



# Oncoplastic surgery and breast reconstruction in the elderly: an unsolved conundrum

Carlos Mavioso<sup>1^</sup>, Claudia Pereira<sup>2,3^</sup>, Maria Joao Cardoso<sup>1,3^</sup>

<sup>1</sup>Breast Unit, Champalimaud Foundation, Lisbon, Portugal; <sup>2</sup>General Surgery Department, Hospital Garcia de Orta, Almada, Portugal; <sup>3</sup>Faculdade de Medicina, Lisbon, Portugal

*Contributions:* (I) Conception and design: C Mavioso, MJ Cardoso; (II) Administrative support: None; (III) Provision of study materials or patients: None; (IV) Collection and assembly of data: All authors; (V) Data analysis and interpretation: All authors; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

*Correspondence to:* Maria Joao Cardoso. Breast Unit, Champalimaud Foundation, Av Brasilia, 1400-038 Lisbon, Portugal.

Email: maria.joao.cardoso@fundacaochampalimaud.pt.

**Abstract:** Breast cancer incidence has been steadily increasing mainly in high income countries as life expectancy. The majority of newly diagnosed breast cancer cases will occur in post-menopausal women with an increasing in the older age group. As in younger women oncoplastic surgery and post mastectomy breast reconstruction should also be viable options, when needed, in older women. However, this is not the case in most centres and chronological age alone seems to be a barrier to these surgical alternatives. We evaluated the most relevant and recently published literature on the topic to analyse the available evidence in favour and against the use of oncoplastic breast surgery and post mastectomy breast reconstruction in this age group. Older women are not significantly represented in randomized clinical trials. There is minimal published evidence on oncoplastic breast surgery. Regarding post mastectomy breast reconstruction, although there are more publications, most studies are retrospective, present an evident selection bias and are very heterogeneous. Regarding oncoplastic surgery and post mastectomy breast reconstruction, there is no evidence that, compared to younger age groups, higher rates of complications should lead to the denial of these choices to older women, especially in the absence of associated comorbidities. Patient reported outcomes are not sufficiently explored in older women but, based on the limited available evidence, older women report higher rates of satisfaction when compared to younger women regarding oncoplastic surgery and post mastectomy breast reconstruction. Decisions in older women proposed for breast surgery and in need of oncoplastic breast surgery or post mastectomy breast reconstruction should always integrate, patients preference, a geriatric assessment and a life expectancy estimation. In case of unfavourable geriatric assessment and low estimation of life expectancy, a higher complication rate should be anticipated. It is not likely that randomized controlled trials will happen in this age group not only due to ethical concerns (as oncoplastic surgery and post mastectomy reconstruction are already standard of care in other age groups) but also to the difficulties in obtaining meaningful numbers. However, well designed prospective cohorts can be a valuable alternative to the scarce available retrospective evidence.

**Keywords:** Breast cancer; elderly; mastectomy; oncoplastic surgery; breast reconstruction

Received: 20 October 2021; Accepted: 22 September 2022; Published online: 11 October 2022.

doi: 10.21037/abs-21-137

**View this article at:** <https://dx.doi.org/10.21037/abs-21-137>

<sup>^</sup> ORCID: Carlos Mavioso, 0000-0002-7257-1115; Claudia Pereira, 0000-0002-7171-329X; Maria Joao Cardoso, 0000-0002-8137-3700.

## Introduction

Breast cancer has become the most prevalent cancer in women in high income countries due to improved detection rates and more effective treatments. As of the end of 2020, there were worldwide 7.8 million women alive who were diagnosed with breast cancer in the past 5 years, making it the world's most prevalent cancer (1). Additionally, a large increase in the aging population is directly proportional to an increase in the absolute number of breast cancer cases in higher age groups (2). Chronological age should not prevail in decision-making about treatment, and we should not forget that older patients are under-represented in clinical trials with the subsequent low evidence level supporting decisions in this age group (3).

Geriatric assessment and competing causes of death should be a mandatory part of the older breast cancer patient pathway (3).

