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Original article

Trends in axillary lymph node dissection for early-stage breast cancer in Europe: Impact of evidence on practice

Carlos A. Garcia-Etienne [a, *], Robert E. Mansel [b], Mariano Tomatis [c], Joerg Heil [d], Laura Biganzoli [e, f], Alberta Ferrari [a], Lorenza Marotti [f], Adele Sgarella [a], Antonio Ponti [c], the EUSOMA Working Group[1]

[a] Breast Surgery, Fondazione IRCCS Policlinico San Matteo, Università degli Studi di Pavia, Italy
[b] School of Medicine, Cardiff University, United Kingdom
[c] AOU Città della Salute e della Scienza, CPO Piemonte and EUSOMA Data Centre, Turin, Italy
[d] University of Heidelberg, Germany
[e] Nuovo Ospedale di Prato, Italy
[f] EUSOMA, Florence, Italy

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ABSTRACT

Background: Data from recently published trials have provided practice-changing recommendations for the surgical approach to the axilla in breast cancer. Patients with T1-2 lesions, treated with breast conservation, who have not received neoadjuvant chemotherapy and have 1–2 positive sentinel nodes (Z0011-criteria) may avoid axillary lymph node dissection (ALND). We aim to describe the dissemination of this practice in Europe over an extended period of time.

Methods: Our source of data was the eusomaDB, a central data warehouse of prospectively collected information of the European Society of Breast Cancer Specialists (EUSOMA). We identified cases fulfilling Z0011-criteria from 2005 to 2016 from 34 European breast centers and report trends in ALND. Data derived from Germany, Italy, Belgium, Switzerland, Austria, and Netherlands.

Results: 6671 patients fulfilled Z0011-criteria. Rates of ALND showed a statistically significant decrease from 2010 (89%) to 2011 (73%), reaching 46% in 2016 ($p < 0.001$). After multivariable analysis, factors associated with higher probability of ALND were earlier year of surgery, younger age, increasing tumor size and grade, and being operated in Italy ($p < 0.001$). The minimum and maximal rates of ALND in the most recent two-year period (2015–2016) were 0% and 83% in two centers located in different countries ($p < 0.001$).

Conclusion: Our study demonstrates, a decrease in rates of ALND that started after year 2010 through the end of the study period. Wide differences were observed among centers and countries indicating the need to spread unified clinical guidelines in Europe to allow for homogeneous evidence-based practice patterns.

1. Introduction

The surgical approach to the axilla in breast cancer has been a controversial issue for the last three decades [1]. Data from recently published trials have provided practice-changing recommendations for the indications of axillary lymph node dissection (ALND).

The most cited and discussed recent study is the Z0011 trial, a randomized controlled trial (RCT) from the American College of Surgeons Oncology Group (ACOSOG) that included patients with T1-2 (≤5 cm) N0 disease who were candidates for breast conservation with whole breast radiotherapy (BCT), had not received neoadjuvant chemotherapy, and had 1 to 2 positive sentinel nodes (micro or macrometastasis) [2,3]. Four hundred forty-six cases were randomized to no further surgical treatment of the axilla (sentinel lymph node biopsy [SLNB]-only) and 445 cases to completion ALND. Their most recent update with a median follow-up of 9.25 years confirmed a 10-year cumulative incidence of

* Corresponding author. Breast Surgery, Fondazione IRCCS Policlinico San Matteo, Università degli Studi di Pavia, Viale Camillo Golgi 19, Pavia, 27100, Italy.
E-mail address: carlos.garciaetienne@unipv.it (C.A. Garcia-Etienne).
[1] The authors from the EUSOMA Working Group are listed in Appendix.

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locoregional recurrence similar for both groups (5.3% SLNB-only vs. 6.2% ALND group [p = 0.36]) and a 10-year overall survival (OS) of 86.3% in the SLND-only group and 83.6% in the ALND group (p = 0.02) [4,5].

From 2011 to 2012, the National Comprehensive Cancer Network (NCCN) guideline in the USA was modified to consider no further axillary surgery in cases who meet all Z0011 selection criteria (T1-2 lesions, 1–2 positive SLNs, candidates for BCT, no neoadjuvant chemotherapy) [6]. The American Society of Clinical Oncology (ASCO) has also stated in its update of recommendations that clinicians should not recommend ALND for the same group of patients [7]. Changes in recommendations have generated controversy in some groups, arguing that omitting ALND should be based on individual cases and that more evidence is needed to inform practice [8,9].

The adoption of a more conservative approach to the axilla in Europe after the publication of the Z0011 and other recent trials seems to be heterogeneous across countries. A study by Gondos et al., included a questionnaire to compare the surgical approach to the axilla during year 2014 among centers from Denmark, Norway, Sweden, Netherlands, Belgium, Italy, Germany and Hungary. The survey indicated that ALND is performed after micrometastasis-only in the SLN at the Institute Jules Bordet in Brussels while the Netherlands Cancer Institute is carrying out its own trial. The Hospital at the University of Heidelberg has adopted modified criteria from the ACOSOG Z0011 trial to avoid ALND since September 2010, while the Istituto Nazionale dei Tumori from Milan incorporated a similar approach since 2013. Z0011 criteria had not been implemented (as of 2014) in Denmark, the Institute Jules Bordet or the National Institute of Oncology in Hungary [10].

