

A Review of the Outcomes of Breast Conserving Surgery in Primary Breast Cancers

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Abstract: Breast cancer is globally predominant cancer found in females, where surgery remains the primary treatment. Though mastectomy has been a primary modality in the therapeutics of breast cancer, this usually leads to some profound physical and physiological changes, including gross disfigurement and prolonged periods of recovery. Breast - conserving surgery (BCS), also called lumpectomy, is a less invasive treatment that allows the conservation of breast tissue and body image, having survival rates similar to mastectomy when post - operatively associated with radiation therapy. The development of BCS started in the 1950s, and since then, it has been confirmed in many large studies and is recognized as a basic therapeutic for primary breast cancer. This review looked at the BCS outcomes regarding survival, recurrence, and patient satisfaction. In this respect, several studies have shown that BCS, especially when combined with radiation, supports an equivalent or improved survival compared to mastectomy. Besides, locoregional recurrence rates are low with BCS, and psychological results are better, hence very attractive to many patients. The oncoplastic techniques, associating tumor removal with immediate breast reconstruction, further improve the cosmetic and oncological outcomes of BCS. Available evidence supports oncoplastic BCS as a trustworthy and efficient replacement for mastectomy since results showed low recurrence rates and high patient satisfaction. This narrative review directs attention to a more individualized treatment plan with consideration of factors, such as cancer biology, patient age, and preferences, that may have different goals for breast cancer surgery and achieve the best possible outcomes.

Keywords: Breast cancer, breast constructive surgery, Lumpectomy, Mastectomy, Oncoplastic breast constructive surgery

1. Introduction

Breast cancer ranks as the second most prevalent disease and is predominant cancer among women in 157 out of 185 countries. It caused 670,000 fatalities globally, including 2,296,840 new cases in women. Apart from age and sex, about 50% of all breast cancers arise in females without any identifiable cause, whereas only about 0.5–1% cases occur in males [1]. Contemporary treatment for non - invasive and localized invasive breast cancer is surgery, which may be combined with systemic hormonal therapy, chemotherapy, or

radiation [2]. The size and position of tumor, as well as the choice of the patient, are key considerations in the decision - making process, as survival rates are generally comparable between patients receiving mastectomy or Breast - conserving surgery (BCS), that is also called as lumpectomy (Figure 1) with adjuvant radiation treatment [3]. For the individuals with multifocal or multicentric breast cancer, large primary tumors, with the involvement of skin or chest wall, mastectomy may be suggested as the treatment modality [4]. However, mastectomy has numerous drawbacks that include physical disfigurement that is associated with the complete removal of the breast [5].