Over and undertreatment are always a delicate balance, particularly in this age group. However, we should not forget that a 70-year-old fit woman has, nowadays, a median life expectancy of additional 15 years at least, in high income countries (4). This means that many 70 years old women can carry the burden of overtreatment without the benefit of improved overall survival or better quality of life (QoL), for a long period of time. On the other hand, older women experience higher mortality from early breast cancer when they are undertreated (5) This is particularly true, regarding locoregional treatment for women over the age of 80, who are less likely to receive any form of surgery or adjuvant radiation as compared to those less than 75 years old (6).

As previously considered, many factors should be taken into consideration when proposing breast cancer surgery in a woman in this age group. A geriatric screening can be quickly performed identifying women that will need a further comprehensive geriatric assessment and a life expectancy estimation using one of the multiple available tools (3).

Although staging is usually higher in older women due to the absence of population-based screening, early breast cancer is still the most common form of presentation, with the majority being stage I or II amenable to breast conserving surgery with good cosmetic outcomes (7).

However, in some cases, classic breast conserving surgery will not be feasible, and using oncoplastic breast conserving techniques or a mastectomy with reconstruction could be a good alternative, but both settings are frequently debated and underused in this older population (8).

The purpose of the current work was to review the most relevant literature analysing surgical strategies in older women trying to obtain some evidence to support the use of oncoplastic procedures and breast reconstruction in this specific age group.

## Review process

Search was undertaken by authors C Mavioso and C Pereira using Medline and Scopus from 1990 until 2022 including all papers published in peer-reviewed journals with retrospective series and prospective cohort studies that would include breast cancer surgical treatment with some form of reconstruction, partial or total, immediate or delayed in older women with or without comorbidities.

## Rarity and heterogeneity of available studies

Most studies published about reconstructive surgery in older women are retrospective and use different definitions for old age. This heterogeneity in the definition of old leads to difficulty in comparison of outcomes, mainly when chronological age is the only factor considered.

Using the recent updated recommendations from the EUSOMA-SIOG joint paper, old age should be defined as  $\geq 70$  years old (3). For every old breast cancer patient, a geriatric screening test should be undertaken before any treatment to determine if the patient is fit or frail. If frailty is diagnosed, a complete geriatric assessment should then follow, accompanied by a life expectancy calculation.

Regarding oncoplastic breast surgery, even the retrospective evidence in old age is almost non-existent (8-10). Even with large enough datasets like the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP), the retrospective nature of the studies without correction for obvious bias (e.g., that women choosing to undergo oncoplastic breast surgery will be less frail than women who opt for having a classic breast conserving surgery) will have a striking impact on the conclusions (10).

The same happens in all studies regarding post mastectomy breast reconstruction (PMBR), where again, heterogeneity and selection bias are constantly reported (*Table 1*).

## Oncoplastic surgery

The lack of evidence in the literature regarding oncoplastic surgery in the elderly reflects the underuse of these techniques in this age group (8).

