



Oncoplastic and reconstructive surgery in SENONETWORK Italian breast centers: lights and shadows

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1. Introduction

Breast cancer (BC) poses a significant worldwide health challenge. In the year 2020, more than 2.3 million cases were detected, and there were approximately 685,000 deaths attributed to BC [1]. Although systemic treatments are gaining importance in BC management, surgery continues to be the fundamental treatment approach for the majority of early-stage patients. A prolonged discussion continues, examining the

overall survival rates between mastectomy and breast-conserving therapy (BCT), yielding inconclusive results. Nevertheless, breast-conservative therapy appears to present fewer complications [2, 3]. Patients undergoing BCT experience enhanced cosmetic results and a better quality of life compared to those opting for non-reconstructed mastectomy [4,5]. However, while BCT is thought to be more conducive to preserving a BC patient's body image compared to mastectomy, it is important to note that the occurrence of unsatisfactory aesthetic

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outcomes is not insignificant, ranging from 20 % to 30 % [6]. The proportion of excised breast volume becomes a pivotal factor influencing the cosmetic outcome following both surgery and breast irradiation [7]. Consequently, oncoplastic procedures have been developed with the aim of enhancing cosmetic results in comparison to standard BCS, ultimately leading to an improved quality of life [8,9]. Furthermore, oncoplastic surgery (OPS) can reduce the occurrence of positive margins and the need for re-excision or mastectomy due to the removal of larger tissue volumes [10,11]. Despite its widespread adoption worldwide, the potential benefits of OPS have not yet been verified through rigorous, high-level evidence studies [12]. Therefore, it exists a compelling necessity to define the precise role of oncoplastic BCS and establish universally accepted guidelines for clinical practice.

Each breast center should be able to offer these options as well as the best post-mastectomy reconstructive techniques, customized according to the patient's case [13,14]. Such procedures are increasingly adopted but a fuller understanding of their limits is needed in order to prevent or intercept any complications that can delay adjuvant treatments [15].

There are several experiences that elicit the importance of OPS and reconstructive procedures, yet a national database and analysis is still lacking and should be created. For this reason, Senonetwork Italia, a non-profit organization representing the multidisciplinary network of the breast units (BUs) in Italy, set up a working group consisting of specialists in various disciplines, in particular breast surgeons, plastic surgeons, radiotherapists, medical oncologists and radiologists in order to evaluate the safety and efficacy of OPS and in general breast reconstruction procedures in Italy.

This working group prepared a questionnaire, addressed to all centers of the network, to evaluate the state, at a national level, of the use of oncoplastic and reconstructive breast surgery, the complications observed, and the widespread use of the dedicated devices available in both the prophylactic and therapeutic phases. The questionnaire was also designed to evaluate the approach to radiotherapy and to post-operative radiological follow-up. The present article represents an important possibility for comparison between Italian BUs which could be usefully compared with other experiences.

2. Materials and methods

An anonymous questionnaire was developed by Senonetwork Italia. The questionnaire involved 123 questions concerning seven critical issues related to the BUs approach to OPS and breast reconstruction.

The survey was submitted by e-mail a first time on July 2021 and a last time in February 2022 (in order to involve other centers) to the 144 BUs associated with Senonetwork Italia. Enrollment in Senonetwork Italia is voluntary, and each BUs must state it meets specific requirements regarding both an annual surgical volume of cases and a full multidisciplinary approach of the "core team" [16].

Both the Clinical Director and the breast surgeon, plastic surgeon, and radiation oncologist of the BUs shared the responsibility of answering the questionnaire via an anonymous electronic format, including where necessary with the other professional members of the MDT multidisciplinary team.

The seven sections included in the survey were:

- 1) SECTION 1 (Q1-Q7): General information, geographical location of the Center and number of cases treated per year, professionals available in the center
- 2) SECTION 2 (Q8-Q21) First and second level oncoplastic techniques: who performs them, how much they impact the total of conservative surgery, which elements are most important in planning the intervention, which techniques are most used, whether OPS is used also in cases of multicentric tumors, and rate of complications.
- 3) SECTION 3 (Q22-Q45) Post-mastectomy reconstruction: different types of mastectomy and different types of reconstruction, the use of

- ADM and meshes, autologous flaps, types of prosthesis, complications after reconstruction, follow-up after reconstruction, BIA-ALCL
- 4) SECTION 4 (Q46-Q86) Prevention and treatment of complications in terms of infections, flap hypo-vascularization, thromboembolism, postoperative bleeding, advanced dressing, and drainage management
- 5) SECTION 5 (Q87-Q97) Radiological follow-up, the use of MRI
- 6) SECTION 6 (Q98-Q112) Post-mastectomy radiotherapy: indications, volumes, techniques, and PMRT impact on surgical planning
- 7) SECTION 7 (Q113-Q123) Regenerative surgery and the adoption of lipofilling.