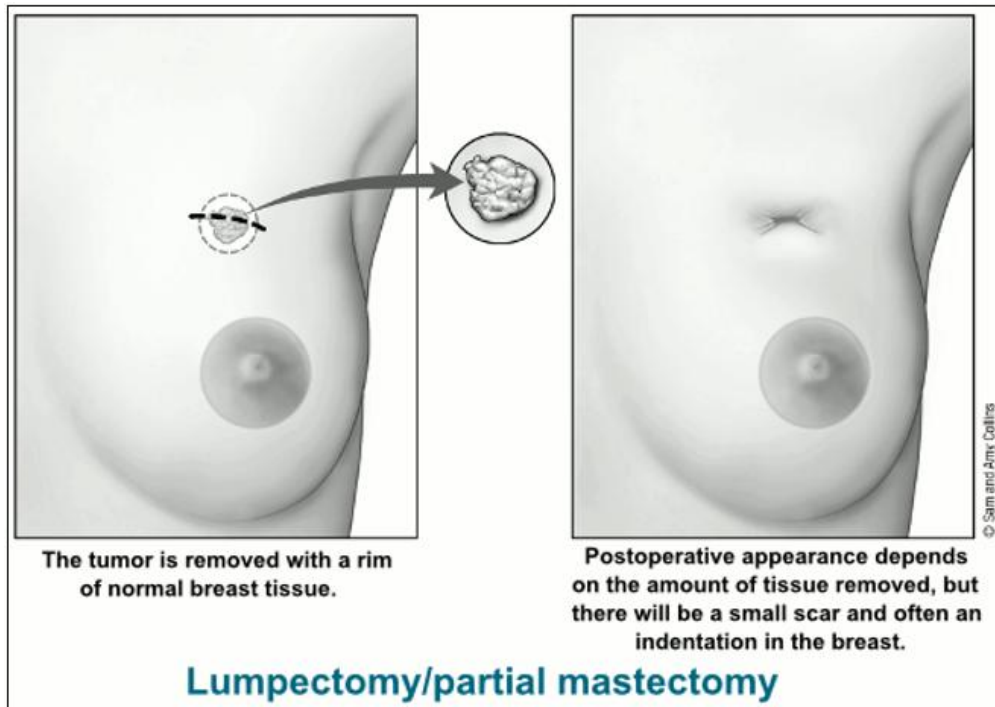


Figure 1: An illustration of Lumpectomy or partial mastectomy (Source: American Cancer Society)

Additionally, mastectomy is linked with higher degrees of psychological morbidity, including anxiety, depression, and a negative impact on sexual health [6]. Furthermore, mastectomy also typically requires a prolonged healing period compared to its alternative BCS, which may impact the ability of the patient to return to normal activities [7]. Meanwhile, if the patient wishes to go for reconstruction, additional surgeries may be required to achieve the desired cosmetic result [8]. Considering these setbacks, an alternative mastectomy called BCS has been approved that has overcome most of the issues that patients face with mastectomy. The advantages of BCS include preserving body aesthetics as this approach allows women to retain most of their breasts, which is beneficial for body image and emotional well-being [6].

Research has consistently shown that survival rates BCS combined with radiotherapy are comparable to those achieved with mastectomy, suggesting it as a viable treatment option for a majority of patients. [9]. Additionally, the shorter recovery time and less invasive surgery in the case of BCS compared to mastectomy results in a faster recovery time and quicker return to normal activities [5]. When it comes to body image and satisfaction with cosmetic results, it has been noted that women who have BCS tend to have better psychological outcomes compared to those who undergo mastectomy [6]. However, there are certain eligibility criteria and requirements [10] that must be fulfilled before availing the option of Breast conservation therapy (BCT), some major ones are depicted in the Figure 2.