**Table 1** Summary of studies 2021–2003 analysing breast reconstruction in older women

Author, year	Type of study	Inclusion dates	Age (years)	Number of patients	Objectives	Results
Cortina, 2021, (1)	Retrospective; NBCD	2004–2015	≥70	M + BR =4,552 M no BR =69,421	Socio-demographic Evaluation of reconstruction in general	Less likely to undergo reconstruction in USA; race, demographics, economics
Dolen, 2022, (12)	Retrospective; single center	2004–2018	≥60	IBR or DBR =309	30 days morbidity rate in all patients with implant-based BR	Reconstruction in patients over 70 y: 48% implant-based; 36% autologous; 15% combination In tissue expander reconstruction (n=215) major complications were related to BMI over 35 kg/m <sup>2</sup> (P=0.04), history of ipsilateral BCT (P=0.048), and adjuvant chemotherapy (P=0.033)
Brender-Spaeth, 2020, (13)	Retrospective; single center	2008–2017	<65; ≥65	<65 y =31 ≥65 y =28	30 days morbidity rate comparing autologous BR in women by age group	Identical minor and major complications and secondary revisions No difference in hospital stays Comparable overall risk
Angarita, 2019, (14)	Retrospective; NSQIP	2005–2016	<70	Implant-based BR =28,850, ≥70 y =1,875 Autologous BR =9,123, ≥70 y=520	30 days morbidity rate Comparing implant-based vs. autologous BR by age group	Implant-based BR significantly higher risk of complications in ≥70 y (7.5% vs. 5.3%, P<0.0001) Identical risk in autologous BR
Sada, 2019, (15)	Retrospective; single center	2014–2018	<65	M no BR: ≥65 y =249; <65 y =259	30-day morbidity rate	No significant difference between younger and older patients, slightly higher rate of hematomas
Angarita, 2019, (16)	NSQIP	2005–2016	≥65	M + BR: ≥65 y =95; <65 y =873 IBR =1,877 DBR =208	Comparing M + BR vs. M no BR by age group 30-day morbidity rate Comparing IBR with DBR in women ≥70 y	While overall 30-day postoperative complication rates in were low, there were higher rates of infectious complications in the IBR cohort
Angarita, 2018, (17)	NSQIP	2004–2014	≥40–69	Total breast surgeries =100,037 ≥40–69 =73,328	30-day morbidity and mortality rate Comparing all breast surgeries by age group	Young and elderly not significantly different (3.9% vs. 3.8%, P=0.2), elderly significantly higher rates of pulmonary, cardiac, venous thromboembolic, and neurological morbidity
Torabi, 2018, (18)	Retrospective; single center	2009–2013	<65	≥70 y =26,709 Autologous BR, DIEP flaps =339 <65 y =285	Cohort differences and 30-day morbidity	The elderly cohort had higher rates of diabetes, hypertension, and hyperlipidemia Wound dehiscence was higher in the elderly cohort (P<0.01). Being elderly was seen as a significant risk factor for complete flap loss (OR, 10.92; 95% CI: 0.97 to 122.67; P=0.05)

**Table 1** (continued)

Table 1 (continued)

Author, year	Type of study	Inclusion dates	Age (years)	Number of patients	Objectives	Results
Kuykendall, 2018, (19)	Retrospective; single center	2011–2015	<55 ≥55	Mastectomy BR =95 Implant BR or autologous BR (DIEP): <55 y =42; ≥55 y =53	Breast-Q satisfaction	Younger patients (<55 y, had higher satisfaction with their outcome (P=0.034) Implant group
Gibreel, 2017, (20)	NCDB	2004–2012	<65 ≥65	M + IBR =127,501 <65 y =114,751 ≥65 y =12,750 (≥75 y =1,912)	Effects of age and comorbidities on the use of IBR and 30-day morbidity in M + IBR by age group	Younger more satisfied with implants. Younger and older no difference in DIEP flap satisfaction 10% of M + IBR patients now age 65 or older. Higher 30-day unplanned readmission rates in elderly M + IBR patients with or without comorbidities
Laporta, 2017, (21)	Retrospective; single center	2004–2014	<50 ≥50–59	BR =1,251 Implant-based BR =356	Aesthetic outcomes 30-day morbidity rate	Aesthetic surveys positive opinion in all age groups for each reconstructive option. Implant-based BR associated with a higher risk for complications
Oh, 2016, (22)	Review (Medline, Embase, Cochrane)	1987–2012	≥60–69 ≥70	Pedicled flap BR =402 Free flap =405 Fat grafting =48 BR =24,746 All types of BR	Uptake, outcome and QoL comparing different types of BR	Implant-based BR was more common than autologous. Mostly, complication rates were not higher in older women, and QoL outcomes were similar
Mays, 2017, (23)	NSQIP	2007–2012	<70 ≥70	M + BR and M no BR =54,821 ≥70: M no BR =11,927; M + BR =109 <70: M no BR =40,755; M + BR =2,040	Comorbidities 30-day morbidity rate in M + BR and M no BR	No difference in 30-day morbidity between patients ≥70 and <70 y having M + BR or no BR. Similar outcomes ≥70 y younger patients may reflect patient selection based on co-morbidities
Maruccia, 2016, (24)	Retrospective; single center	2004–2014	<65 ≥65	138 cases Submuscular implants =50 Partial submuscular with ADM =50 Muscle sparing with ADM =38	By age group QoL in one stage implant-based breast reconstruction comparing the three groups	Better results in Muscle-sparing and ADM BR

Table 1 (continued)

Table 1 (continued)