3. Results

The questionnaire was answered by 85/144 BUs (responders: 59 %, with 76 completed questionnaires) well-distributed throughout the country, which were involved in the management of 35,589 of the 52,000 new BC cases estimated each year in Italy.

Among the responders, BUs were treating ≤ 200 cases, 201–400, 401–600, 601–800 or > 800 cases per year, in 26.4 %, 43.7 %, 19.5 %, 5.7 % and 4.7 %, respectively. Fifty-five BUs (58.5 %) were located in the North, twenty-three (24.5 %) in the Center, and sixteen (17 %) in Southern Italy. Lombardy and Tuscany resulted to be the two most represented regions among responders.

Here the main results observed:

- **SECTION 1 certified breast units:** 48.3 % of the BUs declared they were certified according to regional, national, or European guidelines.
- **SECTION 2 oncoplastic techniques (see Tables 1–2):** 1st level OPS is performed in 56.47 % of cases by breast surgeon only, in 5.88 % by plastic surgeon only, and in 37.65 % cases by both.

Specialists that perform **2nd level OPS** are breast surgeon only 17.65 %, plastic surgeon only 32.94 %, both in 49.41 %.

First level OPS is used in more than 50 % of conservative surgeries by the prevalent proportion of BUs (40 %). More than 50 % of BUs declare they use 2nd level OPS in 11–30 % of conservative surgeries. **Traditional quadrantectomy** still represents the prevalent choice (> 50 %) in breast-conserving surgery (BCS) for 29,41 % BUs. **Contralateral breast symmetrization** after BCS is reserved to < 10 % of cases by 58,82 % of responders.

The most important elements in choosing OPS are considered to be: the disadvantageous tumor size to breast volume rate, disadvantageous tumor site, degree of ptosis/mammary macromastia. Other important factors are pre-existing asymmetry and the expectations of the patient.

In case of multifocality/multicentricity, a total of 56.63 % of responders use OPS to treat tumors simultaneously present in different quadrants (two contiguous or not contiguous quadrants) differently from the other 43,37 %.

Oncoplastic procedures are considered safe since the rate of **major complications** in OPS is below 5 % for 91.57 % of BUs.

The majority (45,78 %) of BUs has a rate of **minor complications** of 5–10 % and 33,73 % has a rate less than 5 %. Most frequent complications are seroma and hematoma; wound dehiscence, infections and flap hypovascularization are less common.

Volume replacement procedures with autologous flaps are indeed infrequent and used in < 5 % of cases by 33.7 % BUs, while they are never used by 55.4 % BUs. The most adopted techniques are TAP (24.0 %) and LICAP 9.6 %.

- **SECTION 3 mastectomy and reconstruction (see Tables 3–6):** Post-mastectomy reconstruction rate is 71–90 % in 37.97 % of BUs, more than 90 % in 22.78 % BUs, while only 7.59 % of responders declare a rate of reconstruction below 50 %. Regarding **type of mastectomy**, both skin-sparing mastectomy (which is used

Table 1
Oncoplastic surgery: % of employment, techniques and indications.

	%	n	Tot responders
At your center, first-level oncoplastic care is provided by a team of specialized professionals, including:			
Breast Surgeon	56,47 %	48	
Plastic Surgeon	5,88 %	5	
Both alternately	16,47 %	14	
Both simultaneously	21,18 %	18	85
At your center, second-level oncoplastic care is provided by a team of specialized professionals, including:			
Breast Surgeon	17,65 %	15	
Plastic Surgeon	32,94 %	28	
Both alternately	15,29 %	13	
Both simultaneously	34,12 %	29	85
At your center, what is the approximate percentage of first-level oncoplastic conserving procedures?			
0–10 %	5,88 %	5	
11–30 %	20,00 %	17	
31–50 %	34,12 %	29	
>50 %	40,00 %	34	85
At your center, what is the approximate percentage of second-level oncoplastic conserving procedures?			
0–10 %	20,00 %	17	
11–30 %	50,59 %	43	
31–50 %	18,82 %	16	
>50 %	10,59 %	9	85
What is the approximate percentage of conservative procedures that fall under quadrantectomy with traditional techniques at your center?			
0–10 %	23,53 %	20	
11–30 %	28,24 %	24	
31–50 %	18,82 %	16	
>50 %	29,41 %	25	85
At your center, what is the approximate percentage of conservative procedures that are associated with contralateral symmetrization surgery?			
0–10 %	58,82 %	50	
11–30 %	22,35 %	19	
31–50 %	12,94 %	11	
>50 %	5,88 %	5	85
Which of these elements do you consider most important in surgical planning with oncoplastic techniques? (Possible multiple answers)			
Relationship between tumor size and breast volume	93,98 %	78	
Tumor size at the limits for conservative surgery	50,60 %	42	
Disadvantageous tumor location	72,29 %	60	
Pre-existing breast asymmetry	54,22 %	45	
Patient's desire/wish	56,63 %	47	
Strong patient resistance to mastectomy	20,48 %	17	
Mammographic breast density	8,43 %	7	