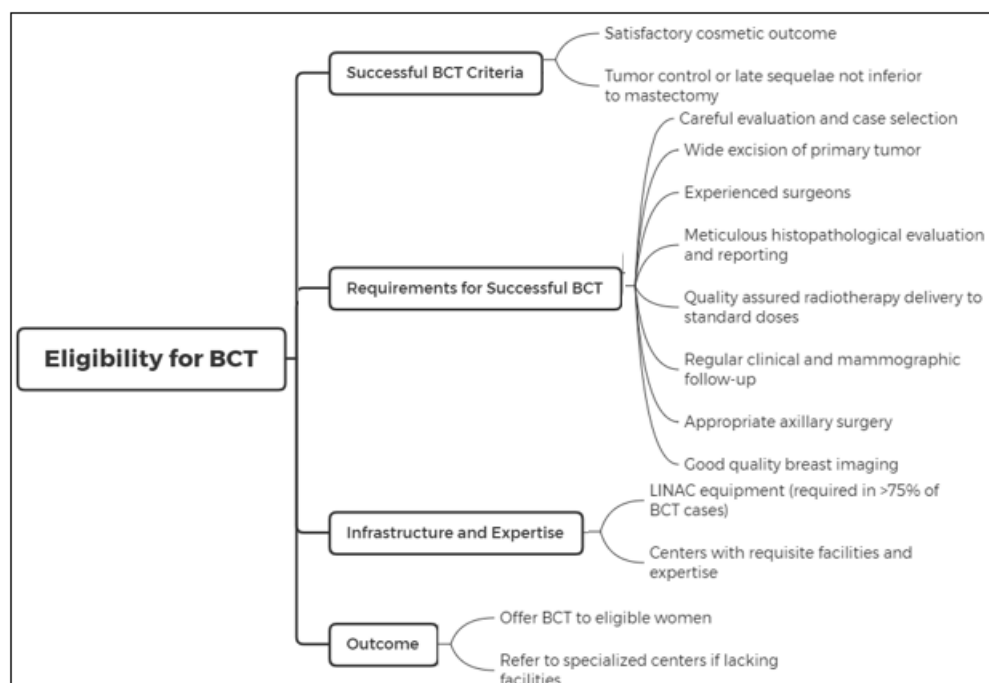


Figure 2: Eligibility criteria and requirements to be fulfilled before considering BCT

For the early - stage breast cancer cases, BCS has become a preferred therapeutic option. BCS began gaining attention in the 1950s as an alternative to radical mastectomy, with early studies suggesting that lumpectomy could be effective [11]. In the 1970s, large - scale clinical trials confirmed that radiation after BCS had survival rates comparable to mastectomy [12]. BCS received its validation as an efficient early stage breast cancer treatment in the 1980s [9], leading to its endorsement by the National Cancer Institute in 1991 as the favored treatment [13]. Since the 1990s, advances in oncoplastic techniques and therapies have further broadened the eligibility for BCS, allowing even patients with larger tumors to benefit from this less invasive approach [14]. The milestones of surgical evolution in the cure of Breast cancer are summarized in the table 1.

With an aim to save as much breast tissue as possible, the primary purpose of BCS is ensure neat removal of tumor. Operable breast cancers provides with a few choices of treatment that are depicted in the flow chart in Figure 3 [10]. This therapeutic approach is often used in combination with radiation therapy to achieve outcomes comparable to those of mastectomy. However, the effectiveness, safety, and patient satisfaction associated with BCS have been subjects of extensive research and debate. In addition to the significance of BCS in females with primary breast cancer, this narrative review will focus on the survival rates, recurrence, cosmetic outcomes, and psychological well - being.

Table 1: Clinical management and the evolution of surgical advancements in Breast cancer.

Year	Breast cancer surgical management	Significance of advancement	References
1979 - 1987	Lumpectomy with Radiation vs. Mastectomy	In case of early breast cancer, Lumpectomy + radiation therapy provides comparable survival rates to mastectomy.	[15]
1991	Position Statement on BCT from NCI	BCT is favored for early - stage breast cancer, confirming its safety and survival equivalence to mastectomy	[13]
2000s	Introduction of Oncoplastic Surgery	Combined oncological and plastic surgery techniques to improve aesthetic outcomes without compromising cancer control	[16]
2010 - 2019	Increased Use of Neoadjuvant Chemotherapy (NAC)	NAC facilitated tumor downstaging, hence expanding the viability of BCS to a larger patient population.	[17]
2020	Modern Techniques in Breast Conservation Surgery	Advanced imaging and 3D radiotherapy planning improved accuracy, tumor control, and reduced side effects	[18]
	Comprehensive Review of 30 Years of Practice - Changing Papers	Highlighted the evolution of breast cancer surgery towards more conservative approaches and the impact of multidisciplinary care	[19]
	Focus on Aesthetic Outcomes and Patient - Centered Approaches	Emphasized the importance of cosmetic outcomes and patient preferences in surgical decision - making	[20]
	Incorporation of Plastic Surgery Techniques in Breast Cancer Surgery	Reduced mutilation and morbidity while maintaining oncological safety	[21]