A recent Dutch population-based study reported by Poodt and colleagues carried out a subgroup analysis that aimed to assess the impact of Z0011 and AMAROS (After Mapping of the Axilla: Radiotherapy Or Surgery?) [14] studies on axillary dissection in patients with cT1-2 N0 disease and 1 to 2 positive sentinel nodes who received BCT or mastectomy from 2011 to 2015. The analysis included 8191 patients and showed a decrease in ALND from 75% in 2011 to 17% in 2015 (p < 0.001) for both groups, with a more pronounced and sustained decrease for cases receiving BCT (72% ALND in 2011 to 11% in 2015) [11]. However, this study depicted a single European country.

We present time trends in ALND in patients with selection criteria from the Z0011 trial in 34 EUSOMA certified breast centers from 2005 to 2016 and assess heterogeneity among centers or countries with the aim to evaluate impact of evidence on practice.

2. Materials and methods

2.1. eusomaDB: EUSOMA data warehouse

The European Society of Breast Cancer Specialists (EUSOMA [originally European Society of Mastology]) has fostered a voluntary certification process for breast centers to establish minimum standards and ensure multidisciplinary care. Prospectively collected information on primary breast cancer cases diagnosed and treated in each unit is transferred annually to a central EUSOMA data warehouse (eusomaDB) for continuous monitoring of quality indicators. The eusomaDB Working Group consists of centers that provide data and comply with EUSOMA requirements [12].

The database includes (as of October 2018) over 120 000 cancers from 78 breast centers located in Germany, Sweden, Switzerland, Belgium, Austria, The Netherlands, Spain, Portugal, Italy, and China. Data include de-identified patient and tumor characteristics, information about preoperative work-up, multidisciplinary management, and follow-up. Participating centers agree to use the database for certification purposes and for cooperative clinical research. Only centers contributing with at least five consecutive years of data were included and provided consent for the study.

2.2. Patients

The scope of this study was to analyze trends in ALND in patients with Z0011 selection criteria; therefore, we included patients with newly diagnosed unilateral early-stage breast cancer with T1-2 (≤5 cm) lesions treated with BCT, who had a positive sentinel node biopsy (micro or macroscopic disease), and had not received neoadjuvant chemotherapy.

Out of 75 168 cases registered in the database from 34 breast centers located in 6 countries (13 in Germany, 11 in Italy, 4 in Belgium, 4 in Switzerland, 1 in Austria, and 1 in the Netherlands) with a final pathology diagnosis of ductal carcinoma *in situ* (DCIS), microinvasive or invasive carcinoma, we excluded 8903 cases with DCIS (pTis), 593 with pTX, 1149 pT0, 3050 pT3, 215 pT4 tumors, and 1329 with missing information on pT; furthermore, we excluded 5546 cases with a preoperative clinically positive axilla or other regional metastasis (cN1-3), as well as 9164 with SLNB not performed, and 34 914 with negative sentinel lymph node, node not found, or with unknown result; 65 patients with distant metastatic disease at diagnosis, 49 cases who did not undergo surgery, and 239 patients who received neoadjuvant chemotherapy. Additionally, cases coded with simultaneous bilateral breast cancer (n = 224) or multiple lesions within the breast (n = 170), and 47 cases with a previous history of ipsilateral breast malignancy were also excluded. Moreover, we excluded 2825 cases operated with mastectomy and 15 cases with missing information on axillary surgery (Fig. 1).

Our study population for the twelve-year (2005–2016) trend analysis consisted of a total of 6671 patients who met Z0011 selection criteria. The database does not contain information on the number of positive sentinel lymph nodes, precluding identification of cases with more than 1 positive sentinel node.

2.3. Statistical analysis

Heterogeneity of axillary lymph node dissection rates among centers was assessed using the *x* [2] test. Correlated variables (year of surgery, age group, pT, tumor histology and grade, ER status, and country) were analyzed with a multivariable logistic model to adjust the proportion of ALNDs. A trend analysis was performed from 2005 to 2016 through the Joinpoint regression method. Statistical analyses were performed with program R (version 2.10.1).

3. Results

Clinicopathologic characteristics of the 6671 T1-2 N0 M0 patients who underwent breast-conserving surgery and had a positive SLNB from 2005 to 2016 are shown in Table 1.

Mean age was 59 years old (range 21–93), with 266 (4%) patients younger than 40 years, 5001 (75%) aged 40–69 years, and 1390 (21%) patients aged ≥70 years. Mean tumor size was 1.85 cm (range 0.1–5.0 cm), with 4362 (65.3%) being pT1 lesions. Tumor histology was invasive ductal carcinoma (IDC) in 5857 (87.8%) cases and invasive lobular carcinoma (ILC) in 544 (8.2%). More than half of tumors (59.6%) were grade II and 6043 (90.6%) were estrogen receptors positive.