Table 1 (continued)

	%	n	Tot responders
Degree of breast ptosis/macromastia	62,65 %	52	
Others	3,61 %	3	83
What are the oncoplastic techniques that you most frequently apply at your center? (maximum 2 responses)			
Sliding flaps in QII	22,89 %	19	
Sliding flaps in QIE	14,46 %	12	
Vertical\short scar	20,48 %	17	
Wise pattern	51,81 %	43	
Quadrantectomy centrale sec.Grisotti	14,46 %	12	
Periareolar approach	54,22 %	45	
Batwing	6,02 %	5	
Propeller flap (LICAP-AICAP)	8,43 %	7	83
Do you employ oncoplastic surgery to treat tumors simultaneously present in different quadrants?			
never	43,37 %	36	
Up to 2 non-contiguous quadrants	28,92 %	24	
Up to 2 contiguous quadrants	27,71 %	23	83

Table 2

Oncoplastic surgery: minor and major complications.

What percentage of conservative oncoplastic interventions have a course burdened by major complications (necrosis, reoperation, infection requiring hospitalization) in your experience?			
	%	N	Tot responders
Less than 5 %	91,57 %	76	
Between 5 % and 10 %	7,23 %	6	
Between 10 % and 30 %	1,20 %	1	
More than 30 %	0,00 %	0	83
What percentage of conservative oncoplastic interventions have a course burdened by minor complications (necrosis, reoperation, infection requiring hospitalization) in your experience?			
Less than 5 %	33,73 %	28	
Between 5 % and 10 %	45,78 %	38	
Between 10 % and 30 %	20,48 %	17	
More than 30 %	0,00 %	0	83

less than 40 % of the time in 64 % of the centers) and especially nipple-sparing (which appears to be used in about 50 % of mastectomies by over 42 % of responders) are highly represented (see [Table 2](#)).

Interestingly, immediate reconstructions exceeded the rate of 90 % of the reconstructions for the vast majority of BUs.

In more details, the choice of two-stage breast reconstruction (with **subpectoral tissue expander**) appears to be rather differentiated. 24 % of BUs use it in <15 % of reconstructions, 43.9 % BUs use it in up to 50 % of cases, and the remaining 32 % use this technique in the majority of cases. **Prepectoral expanders** are quite uncommon. **Prepectoral immediate reconstruction** with prosthesis in around 38.67 % of cases is adopted very rarely, in another 38.67 % of BUs is used in a range between 15 and 50 % cases, and in the remaining 22.66 % of BUs is employed in more than 50 % of cases. The reconstruction with **subpectoral prosthesis** or with **partially subpectoral prosthesis plus ADM** is used in less than 15 % of cases by approximately 64 % and 72 % of BUs respectively. Reconstruction by lipoinjection is significantly used only by 48 % of centers.

For prepectoral reconstruction, ADM is the most used device (57.34

Table 3
Mastectomy and reconstruction.

What is the percentage of mastectomies with reconstruction compared to total mastectomies performed at your center?											
	%		N		Tot responders						
Less than 50 %	7,59 %		6								
Between 51 % and 70 %	31,65 %		25								
Between 71 % and 90 %	37,97 %		30								
More than 90 %	22,78 %		18		79						

At your center, how do the following immediate reconstructions approximately divide? Imagine considering 100 mastectomy and reconstruction surgeries: the total of the answers to questions 28 and 29 should sum up to approximately 100 %											
	Less than 15 %		between 15 % and 30 %		between 31 % and 50 %		between 51 % and 70 %		More than 70 %		Total
Two-stage reconstruction (retro-pectoral expander/implant)	24,00 %	18	29,33 %	22	14,67 %	11	17,33 %	13	14,67 %	11	75
Two-stage reconstruction (pre-pectoral expander/implant)	84,00 %	63	9,33 %	7	4,00 %	3	1,33 %	1	1,33 %	1	75
Mastectomy with two-stage reconstruction (expander/autologous flap)	92,00 %	69	6,67 %	5	1,33 %	1	0,00 %	0	0,00 %	0	75
Prepectoral DTI	38,67 %	29	20,00 %	15	18,67 %	14	9,33 %	7	13,33 %	10	75
Retropectoral DTI	64,00 %	48	21,33 %	16	12,00 %	9	2,67 %	2	0,00 %	0	75
Implant based reconstruction with ADM	72,00 %	54	20,00 %	15	5,33 %	4	1,33 %	1	1,33 %	1	75