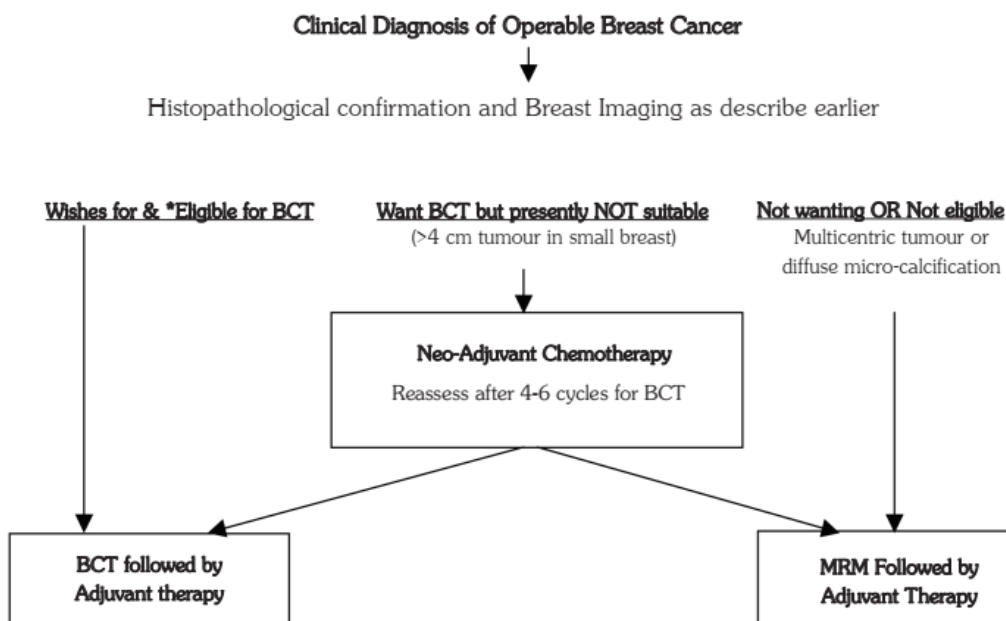


Figure 3: Flow diagram from clinical detection of operable Breast cancer to the choices of management (Source: Consensus Document For Management Of Breast Cancer, ICMR, 2016) [10]

BCS has better survival outcomes compared to contemporary alternatives

Surgical management is a crucial module of breast cancer treatment, and several considerations, including tumor size,

location, patient desire, and the suggestion of an experienced surgeon, typically impact of choosing either BCS or mastectomy. Various studies have explored the results of these surgical alternatives especially in connection to triple -

negative breast cancer, early - stage breast cancer, and other specialized subgroups. One such noteworthy study has been a meta - analysis done to evaluate the results following BCS versus mastectomy in individuals with triple - negative breast cancer. Apart from overall survival (OS), this study explored the parameters like locoregional recurrence (LRR), as well as distant metastasis (DM), in patients with triple - negative breast cancer who underwent BCS compared to those who preferred mastectomy. Compared to mastectomy, the study concluded a link between BCS with considerably decreased odds of LRR and DM and a lowered hazard for all - cause mortality. Since the alternative of surgical therapy can have a major influence on patient outcomes this discovery particularly is noteworthy in triple - negative breast cancer that is commonly regarded as an invasive form of breast cancer. Providing a compromise between appropriate cancer care and saving of the breast tissue, the study reveals that BCS may be a better alternative for many subjects presenting with triple - negative breast cancer [22]. However, long - term outcomes from this meta - analysis was lacking from this meta analysis. For that reason, a meta - analysis from three randomized trials, including around 2000 small breast cancer was performed. The objective was to examine the extent of recurrence rate and overall survival, results of several radiosurgical procedures, including BCS and mastectomy. In this study, BCS reported an equivalent survival rates to mastectomy. However, the rates of local recurrence differed greatly based on the treatment modality, patient age, and histological characteristics. These findings underline the need for tailored treatment planning since factors such as age and tumor biology might impact the probability of recurrence and, consequently, the choice of surgical technique [11]. Similarly, another comprehensive literature research looked at long - term results, specifically of oncoplastic BCS. Oncoplastic BCS is a sophisticated surgical method that combines tumor removal with rapid breast rebuilding. A retrospective analysis and systematic review compared the long - standing oncological consequences of conventional versus oncoplastic BCS. The data revealed positive outcomes for oncoplastic BCS, with low rates of locoregional recurrences, distant metastases, and fatalities. This data implies that oncoplastic BCS is not only a visually appealing alternative but also an oncologically safe technique. It allows for broader excision margins while retaining breast aesthetics, which makes it a desirable alternative for patients wanting both effective cancer therapy and an effective cosmetic outcome [23].