Cases in the dataset derived from 6 countries, 2802 (42%) from Germany, 2455 (36.8%) from Italy, and 1414 (21.2%) from Belgium, Switzerland, Austria, and Netherlands (grouped as “other countries” for the analysis).

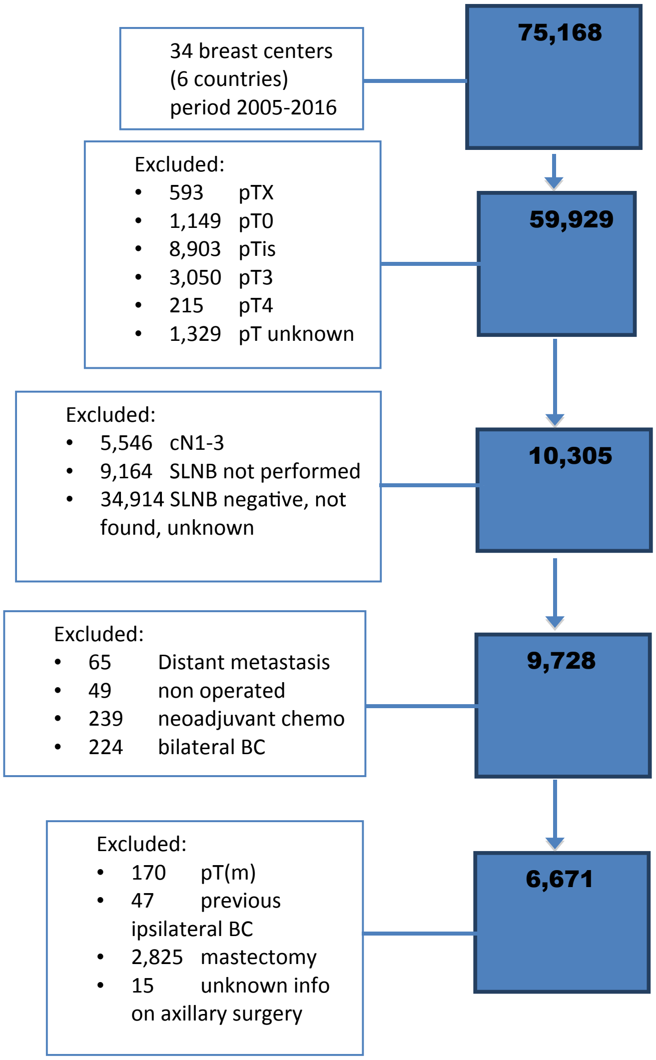

Fig. 1. Study population: 6671 T1-2 N0 M0 patients who underwent breast-conserving surgery, had not received neoadjuvant chemotherapy and had a positive sentinel node from 2005 to 2016.

Some type of adjuvant systemic treatment (chemo and/or endocrine therapy) was administered to 5991 (89.8%) cases (8.5% unknown); chemotherapy in 3571 (53.5%) patients (11.5% unknown); endocrine therapy in 4960 (74.4%) (17.3% unknown). Radiotherapy was delivered to 5878 (88%) cases (8% unknown).

Rates of ALND remained constant from 2005 (87%) to 2010 (89%) ($p = 0.38$) and dropped to 73% in 2011 ($p < 0.001$), after publication of Z0011 results. The decrease was sustained reaching 46% in 2016 (Table 2; Fig. 2). The Joinpoint regression analysis indicated a significant reduction rate of 12% per year from 2010 to 2016 ($p < 0.001$).

Rates of ALND decreased steeply in Germany from 91.5% in 2010 to 64.7% in 2011, to 38.4% in 2013, down to 17% in 2016. The same figures for Italy were 91.5% in 2010, 87.4% in 2011, 73.5% in 2013, and 64.2% in 2016. Belgium, Switzerland, Austria, and Netherlands were analyzed together due to the smaller number of cases in the dataset and also showed a sharp decrease in ALND rates from 79.7% in 2010 to 69.2% in 2011, to 43.6% in 2013, to 30.3% in 2016 (Fig. 3).

A multivariable model adjusted for year of surgery, age group, pT, tumor histology and grade, ER status, and country of treatment showed that factors associated with increased probability of ALND were earlier year of surgery, younger age, increasing tumor size, increasing tumor grade, and being operated in Italy ($p < 0.001$) (Table 2).

For cases operated in the most recent two-year period (2015–2016), the minimum and maximal observed rates of axillary lymph node dissection were 0% (0/23) and 83% (34/41) ($p < 0.001$) in two centers located in different countries.

4. Discussion

Based on the eusomaDB, we were able to show a significant trend of decreasing rates of ALND in cases fulfilling Z0011 selection criteria. The trend started from 2010 to 2011 with a sustained decrease during the whole study period (end 2016).