Author, year	Type of study	Inclusion dates	Age (years)	Number of patients	Objectives	Results
James, 2015, (8)	Review (Medline)	Until 2013	Dependent on the study	9 studies	Rate of reconstruction Type of reconstruction	Complication rates are comparable and QoL is improved in young and older
Zieliński, 2015, (25)	Retrospective; single center	1987–2013	37 to 79	73	Complication rate and QoL Reasons for not having reconstruction	Fear of a second surgical procedure and pain. An important factor in the decision to desist is the age of the patient
In, 2013, (26)	SEER Medicare	2000–2005	≥65	M =9,234 M + BR =554	Rate of reconstruction by institution	Variation in rates of BR suggests unequal access to this component of breast treatment
Walton, 2011, (27)	Review (PubMed, Google Scholar, Scopus)	Not defined	Not defined	7 studies	Satisfaction and complications between younger and older groups	No significant difference in complication between the two groups, fewer problems in autologous reconstruction Improved QoL
Veronesi, 2011, (28)	Retrospective; single center + review	Not defined	≥65	M+ IBR =518 M no BR =159	Safety of IBR in older women	IBR is safe. Radiotherapy can increase the risk of complications
De Lorenzi, 2010, (9)	Retrospective; single center	1999–2004	≥65	Total =63 BCS oncoplastic =14 M + IBR =49	30-day morbidity and late complications rate	In all patients, surgery was well tolerated despite patient age
Howard, 2005, (29)	Retrospective; single center	1993–2003	70 -79 ≥80	M + BR with free flaps =211 70–79 y =184 ≥80 y =27	30-day morbidity rate	Comorbidities associated with complications include age, alcohol use, coronary disease, and hypertension
Lipa, 2003, (30)	Retrospective; single center	1987–2000	≥65	M + BR =84 Implant BR =26 LD flap =24 TRAM flap =34	30-day morbidity rate	Higher complication rate in TRAM if high BMI Greater benefits in autogenous reconstructions

ADM, acellular dermal matrix; BCS, breast conserving surgery; BCT, breast conservation therapy; BMI, body mass index; BR, breast reconstruction; CI, confidence interval; DBR, delayed breast reconstruction; DIEP, deep inferior epigastric perforator; IBR, immediate breast reconstruction; LD, latissimus dorsi; M, mastectomy; NBCD, National Breast Cancer Database; NSQIP, National Surgical Quality Improvement Program database; OR, odds ratio; QoL, quality of life; TRAM, transversus rectus abdominis myocutaneous.

Chronological age remains the most important factor in determining whether a patient will be offered an oncoplastic procedure including breast reconstruction (8,27,31,32).

The main reasons could be the lack of patient education about oncoplastic breast surgery and surgeon bias in selecting a procedure taking into account patient's age. The risks of additional surgery, complications, longer hospital stays, further hospitalizations and uncertain outcomes may outweigh the potential benefits in terms of cosmesis and QoL in these patients. This may also reflect an attitude that body image is less important to this older population due to societal and cultural issues (27,31-34).

Published studies regarding oncoplastic surgery in the elderly suggest that these techniques are feasible and well tolerated despite patient age, although the available evidence is very scarce (9,35). Complication rates, length of stay and recovery time were comparable to younger patients and without any delay to adjuvant radiotherapy (RT). The risk of severe complications seems to be more related to patients' co-morbidities and not to age itself (10).

Oncoplastic procedures may have a potential advantage in this population (8,9). Elderly patients have a higher prevalence of large tumors at presentation (36) and are more likely to have fatty breasts. For large and poorly located tumors (i.e., inferior quadrants) older patients may have a better cosmetic result from a mammoplasty than from mobilization of breast tissue to fill the defect left by a wide local excision (8).

Oncoplastic breast conserving surgery encompasses several techniques, from simple and small tissue transfer to larger mobilizations, local perforator flaps and therapeutic mastopexies and mammoplasties. Each of these very useful types have diverse complications rates that remain very low when compared to classic breast conservation (10). However, higher age was an independent predictor of overall 30-day complications in the large retrospective review of the ACS NSQIP by Angarita *et al.* in 2018 (17).