Further, to confirm the results of oncoplastic BCA, a population - based audit done in Scotland investigated the surgical methods and outcomes of oncoplastic breast conservation among 589 patients. The research demonstrated equivalent results to large - volume single - center series, with a 2.7% of 5 - year recurrence rate and higher overall survival rates. The results from this audit provide evidence that oncoplastic techniques are both safe and effective, providing patients with a viable alternative to mastectomy while maintaining favorable oncological outcomes. The extended safety of oncoplastic procedures in breast cancer management was evident from the low local recurrence rate observed in this study [24]. Specifically for T1–T2 stages of breast cancer, the outcomes from the oncoplastic BCS were further reviewed by systematic literature. A significant OS and DFS along with low LRR and DRR were reported in this study. The data emphasizes the increased popularity of oncoplastic operations as a mainstay of care in BCS, especially for cases that are at early - stages. The exceptional oncologic results, together with the cosmetic benefits of oncoplastic surgery, make it an increasingly popular choice with patients and doctors alike [25]. While exploring the OS rates of different combinations of therapies, cohort research focused on comparing OS rates among cases who received BCT only, mastectomy only, or mastectomy plus radiotherapy. The results suggested that BCT was linked with better 5 - year and 10 - year OS rates compared to only mastectomy or mastectomy combined with radiotherapy. This study confirms the growing body of data that BCT when paired with proper adjuvant treatment, can yield improved survival results for patients with early - stage breast cancer. The findings also show the potential advantages of conserving the breast without sacrificing long - term survival [26]. The outcomes of the different combination of chemotherapy or radiotherapy with the surgical management of breast conservation therapy are provided in Table 2. Population - based research examined the survival results of young females at early - stage treated with BCS or mastectomy. The study found that overall survival and cause - specific survival rates were equal for BCS as well as mastectomy. This discovery is particularly noteworthy for younger patients, who may be more concerned about the cosmetic and psychological consequences of mastectomy. The study demonstrates that BCS can be a reliable and sufficient alternative for young female at early - stage, giving them the opportunity to save their breast without sacrificing survival outcomes [27].

Table 2: Outcomes of the some major studies that have explored the different combination of chemotherapy or radiotherapy with the surgical management of breast conservation therapy

Therapy Combination Used	Sample Size	Outcomes/Results	References
Chemotherapy (5 - FU and Vinorelbine) + Radiotherapy before surgery	59	69% breast conservation rate, 27% pathological complete response, 70.9% overall survival at 13 years, limited side effects	[28]
Breast conserving surgery + Radiotherapy vs. Mastectomy + Chemotherapy	320	The BCS+RT group had superior 5 - year OS rates of locoregional recurrence - free OS (94.6% vs.87.7%), disease - free survival (89.5% vs.80.4%), and OS (95.0% vs.87.8%) in comparison to the mastectomy group.	[29]
Breast conserving surgery + Radiotherapy vs. Mastectomy	3807	Survival results are similar, although there is a higher chance of locoregional recurrence after BCS.	[30]
Chemotherapy + Accelerated superfractionated radiotherapy + Selective mastectomy	52	74% breast preservation rate, 68% 5 - year overall survival for complete responders, well - tolerated treatment	[31]
Partial - breast radiotherapy vs. Whole - breast radiotherapy	2018	Non - inferior local relapse rates, fewer adverse effects with partial - breast radiotherapy	[32]
Neoadjuvant chemotherapy + Breast conserving surgery + Radiotherapy	Not specified	Increased rates of breast conservation, improved breast recurrence rates with multidisciplinary coordination	[33]