Additional recently published trials question the impact of ALND in early-stage breast cancer. The 23-01 trial, from the International Breast Cancer Study Group, included patients with T1-2 lesions with a positive SLNB for micrometastasis and randomized cases to completion ALND ($n = 465$) or no further surgical treatment ($n = 469$). With a median follow-up of 9.7 years, 10-year DFS was 76.8% (95% CI, 72.5–81.0) in the non-ALND group compared with 74.9% (70.5–79.3) in the ALND group (HR 0.85, 95% CI, 0.65–1.11; log-rank $p = 0.24$; $p = 0.0024$ for non-inferiority) [13].

The AMAROS trial from the European Organisation for Research and Treatment of Cancer, selected patients with similar Z0011 criteria, but also included cases operated with mastectomy. Patients were randomized to completion ALND or axillary radiotherapy. After a median follow-up of 6.1 years, there were no significant differences in 5y-axillary recurrence, 5y-DFS and 5y-OS between the two groups (95% CI 0.00–5.27; $p = 0.18$; $p = 0.34$, respectively). The study did show a statistically significant difference in the 5-year incidence of measured arm lymphedema, with 13% after ALND and 5% in the radiotherapy group ($p = 0.0009$) [14].

The INT09/98 trial by Agresti and colleagues addressed whether ALND could be safely avoided and whether tumor biology could adequately guide adjuvant treatment [15]. This study was not conducted in patients with a positive sentinel lymph node, but in cases with a clinically negative axilla and pT1 tumors (mean size 1.5 cm). Cases were randomized to BCT with or without ALND with no attempt to irradiate the axilla. After a median follow-up of 127 months, no statistically significant differences were observed in 10-year DFS (92.4% ALND group vs. 91.3% non-ALND group [log-rank $p = 0.97$]) and 10-year OS (93.3% ALND group vs. 91.5% non-ALND group [log-rank $p = 0.436$]). The study showed a higher rate of axillary recurrence in the non-ALND group (9%) vs. the ALND group (0%). Patients with axillary recurrence underwent ALND and no significant relationship was observed between OS and the number of involved lymph nodes in these cases [15].

The evidence described above has led to a change in guidelines for a more conservative approach of the axilla. A study by Yao and colleagues from the National Cancer Data Base in the USA evaluated the trend of lymph node removal from 1998 to 2011 of 74 309 patients fulfilling Z0011 selection criteria. They categorized cases with not more than 4 lymph nodes removed as having had SLNB-only ($n = 17\,630$ patients). The proportion of patients avoiding ALND increased from 23% in 2009 to 56% in 2011 ($p < 0.001$), after the publication of Z0011 results [16]. However, a recent survey reported by Morrow that aimed to determine surgeon acceptance of Z0011 findings in the US showed that still 49% (175/357) of surgeons would recommend ALND for 1 SLN macrometastasis and 62.6% (221/353) for 2 SLNs with macrometastasis. Lower propensity for ALND was significantly associated with surgeons who treated a higher volume of cases per year (21–50 cases: −0.19; >51 cases: −0.48; $p < 0.001$), surgeons who follow the recommendation of “no-ink-on-tumor” as a negative margin (1–5 mm margin: −0.10; no-ink-on-tumor: −0.53; $p < 0.001$), and those with

Table 1
Clinicopathologic characteristics of 6671 T1-2 N0 M0 sentinel node positive patients who had not received neoadjuvant chemotherapy and underwent breast-conserving surgery with proportion of performed axillary lymph node dissection.

		N	%	No ALND	ALND	% ALND	p-value[a]
		6671		1930	4741	71%	
Year of surgery	2005	234	3.5%	30	204	87%	**<0.001**
	2006	316	4.7%	28	288	91%	
	2007	396	5.9%	44	352	89%	
	2008	500	7.5%	57	443	89%	
	2009	646	9.7%	65	581	90%	
	2010	726	10.9%	78	648	89%	
	2011	806	12.1%	219	587	73%	
	2012	672	10.1%	225	447	67%	
	2013	576	8.6%	250	326	57%	
	2014	634	9.5%	294	340	54%	
	2015	612	9.2%	339	273	45%	
	2016	553	8.3%	301	252	46%	
Age	Mean	59					
	Range	21–93					
Age group	21–39	266	4.0%	57	209	79%	**<0.001**
	40–49	1350	20.2%	307	1043	77%	
	50–59	1819	27.3%	503	1316	72%	
	60–69	1832	27.5%	548	1284	70%	
	70–79	1088	16.3%	374	714	66%	
	80+	302	4.5%	135	167	55%	
	Unknown	14	0.2%	6	8	57%	
Tumor size	Mean (cm)	1.85					
	Range (cm)	0.1–5.0					
pT	pT1mic/a	108	1.6%	42	66	61%	**<0.001**
	pT1b	790	11.8%	269	521	66%	
	pT1c	3464	51.9%	1019	2445	71%	
	pT2	2309	34.6%	600	1709	74%	
Histologic subtype	IDC	5857	87.8%	1679	4178	71%	**0.005**
	ILC	544	8.2%	186	358	66%	
	Other	270	4.0%	65	205	76%	
Grade	I	888	13.3%	322	566	64%	**<0.001**
	II	3978	59.6%	1159	2819	71%	
	III	1778	26.7%	441	1337	75%	
	Unknown	27	0.4%	8	19	70%	
ER	ER+	6043	90.6%	1791	4252	70%	**<0.001**
	ER-	585	8.8%	132	453	77%	
	Unknown	43	0.6%	7	36	84%	
Country	Germany	2802	42.0%	707	2095	75%	**<0.001**
	Italy	2455	36.8%	566	1889	77%	
	Other[b]	1414	21.2%	657	757	54%	
CT	Yes	3571	53.5%	711	2860	80%	**<0.001**
	No	2334	35.0%	1003	1331	57%	
	Unknown	766	11.5%	216	550	72%	
Endocrine therapy	Yes	4960	74.4%	3421	1539	69%	**<0.001**
	No	560	8.4%	405	155	72%	
	Unknown	1151	17.3%	915	236	79%	
RT	Yes, breast	2304	34.5%	729	1575	68%	**<0.001**
	Yes, breast+axilla	680	10.2%	213	467	69%	
	Yes, NS	2894	43.4%	782	2112	73%	
	No	254	3.8%	87	167	66%	
	Unknown	539	8.1%	119	420	78%	