Given the limited evidence for specific use of oncoplastic techniques in older patients, clinicians need to individualize treatment options considering patients expectations and preferences as well as their overall status (acute and chronic medical conditions, nutritional status and level of activity), as co-morbidities, not chronological age, seem to be the determinant factor of 30-day morbidity rate (9,10,37).

## PMBR

As expected PMBR is also less frequently performed in older patients than in younger women. As published in

2017 by Gibreel *et al.* from the retrospective analysis of the National Cancer Data Base (NCDB) there were 364,767 patients who underwent mastectomy, of whom 127,501 (35.0%) had immediate breast reconstruction (IBR). Among mastectomy + IBR (M + IBR) patients, 10.3% were age 65 or older and only 1.5% were 75 or older (20).

From the available literature based almost entirely on retrospective reviews, the conclusion is that PMBR should not be denied based on age, as the rate of complications and patient reported outcomes are not worse when compared to the ones observed in younger women (*Table 1*).

However, as previously referred, the heterogeneity of the before mentioned studies is obvious due to their retrospective nature and the consequent selection bias. Patients proposed for PMBR are more likely to be younger and fitter (16). Age comparators are also heterogeneous between published studies, but reconstruction rates drop dramatically above 75 years old, and the rate of complications raise accordingly (21,29).

From all the papers revised, none of them excludes patients based on age. In fact, a consensus emerges in not using chronological age as a contraindication and, still, it remains unclear the reasons why so few elderly patients undergo PMBR.

As life expectancy and QoL rises, with many elderly patients still vital and healthy with an active socio-economical life, the possibility of an increased demand of PMBR is expected (24). Older patients that have co-morbidities can also be candidates for reconstruction because available support and treatment to optimize these co-factors have also improved greatly.

The type of PMBR is not consensual or uniform in its application, neither in type of surgery nor on its timing.

PMBR can be performed in an immediate setting (IBR) or delayed [delayed breast reconstruction (DBR)], the reconstruction can either be autologous, implant-based or a combination of both.

Usually in elderly patients the most frequent reconstruction choice according to published retrospective studies is an implant-based choice, using one stage strategy or, more frequently, with multistep expander-implant and lower use of autologous reconstruction (24).

Several factors can determine the choice for reconstruction, the timing, and the technique to be used.

Patient factors like personal preference, age, demographics, co-morbidities, American Society of Anesthesiologists (ASA), physical status, body mass index (BMI), smoking status, contralateral breast appearance, tumor stage and



biology, co- or neo-adjuvant therapies, type and timing of reconstruction influence the reconstruction decision in general, as well as in older patients (11,12,28).

No less important is the type of hospital facility patients have access to and the availability of PMBR (11,26). Surgeons' factors like less experience can influence the presumption that older patients do not tolerate longer surgeries as much, the fear of increased complications and poor outcome (13,26,38). In fact, maybe due to less access of other sources of information, elderly patients tend to rely more in their surgeon's opinion, and the way the surgeons present the reconstruction options also positively or negatively influences the patient's choice (27).

In one stage implant-based reconstruction, some authors recognize an oriented choice considering breast size, the use of skin or skin and nipple sparing mastectomy, implant pocket (sub-muscular or acellular dermal matrices), the need of adjuvant RT and contralateral breast appearance (24). The one factor that most influences surgeons to not choose implant-based IBR is the use of RT as adjuvant treatment (39).

Autologous reconstructions are less frequent despite the fact that they usually have better aesthetic outcomes and less complication rates, when considering only chronological age and not associated comorbidities (11,14). The use of local flaps fascio cutaneous flaps, Goldilocks technique, latissimus dorsi (LD) flap and transverse rectus abdominis myocutaneous (TRAM) flaps are the most commonly used (30). Very scarce literature is published concerning free flaps, Dejean *et al.* (40) published the experience of deep inferior epigastric perforator (DIEP) flaps, finding similar results in success and complications comparing young and older patients. The limited literature including free flaps in old age as similar conclusions, attributing however greater satisfaction scores to the latter in most of the articles consulted (13,18,19,27,38).

A systematic review published by Oh *et al.* (22) about PMBR in general included 10 studies reporting complication rates in women over 60 years old. In this review, the overall rate of complications varied between 6.8% and 54.8%, values possibly related to the heterogeneity of the included patients and the different definitions of old age.