Breast conserving surgery + Radiotherapy + Hormonal therapy + Chemotherapy	859	9.9% local recurrence, 85.6% disease - free survival, 84.4% overall survival	[34]
Breast conserving surgery + Radiotherapy vs. No radiotherapy	1684	5% absolute increase in 10 - year recurrence - free interval with radiotherapy, no significant increase in distant recurrence or death	[35]
Standard fractionation radiotherapy vs. Accelerated fractionation radiotherapy	8189	No discernible disparity was reported in local or regional treatment failure or overall survival rates. However, the use of rapid fractionation results in reduced incidence of acute toxicity.	[36]

BCS has lower recurrence rates

With the establishment of BCS, the area of treatment has developed tremendously. From the literature above, we can plainly tell that this strategy has surely become a cornerstone, especially in the care of early - stages. Additionally, this method enabled the patients to keep their breasts while attaining oncologically safe results. However, with BCS, the possibility of local and regional relapse remains a serious problem [37, 38] that warrants a deeper understanding of the factors that influence these outcomes. Various studies have explored the rates of recurrence, factors influencing these rates, and the impact of additional treatments and patient characteristics on overall survival and recurrence outcomes. One such crucial research is a recent retrospective cohort analysis that attempted to analyze the local and regional relapse rates following breast - conserving treatment in a group of patients who participated in legacy trials of the Alliance for Clinical Trials in Oncology (AFT - 01). The study indicated that the overall 5 - year relapse rate was 4.6%, with the lowest rates reported in individuals with estrogen receptor - positive (ER+) or progesterone receptor - positive (PR+) tumors. Conversely, the greatest recurrence rates were reported in patients with triple - negative breast cancer. Additionally, the study identified increasing nodal involvement and the presence of triple - negative breast cancer as significant factors positively associated with recurrence, underscoring the need for tailored approaches in managing high - risk subgroups within the BCS population [39]. A preliminary study in the form of a randomized controlled trial focusing on recurrence rates after breast cancer treatment with standard radiation therapy, with or without radiation boost to the tumor bed. This study intends to explore the impact of extra radiation on local recurrence rates post - BCS. The data suggested that individuals who got extra radiation saw a lower 5 - year LRR of 4.3%, compared to 7.3% in those who underwent conventional therapy. Notably, young patients or the ones aged 40 years benefited the most from the extra radiation, suggesting that younger patients would require more aggressive treatment options to decrease the greater threat of recurrence [40]. Outcomes like this warrant the understanding of the causes associated with LRR after BCT, that is crucial for developing effective management strategies. A literature research on this issue discovered numerous critical variables that raise the chance of LRR, including positive surgical margins, high - grade ductal carcinoma in situ (DCIS), younger age, and the lack of treatment by radiation. The review also emphasized that while LRR is a significant concern, the prognosis is generally more favorable compared to chest wall recurrence following mastectomy, pointing towards efficacy of BCS when appropriately managed [41]. Additionally, in the context of oncoplastic BCS, which combines oncological and cosmetic outcomes, a separate literature review analyzed the success rates of various partial breast reconstructive techniques. The study indicated that LRR varied from 0 to 1.8% per annum,