ALND = axillary lymph node dissection; pT = pathologic tumor size classification; IDC = invasive ductal carcinoma; ILC = invasive lobular carcinoma; ER = estrogen receptors; RT = radiotherapy; NS = not specified; CT = chemotherapy.

[a] Univariable chi square test.

[b] Other countries: Belgium, Switzerland, Austria and Netherlands.

a higher proportion of cases discussed in a multidisciplinary tumor board (1%–9% of cases: −0.25; >9% of cases: −0.37; p = 0.02), indicating the need for education targeted toward lower-volume breast surgeons [17].

Few recent reports explore this scenario in Europe. The study by Gondos lacked data for the period after publication of the Z0011 and other additional studies [10]. The recent Dutch report showed a clearer picture, with a sustained decrease in ALND from 72% in 2011 to 11% in 2015 for cases fulfilling Z0011 and AMAROS criteria receiving BCT. For their whole studied population, factors associated with increased probability of performing ALND were earlier year of diagnosis, younger age, primary mastectomy, invasive lobular carcinoma, increasing tumor grade, and having surgery at a nonteaching hospital (p < 0.001) [11]. Our analysis concurred with this study in some factors associated with ALND such as earlier year of surgery, younger age, increasing tumor size (as a partial surrogate of primary mastectomy), and increasing tumor grade.

A recent study from Germany analyzed ALND trends in 13 741 cases that met Z0011 criteria deriving from 179 breast centers from 2008 to 2015. Completion ALND decreased from 94.6% in 2008 to 46.9% in 2015 (p < 0.001). Factors associated with ALND were fewer removed SLNs, 2 metastatic SLNs, younger age, lower case volume

Table 2
Univariable and multivariable analyses (adjusted for year of surgery, age group, pT, tumor histology and grade, ER status, and country of treatment) for the performance of axillary lymph node dissection (ALND) in 6671 T1-2 N0 M0 sentinel node positive patients who underwent breast-conserving surgery and had not received neoadjuvant chemotherapy.

		N	% ALND	Univariable		Multivariable	
		6671	71%	OR crude	p-value	OR adj.	p-value
Year of surgery	2005	234	87%	ref.		ref.	
	2006	316	91%	1.51	0.137	1.61	0.092
	2007	396	89%	1.18	0.520	1.32	0.284
	2008	500	89%	1.14	0.579	1.30	0.284
	2009	646	90%	1.31	0.245	1.47	0.110
	2010	726	89%	1.22	0.383	1.33	0.228
	2011	806	73%	0.39	**<0.001**	0.42	**<0.001**
	2012	672	67%	0.29	**<0.001**	0.28	**<0.001**
	2013	576	57%	0.19	**<0.001**	0.16	**<0.001**
	2014	634	54%	0.17	**<0.001**	0.14	**<0.001**
	2015	612	45%	0.12	**<0.001**	0.10	**<0.001**
	2016	553	46%	0.12	**<0.001**	0.09	**<0.001**
Age group	21–39	266	79%	1.40	**0.033**	1.09	0.616
	40–49	1350	77%	1.30	**0.002**	1.21	**0.041**
	50–59	1819	72%	ref.		ref.	
	60–69	1832	70%	0.90	0.132	0.81	**0.009**
	70–79	1088	66%	0.73	**<0.001**	0.72	**<0.001**
	80+	302	55%	0.47	**<0.001**	0.45	**<0.001**
	Unknown	14	57%	0.51	0.214	1.29	0.669
pT	pT1mic/a	108	61%	ref.		ref.	
	pT1b	790	66%	1.23	0.322	1.55	0.069
	pT1c	3464	71%	1.53	**0.035**	1.97	**0.003**
	pT2	2309	74%	1.81	**0.003**	2.65	**<0.001**
Histologic subtype	IDC	5857	71%	ref.		ref.	
	ILC	544	66%	0.77	**0.007**	0.80	0.054
	Other	270	76%	1.27	0.103	0.77	0.133
Grade	I	888	64%	ref.		ref.	
	II	3978	71%	1.38	**<0.001**	1.58	**<0.001**
	III	1778	75%	1.72	**<0.001**	1.85	**<0.001**
	Unknown	27	70%	1.35	0.481	1.33	0.561
ER	ER+	6043	70%	ref.		ref.	
	ER-	585	77%	1.45	**<0.001**	1.11	0.393
	Unknown	43	84%	2.17	0.062	0.50	0.133
Country	Germany	2802	75%	ref.		ref.	
	Italy	2455	77%	1.13	0.066	2.62	**<0.001**
	Other	1414	54%	0.39	**<0.001**	0.88	0.115

