery (TAS) was investigated and determined not to be inferior to ALND for preventing recurrence [28]. TAS is performed using a tattooing technique, clip insertion, or radioactive seed insertion. The surgery resulted in a 2.0% FNR, providing the basis for avoiding ALND in patients with ALN metastasis who received NAC [29,30]. However, HR+/HER2− BC patients had more frequent invasive axillary surgery than patients with other subtypes due to the low pCR rate. Therefore, identifying HR+/HER2− BC patients who converted to clinically node-negative after NAC is necessary before performing SLNB.

The present study had several limitations. First, the data were collected from a single center and retrospectively analyzed. Second, HR+/HER2−, known as luminal type, was not divided into luminal A and luminal B based on Ki-67 expression. Thus, the trend of axillary surgery was not investigated based on luminal type subgroup. Third, NAC regimen and duration were not examined. Therefore, the chemosensitivity based on NAC regimen might be different and may have affected the trends of axillary surgery following NAC. Fourth, because the time interval was not constant, a bias may have existed. Fifth, because the focus was on the trend of axillary surgery, the DFS and overall survival based on the type of axillary surgery were not analyzed. However, the strength of the study was a homogeneous BC cohort. Further well-designed prospective studies are needed to provide information regarding axillary surgery in HR+/HER2− patients with ALN metastasis.

In conclusion, the SLNB rate in patients with ALN metastasis has increased over time. However, the ALND rate in HR+/HER2− patients was significantly higher than in HR+/HER2+, HR−/HER2+, and TNBC patients and NAC affected these trends.

SUPPLEMENTARY MATERIALS

Supplementary Table 1 and Supplementary Fig. 1 can be found via https://doi.org/10.4174/astr.2023.105.1.10.

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Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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