At your center, how do the following immediate reconstructions approximately divide? Imagine considering 100 mastectomy and reconstruction surgeries: the total of the answers to questions 28 and 29 should add up to approximately 100 %.											
	Less than 5 %		Between 5 and 10 %		Between 11 and 15 %		More than 15 %		Total		
Immediate mastectomy reconstruction with autologous flap	78,67 %	59	10,67 %	8	2,67 %	2	8,00 %	6	75		
Two-stage reconstruction with expander/autologous flap	77,03 %	57	8,11 %	6	2,70 %	2	12,16 %	9	74		
Total reconstruction with fat grafting	87,67 %	64	4,11 %	3	2,74 %	2	5,48 %	4	73		

In your breast center											
	Breast Surgeon		Plastic Surgeon		Both alternately		Both simultaneously		Total	Weighted Average	
Which professionals are involved in reconstructive surgery after ablative oncoplastic surgery?	24,00 %	18	38,67 %	29	14,67 %	11	22,67 %	17	75	2,36	75
Who performs the mastectomy?	93,33 %	70	1,33 %	1	5,33 %	4	0,00 %	0	75	1,12	75
Who performs the two-stage reconstruction with expander?	32,00 %	24	48,00 %	36	10,67 %	8	9,33 %	7	75	1,97	75
Who performs the prepectoral reconstruction ?	22,67 %	17	58,67 %	44	5,33 %	4	13,33 %	10	75	2,09	75

Table 4
Device employed in post-mastectomy reconstruction.

In cases of prepectoral reconstruction, which devices are used at your center?		
Whole ADM (Acellular Dermal Matrix)	34,67 %	26
Fenestrated ADM (Acellular Dermal Matrix)	22,67 %	17
Poliurethan Coated Implant	30,67 %	23
Titanium Mesh	28,00 %	21
We don't perform prepectoral reconstruction	10,67 %	8
We don't use devices	5,33 %	4
Altro (specificare)	5,33 %	4
		75

%), followed by polyurethane prosthesis (30.67 %) and titanized meshes (28 %).

Two thirds of the centers do not have a dedicated microsurgical team.

Referring to the **roles inside the surgical team**, mastectomy is performed by the breast surgeon in 93.3 % of cases, the breast reconstruction in two steps (expander placement) is performed by the breast surgeon in 32 %, by the plastic surgeon in 48 %, and by both in the remaining 20 % of cases. Prepectoral reconstruction is more frequently done by the plastic surgeon (58.67 %) while by the breast surgeon by 22.67 %.

Symmetrization of the contralateral breast is carried out by the plastic surgeon in the vast majority (69.33 %) of cases.

In case of mastectomy, **major complications** (severe infection or severe skin flap ischemia with the threat of implant loss) are very rare (<5 %) for 62.16 % of BUs, while the **minor complications** were present in 5–10 % for 51.35 % BUs.

In more than 70 % (72.6 %) of centers, a dedicated pathway for the early diagnosis and treatment of BIA-ALCL is present. The systematic use of the National Registry of breast implants is documented in a little more than half centers (53.42 %).

- **SECTION 4 technical details and tricks (see Table 7): preoperative assessment of flap** is executed clinically by 50 % of BUs, while 31 % adopt an indocyanine-green-based device. Regarding **antibiotic prophylaxis** for BCS, preoperative one-shot therapy prevails, while in cases of mastectomy and reconstruction the majority (47 %) use a prolonged prophylaxis until the seventh postoperative day or up to the removal of drains.

The intraoperative use of systemic (i.v.) **drugs to prevent bleeding** complications is not usual in more than 85 % of the BUs.

In cases of **delayed wound healing** after conservative or ablative surgery, dedicated products are used with therapeutic intent: advanced

Table 5
Mastectomy: contralateral simmetrization and complications.

At your center, out of 100 immediate prepectoral mastectomy reconstruction procedures performed in a single stage, how many are associated with contralateral symmetrization surgery?		
	%	N
Less than 10 %	51,35 %	38
Between 10 and 30 %	27,03 %	20
Between 31 and 50 %	5,41 %	4
More than 50 %	16,22 %	12
At your center, what percentage of mastectomy have a course burdened by major complications (reconstructive failure, infection requiring hospitalization, skin or flap necrosis)?		
Less than 5 %	62,16 %	46
Between 5 and 10 %	32,43 %	24
Tra 10 e 30 %	5,41 %	4
Oltre al 30 %	0,00 %	0
At your center, what percentage of mastectomy have a course burdened by minor complications (seroma, hematoma, wound dehiscence)?		
Less than 5 %	14,86 %	11
Between 5 and 10 %	51,35 %	38
Between 10 and 30 %	32,43 %	24
Oltre al 30 %	1,35 %	1
What are the three most common complications recorded at your center in reconstructive surgery following ablative oncological procedures? (up to 3 answers)		
Infection	36,99 %	27
Seroma	86,30 %	63
Ematoma	53,42 %	39
Flap necrosis	38,36 %	28
Wound dehiscence	31,51 %	23
Nipple areola necrosis	17,81 %	13
Other (please specify)	0,00 %	0

Table 6
BIA-ALCL, a screening and eradication protocol for patients carrying MSSA/MRSA; antibiotic prophylaxis.