ALND = axillary lymph node dissection; pT = pathologic tumor size classification; IDC = invasive ductal carcinoma; ILC = invasive lobular carcinoma; ER = estrogen receptors.

per year, higher tumor grade and presence of lymphovascular invasion [18].

Some factors associated with increased likelihood of performing ALND in our study may find a partial explanation on initial concerns with the Z0011 results. Regarding age, young patients, especially under 40 years were likely to be underrepresented in the trial due to the natural history of the disease that tends to present in older women and due to a selection bias before enrollment. Although the trial accepted women starting from age 18 years, close to 65% of patients were older than 50 years [2–5]. An unplanned analysis has suggested that younger patients (defined as premenopausal) should not have different outcomes when omitting ALND [19]. However, this post hoc analysis may need further validation. Regarding tumor size, although Z0011, 23-01 and AMAROS trials could include cases with tumors up to 5 cm, the great majority of recruited patients had small to medium size lesions. In trial 23-01, 92% of cases had tumors <3 cm [13]. In AMAROS and Z0011 trials, approximately 80% and 70% of patients had T1 lesions, respectively [2–5,14]. This distribution was likely the result of a selection bias prior to randomization.

With regard to geographical differences illustrated in this report (Fig. 3), it is quite challenging to find a plausible explanation with the available data, especially for the very early period right after the publication of Z0011 results (2010–2011) where a straight day-after evidence-based adherence was noted in German centers, whereas for Italian centers the change in practice seemed somehow slower.

Many randomized trials which extensive discussion is not the scope of this article have recently emerged in Europe. On one end, the SOUND (Sentinel node vs Observation after axillary UltrasouND; Italy) trial takes one step ahead the Z0011 and aims to determine if axillary staging could even be omitted in cases with cT1 cN0 disease [20,21]. On the other end, reluctance to fully accept evidence from the Z0011 study and/or interest in solving new questions have recently initiated the following trials for cN0 patients in European countries: POSNOC (POsitive Sentinel NOde: adjuvant therapy alone versus adjuvant therapy plus Clearance or axillary radiotherapy; UK), INSEMA (Intergroup Sentinel Mamma; Germany/Austria), BOOG 2013–07 (The value of completion axillary treatment in sentinel node positive breast cancer patients undergoing a mastectomy; Netherlands), SINODAR ONE (Randomized Clinical Trial to Assess the Role of Axillary Surgery in Breast Cancer Patients with One or Two Macrometastatic Sentinel Nodes; Italy), and SENOMAC (Omission of Axillary Clearance in Breast Cancer Patients with Sentinel Node Macrometastases; Sweden) [22–28]. BOOG 2013-07 and SENOMAC propose to answer additional questions not addressed by the Z0011 study by selecting patients with higher tumor burden, whereas INSEMA trial contemplates a wide design that approaches more than one clinical question with a high observational power.

It should be noted that our study only included data deriving from six European countries, hence precluding a clear illustration of