whereas failure rates of cosmetic intervention ranged from 0 to 18%. However, the review noted that detailed studies were often small, and the results varied, making it hard to draw definitive conclusions. This variability underscores the need for larger, studies to standardize the oncoplastic techniques with long - term efficacy and better cosmetic outcomes [42]. Furthermore, while looking at age as a risk factor associated with the recurrence outcomes, a retrospective cohort study compared LRR and OS rates between younger females or the ones aged 35 and their older counterparts. The study found that younger females had significantly higher rates of LRR and lower OS rates. Despite these findings, the research group concluded that young age alone should not exclude patients from BCS, but it should be a critical component of informed consent discussions [43]. Young age, particularly in patients under 40 years, has been consistently identified as a cause for higher LRR. Another retrospective cohort study delved into this topic, revealing that patients younger than 40 years had higher local recurrence rates, particularly in the absence of adjuvant radiation therapy and in cases with node positivity and ER negativity. These findings reinforce the need for aggressive treatment strategies in younger patients to reduce the chances of relapse [44]. While examining the long - term results and future reoperation rates, following breast - conserving therapy is critical for determining the durability of treatment and the necessity for further therapies. Retrospective cohort research analyzed the outcomes of patients who sustained local recurrence following BCS and final radiation therapy. The study found an OS rate of 69% at ten years post - local recurrence. Significant predictors of survival were the period from detection to local relapse and the technique of detection. These findings indicate the significance of attentive monitoring and prompt intervention in treating local recurrences to maximize long - term survival [45]. When considering the reoperation interventions, in a population - based study conducted in New York State, researchers investigated the 90 - day reoperation rates following BCS. They explored the influence of surgeon experience on these rates. The study found a mean overall reoperation rate of 30.9%, with a notable decrease in rates over time as surgeon experience increased. High - volume surgeons were associated with lower reoperation rates, underscoring the importance of surgeon experience in achieving optimal surgical outcomes and minimizing the need for reoperations [46]. Meanwhile, the role of neoadjuvant chemotherapy in the setting of BCS and subsequent recurrence was examined in a retrospective cohort study [47]. This study focused on the clinical outcomes of individuals with locoregional recurrence and ipsilateral breast tumor recurrence after BCS and radiation following neoadjuvant chemotherapy. The 5 - year actuarial rates of ipsilateral breast tumor recurrence - free and locoregional RFS were reported as 91% and 89%, respectively. The study also demonstrated a lack of hormone suppression therapy and larger pathological stage as features connected to increased recurrence rates [47].

These data demonstrate that preoperative chemotherapy, along with hormone suppression medication, can significantly improve long - term recurrence outcomes in breast cancer patients BCS.

Cosmetic outcomes of BCS surpasses the traditional ones

Literature research analyzed the oncological and cosmetic consequences of partial breast reconstruction surgeries in BCS. The review found that intermediate follow - up showed low local recurrence rates and variable cosmetic failure rates. These findings underline the significance of frequent monitoring of both oncological and cosmetic outcomes in patients having oncoplastic surgery. While oncoplastic techniques offer significant cosmetic benefits, the variability in cosmetic outcomes suggests the need for standardized assessment methods to ensure consistent and satisfactory results for patients [42]. Additionally, additional studies have also contributed crucial insights into the results and variables impacting esthetic and quality of life elements in breast conservation treatment. For instance, a survey on patient - reported quality of life and satisfaction with cosmetic outcomes after different locoregional management approaches revealed that cosmetic fulfillment was similar between those who received breast conservation therapy and those who undertook mastectomy with reconstruction.

Moreover, autologous repair appears to minimize the harmful impact of radiation on cosmetic results [8]. Another follow - up experiment intended to evaluate the influence of surgical and radiation treatment variables on cosmetic and functional results after breast conservation therapy. It was discovered that 73% of patients viewed their cosmetic outcomes as great or satisfactory. However, problems such as breast fibrosis, cutaneous telangiectasia, and breast retraction were strongly related to less satisfying esthetic results [48]. A prospective analysis delved into the elements affecting cosmetic outcomes after conservation therapy for breast cancer. The study observed that satisfactory cosmetic outcomes were recorded in 81% of patients. However, factors such as improper orientation of tylectomy and axillary incisions, larger breast resection volumes, and concurrent chemotherapy administration were associated with impaired results [49].