At your center, have there been any confirmed cases of BIA-ALCL (Breast Implant-Associated Anaplastic Large Cell Lymphoma)?			
No	69,86 %	51	73
Yes	30,14 %	22	
At your center, is the National Prosthesis Registry regularly used for the inclusion of all relevant cases?			
Yes	53,42 %	39	73
No	46,58 %	34	
At your center, is there a screening and eradication protocol for patients carrying MSSA/MRSA (Methicillin-Sensitive Staphylococcus Aureus and Methicillin-Resistant Staphylococcus Aureus)?			
Yes	41,67 %	30	72
No	58,33 %	42	
At your center, what antibiotic prophylaxis regimen is followed in cases of conservative oncological surgery?			
Preoperative single shot	48,61 %	35	72
Prophylaxis within 24 h.	16,67 %	12	
Prolonged Prophylaxis	19,44 %	14	
No prophylaxis	15,28 %	11	
At your center, what antibiotic prophylaxis regimen is followed in cases of mastectomy?			
Preoperative single shot	29,17 %	21	72
Prophylaxis within 24 h.	18,06 %	13	
Prolonged Prophylaxis	47,22 %	34	
No prophylaxis	5,56 %	4	
In case of prolonged prophylaxis, based on what criteria is the duration chosen?			
Until 7 days postop	50,00 %	36	72
Until 14 days postop	1,39 %	1	
Until drains removal	38,89 %	28	
Other (specify)	9,72 %	7	

medications by 59 % or negative pressure devices by 27 %. Pico©, Avelle© and Prevena© are the most common, but almost 30 % do not use these products because they are unavailable in their hospitals (60 %) or too expensive (10 %). These devices are more frequently employed in prepectoral reconstruction (56.86 %), followed by retropectoral

Table 7
Prevention of surgical site complications, postoperative compression garments, thromboembolic events prophylaxis, drains management.

At your center, are devices used for prophylactic prevention of surgical site complications?			
	%	N	tot responders
Yes	46,48 %	33	
No	53,52 %	38	71
If you answered NO to the previous question, can you please provide the reason?			
Because I do not consider them beneficial	20,00 %	4	20 su 38
Because they are not provided by my institution (not reimbursable)	60,00 %	12	
For me, the cost does not justify the potential clinical benefit	10,00 %	2	
Other (specify)	10,00 %	2	
In which types of procedures do you use the aforementioned devices? (multiple answers possible)			
Prepectoral Breast Reconstruction	56,86 %	29	51
Retropectoral Breast Reconstruction	41,18 %	21	
Symmetrization procedures	25,49 %	13	
The site of autologous flap harvest.	25,49 %	13	
Conservative oncological surgery	37,25 %	19	
At your center, are postoperative compression garments used?			
Adjustable compression bra ± band	63,38 %	45	
Sports bra	21,13 %	15	
Bra + dressing	14,08 %	10	
Nothing	1,41 %	1	
At your center, is a protocol for thromboembolic events prophylaxis in use?			
Yes	95,77 %	68	71
No	4,23 %	3	
At your center, typically how many drains do you use in mastectomy with prepectoral implant-based reconstruction without axillary clearance?			
No drains	2,82 %	2	71
1	69,01 %	49	
2	28,17 %	20	
3	0,00 %	0	
>3	0,00 %	0	
When do you typically remove them, in case of prepectoral reconstruction (without axillary clearance)?			
I day postop	1,41 %	1	71
II-III days postop	2,82 %	2	
IV—VII days postop	1,41 %	1	
More than VII days postop	8,45 %	6	
I decide based on the output (<50 ml/day).	32,39 %	23	
I decide based on the output (<30 ml/day).	53,52 %	38	

reconstruction and conservative procedure.

Almost all the BUs (95.77 %) adopt an **antithromboembolic prophylaxis** protocol and 59 % of them did not experience an increase in post-op bleeding, with rates mostly below 5 %.

Management of drains obviously differs according to the type of surgery: in the lumpectomies most surgeons (34 %) tend to remove them with a flow rate <30 cc/day, while in the mastectomies with expanders they remove drains with <50 cc/day (46 %) or with <30 cc/day (38 %). In case of mastectomies with prepectoral implant (without axillary clearance), drains are removed with <30 cc/day (53.52 %) or with <50 cc/day (32.39 %). To reduce seroma formation, 34 % report using either

ultrasonic dissector (Ultracision©) or fibrin glue or quilting sutures.