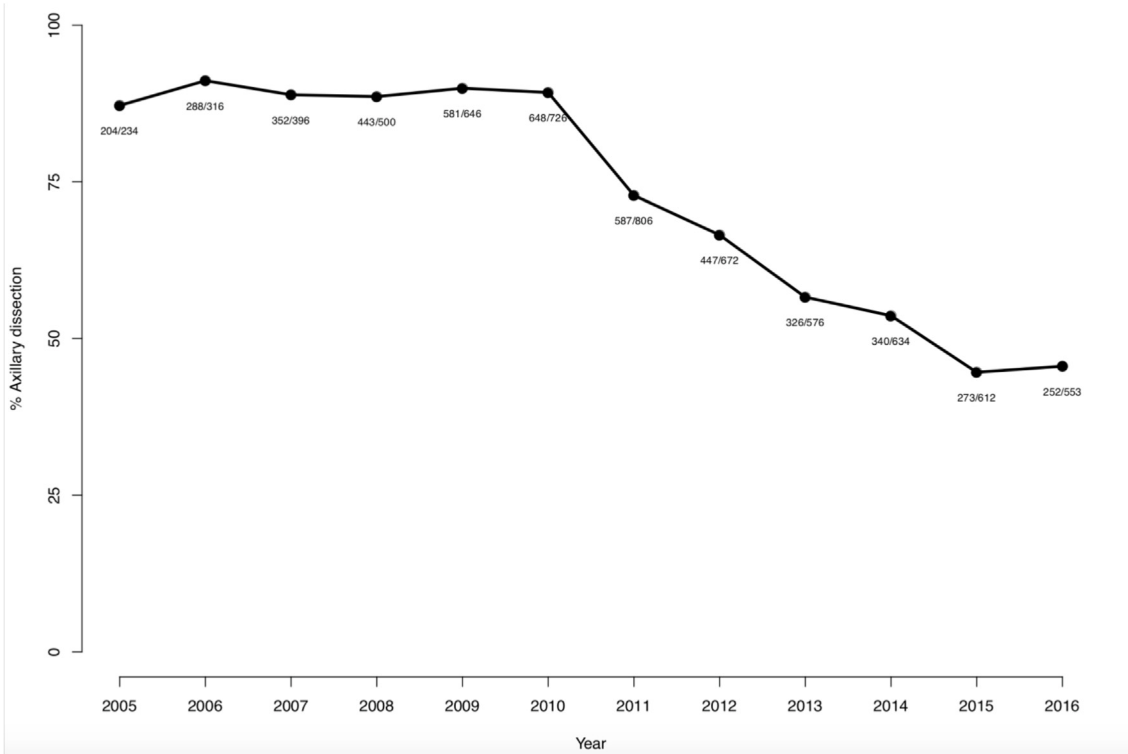

Fig. 2. Rates of axillary lymph node dissection from 2005 to 2016 in T1-2 N0 M0 sentinel node positive patients who underwent breast-conserving surgery and had not received neoadjuvant chemotherapy.

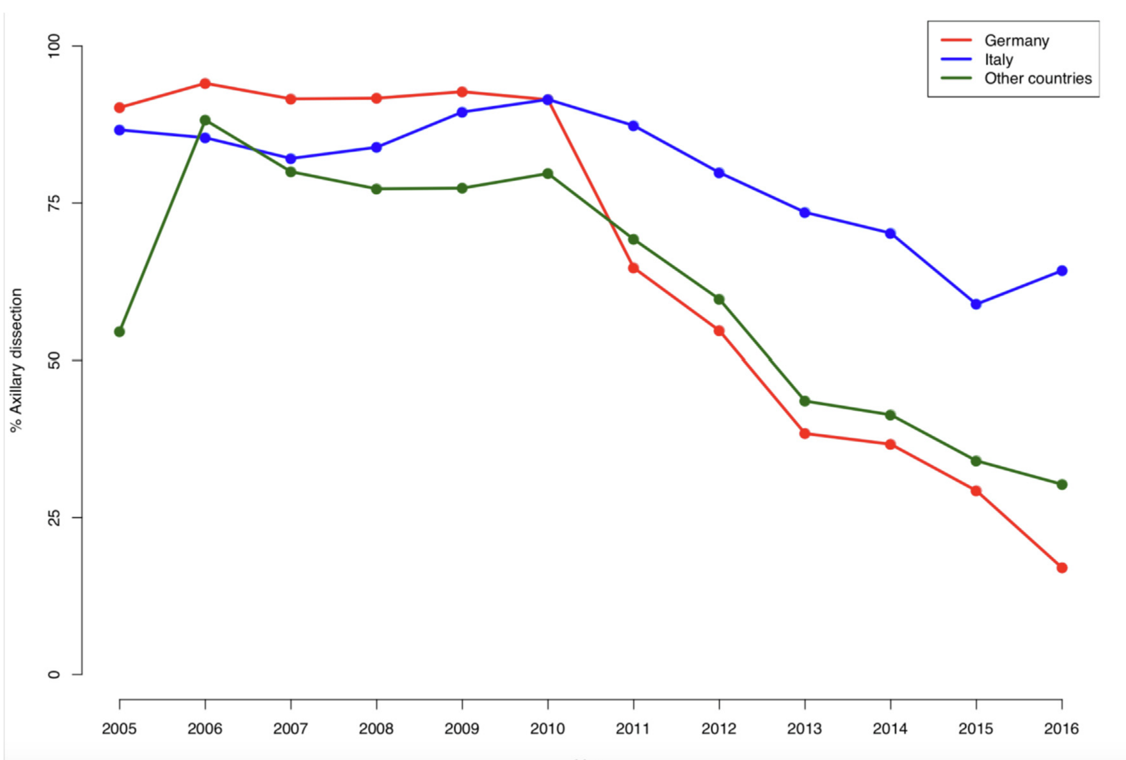

Fig. 3. Rates of axillary lymph node dissection by country from 2005 to 2016 in T1-2 N0 M0 sentinel node positive patients who underwent breast-conserving surgery and had not received neoadjuvant chemotherapy.

a wider geographical area. Moreover, datasets divided by country do not necessarily portray the standard practice across that nation, as data derived from a limited number of centers.