In most published studies, older patients have comparable outcomes to younger women with no significant differences in 30-day morbidity rates (9,13,22,33,41,42).

Although complication rates do not seem to be related with chronologic age alone, there have been reported higher rates of postoperative events including bleeding requiring reoperation, and higher unplanned readmission

rates in elderly women submitted to breast reconstruction compared to younger patients, particularly when comorbidities are taken into consideration (13,15,23,30).

### Patient reported outcomes in oncoplastic and reconstructive breast surgery

In older breast cancer patients, the most valued driver of choice in breast cancer surgery regarding reconstruction options should be patient preference, after a careful geriatric assessment and life expectancy calculation. Most of the women who deny breast reconstruction surgery, make this decision based on more than one reason. Fear of undergoing a more complex with more pain and higher complication rate are the most frequently described reasons for the refusal of breast reconstruction (25).

Few studies focused on the QoL and body image of older breast reconstruction patients using patient-related outcome measures (PROMs) (33,41,43). These studies are limited because the authors tend to use a broad QoL score to measure multidimensional concepts such as mental health and body image. Nevertheless, body image seems to be important to breast cancer patients regardless of age and concerns about body image that are exacerbated in women who receive mastectomies without reconstruction (7). Breast-related psychosocial well-being and satisfaction with the outcome of breast reconstruction seems to be independent of age (43).

Concerning the type of reconstruction, Giroto *et al.* assessed outcomes with the use of a self-reported questionnaire (SF-36) addressing health-related QoL, body image and physical functioning (41). The authors observed that elderly patients reconstructed with autologous tissues had better outcomes than patients reconstructed with implant-based techniques due mainly to physical pain and role limitations (41).

To achieve better patient-related outcomes, the treatment of older patients must be individualized. Figueiredo *et al.*, in a study that included a longitudinal cohort of 563 women with 67 years old or older, concluded that if women's preferences about appearance were discordant with the type of treatment they received, they had poorer body image, mental health and QoL outcomes (44).

### Conclusions

Due to the retrospective nature of all the analyzed studies, and its inherent selection bias, it is difficult to conclude

that oncoplastic surgery and PMBR are safe alternatives to classic breast conservation and mastectomy without reconstruction.

We can conclude, however, from the reviewed publications, that the indication for the use of oncoplastic surgery or PMBR in older patients, should not be based in chronological age alone but in a comprehensive evaluation including geriatric assessment, life expectancy calculation and patient preference.

It is true that we lack prospective randomized trials in older women, but it is highly unlikely that these trials will happen with a traditional design due not only on to the difficulty in recruiting the necessary number of patients that will allow a meaningful result but also because some treatment options are no longer ethically susceptible to randomization. Large and well-structured prospective cohorts could be a valuable alternative to retrospective analysis.

## Acknowledgments

*Funding:* None.

## Footnote

*Provenance and Peer Review:* This article was commissioned by the Guest Editor (Kwok-Leung Cheung) for the series “Diagnosis and Treatment on Primary Breast Cancer in Older Women” published in *Annals of Breast Surgery*. The article has undergone external peer review.

*Peer Review File:* Available at <https://abs.amegroups.com/article/view/10.21037/abs-21-137/prf>

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <https://abs.amegroups.com/article/view/10.21037/abs-21-137/coif>). The series “Diagnosis and Treatment on Primary Breast Cancer in Older Women” was commissioned by the editorial office without any funding or sponsorship. The authors have no other conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