- **SECTION 5 follow-up and MRI use (see Table 8):** 59.15 % of centers ensure radiological follow-up until the tenth year with mammography or ultrasound (in cases of mastectomy) and 40.85 % until the fifth year. Breast reconstruction with flap does not change the normal follow-up. MRI in the postoperative period is not used unless there are doubts (88.73 % responders). MRI, in cases of prophylactic surgery (BRCA mutation carriers), is used in the preoperative phase by 70.42 % of responders. The indication for preoperative MRI in cancer patients is generally discussed by the multidisciplinary group (76.06 % responders): in more than 50 % of operations, MRI is not employed according to 33.80 % responders in cases of mastectomy; MRI is not used according to 40.85 % responders in cases of OPS. Only the remaining 26.76/30.98 % use MRI much more frequently in OPS or mastectomy cases respectively.
- **SECTION 6 Radiotherapy (see Table 9):** 67.14 % of BUs state that post-mastectomy radiotherapy (PMRT) changes the type of reconstruction if the indication is already present before surgery: the expander appears to be the predominant choice (34.29 %), followed by 12.86 % delayed post-radiotherapy reconstruction with flaps, 8.57 % immediate retropectoral reconstruction, and 5.71 % immediate autologous flap reconstruction.

By contrast, the indication to PMRT that emerges only in the postoperative phase generally (82.86 % responders) does not imply changes in the reconstructive procedure, except for a low percentage of BUs that perform a fast track expansion program for replacing expanders before

Table 8
Postoperative follow-up management.

At your center, postoperative follow-up occurs			71
Every year with mammography	9,86 %	7	
Every year with mammography and ultrasound	73,24 %	52	
Every year with mammography and ultrasound, alternating with ultrasound only every 6 months	16,90 %	12	
In the case of prophylactic mastectomy, is breast MRI used before the intervention?			
Always	70,42 %	50	71
Never	1,41 %	1	
Only in extremely dense breasts.	7,04 %	5	
Only in case of diagnostic doubt	21,13 %	15	
After prophylactic mastectomy, is breast MRI used?			
Only after the intervention to assess glandular residue	9,86 %	7	71
Never	4,23 %	3	
Every year	8,45 %	6	
Every three years	4,23 %	3	
Only in case of diagnostic doubt.	73,24 %	52	
How many mastectomy procedures are performed without the preventive use of breast MRI?			
More than 50 %	33,80 %	24	71
Between 11 and 50 %	35,21 %	25	
Between 5 and 10 %	14,08 %	10	
Less than 5 %	16,90 %	12	
How many conservative oncoplastic surgery procedures are performed without the preventive use of breast MRI?"			
More than 50 %	40,85 %	29	71
Between 11 and 50 %	32,39 %	23	
Between 5 and 10 %	14,08 %	10	
Less than 5 %	12,68 %	9	

Table 9
Postmastectomy Radiotherapy: indications and multidisciplinary management.

Does the indication for pre-planned Post-mastectomy Radiotherapy (PMRT) at your Center affect the type of proposed reconstructive surgery for the patient?			
yes	67,14 %	47	
No	32,86 %	23	
What type of surgery is offered to patients for whom PMRT is indicated?			
Immediate reconstruction with prepectoral implant	1,43 %	1	47 su
Immediate reconstruction with retropectoral implant	8,57 %	6	47
Immediate reconstruction with free flap	5,71 %	4	
Immediate reconstruction with tissue expander	34,29 %	24	
Delayed reconstruction with free flap	12,86 %	9	
Delayed reconstruction with implant	4,29 %	3	
Our approach doesn't change	32,86 %	23	
If the indication for PMRT (Postmastectomy Radiotherapy) is NOT PRE-PLANNED BEFORE SURGERY but arises during the POSTOPERATIVE MDM (Multidisciplinary Meeting), does it modify the type of reconstructive surgery already performed?			
Yes	17,14 %	12	70
No	82,86 %	58	
What type of surgery is proposed to patients for whom PMRT is indicated?			
Implant removal and conversion to autologous flap before radiation therapy	0,00 %	0	70
Implant removal and conversion to autologous flap after radiation therapy	0,00 %	0	
Fat grafting	7,14 %	5	
Acceleration of expansions (if tissue expander in place), replacement with a permanent implant, and radiation therapy on the implant.	8,57 %	6	
I do not accelerate the expansions; the patient undergoes radiation therapy on the tissue expander	4,29 %	3	
Our approach doesn't change	80,00 %	56	
At your center, for patients who are candidates for PMRT with two-stage reconstruction (expander-implant), what is the optimal sequence for the placement of radiation therapy?			
Immediate reconstruction with tissue expander - Radiation therapy - Placement of permanent breast implant.	77,14 %	54	70
Immediate reconstruction with tissue expander - Placement of permanent breast implant - Radiation therapy	22,86 %	16	
At your center, in the presence of pN+ (4 or more positive lymph nodes), is radiation therapy indicated for the chest wall and lymph node stations, or only for the lymph node stations?			
Irradiation of lymph nodes only	38,57 %	27	70
Irradiation of chest wall + lymph nodes	61,43 %	43	
At your center, which technique is usually used for the irradiation of the reconstructed breast and lymph node drainage areas? (multiple answers possible)			
3D-CRT	55,38 %	36	
IMRT step and shoot	26,15 %	17	
IMRT sliding window	18,46 %	12	
VMAT	38,46 %	25	
Tomotherapy	10,77 %	7	
What type of fractionation do you usually use in the radiotherapy treatment of the reconstructed breast and lymph node drainage areas?			
Hypofractionated schedule	41,54 %	27	65
Conventional schedule	58,46 %	38	