Further, a prospective follow - up research investigated the clinical, cosmetic, and life quality results in patients who had received non - oncological excision of the original tumor before BCS. The study indicated that 90% of patients reported excellent to good cosmetic results, while 65% of patients evaluated their quality of life as excellent to exceptional [50]. Lastly, a study investigating the cosmetic consequences of patients having BCT for localized breast cancer found that 35% of patients displayed considerable asymmetry. This data shows that giving plastic surgery advice as part of the therapy procedure may be appropriate to address these problems [51]. All these studies collectively underscore the importance of considering cosmetic and quality - of - life outcomes in breast cancer treatment and suggest areas where additional interventions may be beneficial for improving patient satisfaction.

BCS has better psychological outcomes

Although BCS does offer some advantages related to body image and functional outcomes, it does not necessarily lead to

better psychological well - being compared to mastectomy. Both groups of patients may require tailored psychosocial support to address their specific needs. An research done between 1984 and 1989 indicated that patients who had BCS were viewed as more functional by onlookers but defined themselves as having less energy and emotional support, especially in the first three months post - surgery. This shows that BCS patients may want greater social support and mental health measures [5]. Another study analyzed 109 women and found no significant changes in life quality, mood disturbance, or general adjustment between BCS and mastectomy patients during the first year post - surgery. However, BCS patients reported fewer concerns with clothes and body image, indicating a need for more rigorous psychological assistance owing to the extra burden of primary radiation treatment [52]. A study involving 197 women under 70 years of age found high levels of anxiety and depression before treatment, with no significant differences in new cases of psychological morbidity between BCS and mastectomy groups at 3 - and 12 - months post - surgery. BCS patients were more likely to wear their everyday clothes and found the cosmetic results highly effective [7]. Multicenter research, including 269 women, revealed that there were no notable disparities in anxiety and depression levels between patients who underwent BCS and those who undertook mastectomy. Nevertheless, patients who were treated by surgeons who provided them with the option to choose their therapy had reduced levels of depression. This indicates that the ability of patients to make decisions about their healthcare may have an impact on their psychological well - being. [53]. A study investigating the lasting implications of surgery revealed that patients who underwent BCS suffered elevated levels of psychological discomfort and somewhat lesser quality of life starting from 40 months after the operation, in comparison to patients who underwent mastectomy. This underscores the necessity for providing counseling on the enduring psychological consequences of various surgical interventions. [54]. Another study compared psychological morbidity in 52 mastectomy and 67 BCS patients, finding a significant excess of severe depression in the mastectomy group. This suggests that BCS may reduce psychological morbidity [55]. Research including 258 women revealed that there were comparable short - term changes in adjustment among different surgical groups. However, during long - term follow - up, significant enhancements in psychosocial adjustment and quality of life were seen for all groups. Patients who underwent BCS expressed more satisfaction with the look of their chest and experienced a superior quality of life in the physical health aspect [56]. A thorough, comprehensive review and meta - analysis of 9 studies involving 2301 patients indicated that BCS patients had superior outcomes in body image, future perspective, and role function compared to mastectomy patients. However, BCS was inferior to breast reconstruction in physical and cognitive function but superior in body image [57]. A study comparing patients who chose their surgery type found that BCS patients were mentally worse off at three months follow - up compared to those in a randomized trial, indicating that the element of choice may impact psychological outcomes [58].

2. Conclusion

In conclusion, BCS has emerged as a pivotal therapeutic option for early - stage breast cancer, offering comparable survival outcomes to mastectomy while preserving breast tissue and enhancing psychological well - being. Despite the associated chances of confined relapse, particularly in younger patients and those with triple - negative breast cancer, BCS is a viable alternative because of its favorable balance of oncological safety and cosmetic outcomes. Advances in oncoplastic techniques have further broadened the eligibility for BCS, making it a widely accepted and preferred approach in breast cancer management. These findings underscore the importance of individualized treatment planning to optimize outcomes for patients. To sum up, it is quite evident that compared to the conventional mastectomy, BCS provides an efficient and evidence based solution in the management of the Breast cancers. Furthermore, through this study, we specifically aimed at providing the general awareness about the societal benefits of BCS while supporting for improved access and patient - centered care, which are crucial for enhancing the overall well - being of women with breast cancer.

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