*Open Access Statement:* This is an Open Access article

distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

## References

1. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin* 2021;71:209-49.
2. Louwman WJ, Vulto JC, Verhoeven RH, et al. Clinical epidemiology of breast cancer in the elderly. *Eur J Cancer* 2007;43:2242-52.
3. Biganzoli L, Battisti NML, Wildiers H, et al. Updated recommendations regarding the management of older patients with breast cancer: a joint paper from the European Society of Breast Cancer Specialists (EUSOMA) and the International Society of Geriatric Oncology (SIOG). *Lancet Oncol* 2021;22:e327-40.
4. Ho JY, Hendi AS. Recent trends in life expectancy across high income countries: retrospective observational study. *BMJ* 2018;362:k2562.
5. Schonberg MA, Silliman RA, McCarthy EP, et al. Factors noted to affect breast cancer treatment decisions of women aged 80 and older. *J Am Geriatr Soc* 2012;60:538-44.
6. Baban CK, Devane L, Geraghty J. Change of paradigm in treating elderly with breast cancer: are we undertreating elderly patients? *Ir J Med Sci* 2019;188:379-88.
7. Davis C, Tami P, Ramsay D, et al. Body image in older breast cancer survivors: A systematic review. *Psychooncology* 2020;29:823-32.
8. James R, McCulley SJ, Macmillan RD. Oncoplastic and reconstructive breast surgery in the elderly. *Br J Surg* 2015;102:480-8.
9. De Lorenzi F, Rietjens M, Soresina M, et al. Immediate breast reconstruction in the elderly: can it be considered an integral step of breast cancer treatment? The experience of the European Institute of Oncology, Milan. *J Plast Reconstr Aesthet Surg* 2010;63:511-5.
10. Angarita FA, Acuna SA, Cordeiro E, et al. Does oncoplastic surgery increase immediate (30-day) postoperative complications? An analysis of the American College of Surgeons National Surgical Quality Improvement



- Program (ACS NSQIP) database. *Breast Cancer Res Treat* 2020;182:429-38.
11. Cortina CS, Bergom CR, Kijack J, et al. Postmastectomy breast reconstruction in women aged 70 and older: An analysis of the National Cancer Database (NCDB). *Surgery* 2021;170:30-8.
  12. Dolen UC, Law J, Tenenbaum MM, et al. Breast reconstruction is a viable option for older patients. *Breast Cancer Res Treat* 2022;191:77-86.
  13. Brendler-Spaeth CI, Jacklin C, See JL, et al. Autologous breast reconstruction in older women: A retrospective single-centre analysis of complications and uptake of secondary reconstructive procedures. *J Plast Reconstr Aesthet Surg* 2020;73:856-64.
  14. Angarita FA, Dossa F, Zuckerman J, et al. Is immediate breast reconstruction safe in women over 70? An analysis of the National Surgical Quality Improvement Program (NSQIP) database. *Breast Cancer Res Treat* 2019;177:215-24.
  15. Sada A, Day CN, Hoskin TL, et al. Mastectomy and immediate breast reconstruction in the elderly: Trends and outcomes. *Surgery* 2019;166:709-14.
  16. Angarita FA, Dossa F, Hermann N, et al. Does timing of alloplastic breast reconstruction in older women impact immediate postoperative complications? An analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) database. *Breast* 2019;48:58-64.
  17. Angarita FA, Acuna SA, Cordeiro E, et al. Thirty-day postoperative morbidity and mortality in elderly women with breast cancer: an analysis of the NSQIP database. *Breast Cancer Res Treat* 2018;170:373-9.
  18. Torabi R, Stalder MW, Tessler O, et al. Assessing Age as a Risk Factor for Complications in Autologous Breast Reconstruction. *Plast Reconstr Surg* 2018;142:840e-6e.
  19. Kuykendall LV, Zhang A, Tugertimur B, et al. Outcomes in Deep Inferior Epigastric Perforator Flap and Implant-Based Reconstruction: Does Age Really Matter? *Cancer Control* 2018;25:1073274817744603.
  20. Gibreel WO, Day CN, Hoskin TL, et al. Mastectomy and Immediate Breast Reconstruction for Cancer in the Elderly: A National Cancer Data Base Study. *J Am Coll Surg* 2017;224:895-905.
  21. Laporta R, Sorotos M, Longo B, et al. Breast Reconstruction in Elderly Patients: Risk Factors, Clinical Outcomes, and Aesthetic Results. *J Reconstr Microsurg* 2017;33:257-67.
  22. Oh DD, Flitcroft K, Brennan ME, et al. Patterns and outcomes of breast reconstruction in older women - A systematic review of the literature. *Eur J Surg Oncol* 2016;42:604-15.
  23. Mays S, Alabdulkareem H, Christos P, et al. Surgical outcomes in women  $\geq 70$  years undergoing mastectomy with and without reconstruction for breast cancer. *Am J Surg* 2017;214:904-6.
  24. Maruccia M, Mazzocchi M, Dessy LA, et al. One-stage breast reconstruction techniques in elderly patients to preserve quality of life. *Eur Rev Med Pharmacol Sci* 2016;20:5058-66.
  25. Zieliński T, Lorenc-Podgórska K, Antoszewski B. Why women who have mastectomy decide not to have breast reconstruction? *Pol Przegl Chir* 2015;86:451-5.
  26. In H, Jiang W, Lipsitz SR, et al. Variation in the utilization of reconstruction following mastectomy in elderly women. *Ann Surg Oncol* 2013;20:1872-9.
  27. Walton L, Ommen K, Audisio RA. Breast reconstruction in elderly women breast cancer: a review. *Cancer Treat Rev* 2011;37:353-7.
  28. Veronesi P, Ballardini B, De Lorenzi F, et al. Immediate breast reconstruction after mastectomy. *Breast* 2011;20 Suppl 3:S104-7.
  29. Howard MA, Cordeiro PG, Disa J, et al. Free tissue transfer in the elderly: incidence of perioperative complications following microsurgical reconstruction of 197 septuagenarians and octogenarians. *Plast Reconstr Surg* 2005;116:1659-68; discussion 1669-71.
  30. Lipa JE, Youssef AA, Kuerer HM, et al. Breast reconstruction in older women: advantages of autogenous tissue. *Plast Reconstr Surg* 2003;111:1110-21.
  31. Héquet D, Zarca K, Dolbeault S, et al. Reasons of not having breast reconstruction: a historical cohort of 1937 breast cancer patients undergoing mastectomy. *Springerplus* 2013;2:325.
  32. Morrow M, Scott SK, Menck HR, et al. Factors influencing the use of breast reconstruction postmastectomy: a National Cancer Database study. *J Am Coll Surg* 2001;192:1-8.
  33. Bowman CC, Lennox PA, Clugston PA, et al. Breast reconstruction in older women: should age be an exclusion criterion? *Plast Reconstr Surg* 2006;118:16-22.
  34. Richardson H, Ma G. The Goldilocks mastectomy. *Int J Surg* 2012;10:522-6.
  35. Ritter M, Ling BM, Oberhauser I, et al. The impact of age on patient-reported outcomes after oncoplastic versus conventional breast cancer surgery. *Breast Cancer Res Treat* 2021;187:437-46.