radiotherapy (8.57 %) or multiple autologous fat grafting (7.14 %)

Regarding the timing of PMRT in two-step reconstruction, most (77.14 %) prefer to irradiate the expander while 22.86 % irradiates the prosthesis.

In PMRT, with pN2 (4 or more nodes positive), irradiation of the wall and lymph node stations is considered indicated by 61.43 %, while radiotherapy only to the lymph nodes is chosen by the remaining 38.57 %.

In retropectoral reconstruction, the definition of the CTV of the reconstructed breast includes the prosthetic implant (34 %); a total of 56 % respond that it depends on the characteristics of tumor or surgery. Usually (67 %) the definition of volumes depends on the retropectoral or prepectoral position of the implant.

The most commonly used technique in wall and drainage irradiation is 3D-CRT (55.38 %) followed by VMAT (38.46 %) and step-and-shoot IMRT (26.15 %). A majority of centers (58.46 %) still use traditional fractionation rather than a hypofractionated scheme (41.54 %).

- **SECTION 7 autologous fat grafting (see Table 10):** it is adopted by 92.31 % of responders. Among those who do not use it, only a small fraction consider the technique oncologically unsafe. The procedure is carried out in all biological subgroups in 44.62 % of centers; 43.08 % responders discuss the indication for lipofilling in the MDM.

The autologous fat tissue is mostly processed by centrifugation (56 %) or decantation (37.5 %); its withdrawal is usually manual. The indications for lipofilling after conservative surgery are: localized deformities, radiodystrophic areas or, less frequently, correction of painful syndrome. In prepectoral reconstruction, lipofilling is used in >10 % of cases by the majority of surgeons (35.85 %).

4. Discussion

Oncoplastic treatment has become part of routine surgical

Table 10
Autologous fat tissue grafting: indications and use.

At your center, are procedures of autologous fat tissue grafting or lipofilling performed?			
Yes	92,31 %	60	65
No	7,69 %	5	
If no why ?			
I do not consider it oncologically safe	1,54 %	1	65
I do not have operating rooms available to include this procedure	4,62 %	3	
I do not consider it useful	1,54 %	1	
I answered yes	92,31 %	60	
Per quanto riguarda la safety del tessuto adiposo autologo presso il tuo centro si seguono particolari attenzioni (più risposte possibili):			
The indication for lipofilling is discussed in a multidisciplinary consultation	43,08 %	28	65
Lipofilling is not performed in patients who have undergone (demolitive) surgery less than two years ago.	16,92 %	11	
Lipofilling is not performed in triple negative patients	4,62 %	3	
Lipofilling is not performed in LUMINAL B patients	3,08 %	2	
At my center, the procedure is performed in all patient classes.	44,62 %	29	
Other (specify)	6,15 %	4	
Do you use autologous fat tissue grafting following prepectoral reconstruction?			
51–70 % cases	9,23 %	6	65
Between 11 and 50 % of cases	24,62 %	16	
Between 5 and 10 % cases	18,46 %	12	
Less than 5 %	16,92 %	11	
Never	30,77 %	20	

management of BC in the Italian centers. Most studies comparing OPS with traditional BCS have reported no difference in surgical complications between the groups [17,18]. Our study shows that OPS performed by the multidisciplinary trained teams of the Italian Senonetwork is a safe group of techniques with a low and acceptable risk of complications.

Carter et al. compared complication rates in 9861 patients treated with BCS, OPS, mastectomy only, and mastectomy plus immediate reconstruction (M + IR) [19]. OPS had a lower seroma rate (13 %) than BCS but wound-related complications (4.8 %) were statistically higher. OPS and BCS had a similar rate of hematoma (2 %) and surgical site infection (4.5 %). Compared with M + IR, OPS had significantly lower wound-related complications, surgical site infections, and hematomas.