The most remarkable observation from our study is that, for cases operated in the most recent two-year period (2015–2016), reported rates of ALND were as wide as 0%–83%. This seems counterintuitive, as participating centers have been certified by EUSOMA, which maintains a data warehouse and provides annual feedback on a number of performance measures, although it should be noted that omitting ALND in this scenario has not yet been introduced as a quality indicator [12,29]. Along with EUSOMA's policy, Javid and Anderson have recently advocated to monitor adherence to quality metrics and to make surgeons aware of their own performance relative to peers [30].

5. Conclusion

Our study demonstrates, in this European dataset of cases fulfilling the Z0011 trial selection criteria, a statistically significant decrease in rates of axillary lymph node dissection that started after publication of the trial with a sustained reduction through the end of the study period. Factors associated with increased probability of ALND were earlier year of surgery, younger age, increasing tumor size, increasing tumor grade, and being operated in Italy. Wide differences in patient management were observed among centers and countries indicating the need to formulate and spread unified clinical guidelines and benchmarking in Europe to allow for homogeneous evidence-based practice patterns.

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Conflicts of interest

No conflicts declared.

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Appendix. Members of the EUSOMA Working Group

Mahmoud Danaei, Brustcentrum Aachen Marienhospital, Aachen, Germany

Elmar Stickeler, University Medical Center and Luisenhospital, Aachen Germany

Dimitri Sarlos, Brustzentrum Mittelland Kantonsspitaeler Aarau/Olten, Switzerland

Annemie Prové, Breast Center Sint Augustinus, Wilrijk, Antwerpen, Belgium

Olivia Pagani, Centro di Senologia della Svizzera Italiana, Ospedali Regionali di Lugano, Bellinzona e Valli, Switzerland

Gilles Berclaz, Breast Centre Bern, Division of Gynaecology & Surgical Oncology, Klinik Engeried, Lindenhofgruppe, Bern, Switzerland

Mario Taffurelli, Breast Cancer Unit, Policlinico Sant'Orsola Malpighi, University of Bologna, Italy

Elisabetta Cretella, GIPMa, Comprensorio Sanitario di Bolzano, Italy

Didier Verhoeven, University of Antwerp, Breast Clinic Voorkempen, Brasschaat, Belgium

Andreas Denk, Brustzentrum St. Joseph-Stift, Bremen, Germany

Birgit Carly, Breast Unit and Prevention Center Isala, Department Gynecology-Obstetrics, CHU-UMC St Pierre, Brussels, Belgium

Bettina Ballardini, Centro Senologia Multimedica, Italy

Yvonne van Riet, Catharina Hospital, Eindhoven, The Netherlands

Rainer Kimmig, West German Cancer Center, Breast Unit, University Hospital Essen, Germany

Mattea Reinisch, Breast Unit, Kliniken Essen-Mitte, Germany;

Catia Angiolini, Breast Unit e Gruppo Oncologico Multidisciplinare Tumori della Mammella, DAI Oncologico e di Chirurgia ad indirizzo robotico, Azienda Ospedaliero Universitaria Careggi, Firenze, Florence, Italy

Volker Möbus, Breast Unit, Klinikum Frankfurt Höchst, Academic Hospital, Frankfurt, Germany

Gunter Emons, Department of Obstetrics & Gynecology, University of Goettingen, Germany

Kay Friedrichs, Mammazentrum, Hamburg, Germany

Andreas Schneeweiss, Breast Unit University of Heidelberg, Germany

Corrado Tinterri, Breast Unit Humanitas Cancer Center, Rozzano, Italy

Daniel Egle, Leitender Oberarzt BGZ Tirol Univ. Frauenklinik Innsbruck, Austria

Gracienne Staelens, Borstkliniek Kortrijk AZ Groeninge, Belgium

Marion Kiechle, University Hospital Klinkum Rechts der Isar, Department of Gynecology, Technical University Munich, Germany

Nadia Harbeck, Breast Center, University of Munich LMU, Germany

Fabio Corsi, Breast Unit, Istituti Clinici Scientifici Maugeri, Pavia, Italy

Lorenzo Menghini, AUSL Romagna, Breast Unit Rimini, Italy

Augusto Lombardi, Breast Surgery Unit, University of Rome La Sapienza, Sant'Andrea Hospital, Rome, Italy

Lucio Fortunato, Centro di Senologia Azienda Ospedaliera San Giovanni Addolorata, Rome, Italy

Marina Bortul, SSD Breast Unit - ASUITS - Azienda Sanitaria Universitaria Integrata di Trieste, Italy

Jens Huober, Comprehensive Cancer Center Ulm, Germany

Farzaneh Badbanchi, Breast Unit, Dr. Horst Schmidt Klinken, Wiesbaden, Germany

Christoph Tausch, Breast Center Zurich Seefeld, Switzerland

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