36. Wyld L, Reed M. The role of surgery in the management of older women with breast cancer. *Eur J Cancer* 2007;43:2253-63.
37. Passage KJ, McCarthy NJ. Critical review of the management of early-stage breast cancer in elderly women. *Intern Med J* 2007;37:181-9.
38. Momoh AO, Griffith KA, Hawley ST, et al. Postmastectomy Breast Reconstruction: Exploring Plastic Surgeon Practice Patterns and Perspectives. *Plast Reconstr Surg* 2020;145:865-76.
39. Quemener J, Wallet J, Boulanger L, et al. Decision-making determinants for breast reconstruction in women over 65 years old. *Breast J* 2019;25:1235-40.
40. Dejean MF, Dabi Y, Goutard M, et al. Deep inferior epigastric perforator free flap in elderly women for breast reconstruction: The experience of a tertiary referral center and a literature review. *Breast J* 2021;27:700-5.
41. Giroto JA, Schreiber J, Nahabedian MY. Breast reconstruction in the elderly: preserving excellent quality of life. *Ann Plast Surg* 2003;50:572-8.
42. August DA, Wilkins E, Rea T. Breast reconstruction in older women. *Surgery* 1994;115:663-8.
43. Sisco M, Johnson DB, Wang C, et al. The quality-of-life benefits of breast reconstruction do not diminish with age. *J Surg Oncol* 2015;111:663-8.
44. Figueiredo MI, Cullen J, Hwang YT, et al. Breast cancer treatment in older women: does getting what you want improve your long-term body image and mental health? *J Clin Oncol* 2004;22:4002-9.

doi: 10.21037/abs-21-137

**Cite this article as:** Mavioso C, Pereira C, Cardoso MJ. Oncoplastic surgery and breast reconstruction in the elderly: an unsolved conundrum. *Ann Breast Surg* 2023;7:37.