Our survey demonstrates that M + IR presented:

- low rate of major complications (reconstructive failure, severe infection with hospitalization, skin necrosis) in 62.16 % of BUs and a rate of 5–10 % in 32.43 % of BUs;
- a rate of minor complications (seroma, hematoma, wound dehiscence) lower than 5 % in 14.86 % of BUs, a rate between 5 and 10 % in 51.35 % of BUs and a rate 10–30 % in 32.43 % of BUs. Seroma, hematoma and skin hypoperfusion were the most represented, followed by mild infection. This data appears comparable with those reported in literature [19,20].

Our study shows how the reconstructive quality after OPS and demolitive surgery is good, both in low and high-volume centers; however, the latter offer a wider range of reconstructive possibilities, including autologous tissue reconstruction techniques, in the vast majority of cases using the DIEP flap. This is consistent with the need to make maximum effort to meet patient expectations as well as to consider multiple variables related to BC and breast type.

Although several options are currently available for reconstructing the breast after mastectomy, implant-based techniques remain the most common. Direct-to-implant reconstruction has become a favorable option for both patients and surgeons as it offers distinct advantages. A combined one-stage M + IR approach is used in many cases because it avoids multiple tissue expansions, a second operation, and the possibility of a prolonged expansion period influenced by postoperative complications or adjuvant oncological therapies. We have highlighted how there is an increasing trend towards a return to the prepectoral technique, also due to the increasingly widespread use of ADM, which allows good aesthetic results, with an acceptable cost [21].

Regarding post mastectomy radiotherapy, it is surprising how about 40 % BUs irradiate only the lymph nodes excluding the chest wall in case of 4 or more nodes positive. Surgical techniques for breast reconstruction continue to develop with the aim of improving cosmetic outcomes via pre or retro-pectoral placement of the implant, or the use of an autologous-flap, lipofilling or synthetic coverage materials in association with the implant. Radiation therapy in the setting of breast reconstruction is challenging [22]. Contouring guidelines for PMRT after implant-based IBR (Immediate breast reconstruction) were published in 2019 [23]. From our survey a still rather heterogeneous behavior emerges with respect to the PMRT modalities.

BUs are increasingly focusing on screening for BIA-ALCL, in the light of the increase in the number of cases and the capacity for diagnosis, as emerges from a survey conducted by the European Association of Societies of Aesthetic Plastic Surgery E(A)SAPS in 48 European countries [24]. Indeed, efforts still need to be made in order to increase the adoption of a national implant registry.

Fat grafting is an ancillary procedure used by almost all BUs. It can be used both after conservative and ablative surgery [25]. It is usually delayed in order to correct any deformities following OPS, but immediate lipofilling as a volume replacement technique in BCS is a safe and simple technique without major complications. Oncological concerns are in fact decreasing in the light of increasing evidence regarding its

safety [26].

The need for preoperative MRI is mostly decided by the Multidisciplinary team (MDT) and in the majority of centers MRI is required before prophylactic mastectomy. Post-surgical follow-up includes annual mammography and/or ultrasound for 5 or 10 years.

5. Conclusions

The value of this survey lies above all in comparing the MDT of many dozens of Italian centers belonging to a network (Senonetwork) which in any case requires the presence of adequate case-load for affiliation (at least 150 new cases/year of BC) and appropriate quality standards monitored through dedicated databases. This certainly reduces the variability within the sample which is made up of centers with an averagely high standard. Obviously, the sample includes centers with different volumes and standards, but the statistical analysis does not allow us to highlight significant differences, which for this reason are not reported. Secondly, the strength of the survey lies in stimulating multidisciplinary work, in this case between breast surgeons, plastic surgeons, radiation oncologists, oncologists, radiologists. The value also lies in promoting a comparison and self-examination particularly with respect to the short-term complications of both conservative and ablative oncoplasty. It therefore produces a valuable and vital snapshot of the state of the art that can be replicated and monitored over time. Finally, it introduces a practical point of view on the knowledge and use of advanced dressings and negative pressure devices (mini-vac) not only in the management, but also in the prevention of post-surgical complications. A useful starting point is therefore represented by the need for a multidisciplinary discussion between surgeons and radiation oncologists, particularly in cases of mastectomy that require radiotherapy of the chest wall, both those in which the indication is foreseeable already before the operation and those in which it emerges only afterwards.

Again, this survey focuses on the growing problem of BIA-ALCL and in any case of neoplastic diseases potentially linked to the presence of breast implants.

The survey is not, of course, without certain weaknesses. These are a numerically still small - although not negligible - sample, the self-referential nature of the answers, and the statistical limits of the design. We intend to replicate the survey at the earliest opportunity, employing a more rigorous design.

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