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BREAST SURGERY

Time to operative care for breast cancer in the Cape Metro West region

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Background: Time from diagnosis to operative care is a quality indicator in breast cancer (BCA) care. The recommended time from diagnosis to definitive treatment in South Africa (SA) is 31 days. The primary objective of this study was to determine the time to operative care (TOC) for BCA patients attending a multidisciplinary breast clinic at a tertiary hospital in Cape Town, SA.
Methods: This was a retrospective review of women with BCA reviewed by the BCA multidisciplinary unit at Groote Schuur Hospital, SA, from 1 January 2018 to 31 December 2019.
Results: Of 563 women who underwent BCA operations, 370 (65.7%) had surgery as the primary treatment modality. The median TOC for those who had surgery first was 86 days (IQR: 63–109). Of the 370 who had surgery first, 20 (5.4%) were operated on within the recommended 31 days. TOC at the district hospital was 35.1 days shorter ($p < 0.001$), and at the regional hospital, it was 16.3 days ($p = 0.008$) shorter than at the tertiary hospital after controlling for age, district, and stage of cancer.
Conclusions: A low proportion of women with BCA had definitive surgery within the 31-day recommended waiting period. Decentralisation of operative care allowed faster access to surgery at district hospitals for women who did not need sentinel node biopsy or advanced anaesthesia care. Identifying additional resources needed to decrease TOC for BCA patients could improve access to timeous surgical care.
Keywords: breast cancer, time to care, South Africa

Introduction

Breast cancer (BCA) is the most common form of cancer among women globally and, in 2020, it accounted for 11.7% of all new cancer cases among women and 6.9% of cancer-related deaths.[1] The incidence of BCA is increasing, especially in low to middle-income countries (LMICs) where cancer mortality is also high.[1,2] In South Africa (SA), BCA is the most common cancer among women, and in 2018 was responsible for 23.2% of all cancer cases in women.[3]

Early detection, as well as timely and appropriate treatment, are important strategies for improving BCA outcomes, including reducing deaths. The BCA treatment pathway includes a multidisciplinary plan formulated by surgeons and oncologists with consideration of surgical removal of part or all of the breast, chemotherapy, and/or radiation. Surgery is the main treatment for BCA if detected before widespread metastases have occurred,[4] but in many LMICs, timely access to BCA operative care is lacking.[5] Other treatment modalities include chemotherapy, endocrine therapy, targeted therapy, immunotherapy, and gene therapy, depending on BCA stage and the status of the lymph nodes, hormone receptor, and human growth factor receptor-2.[4]

There are sentinel stages along the BCA pathway to care, including the first symptom, first healthcare visit, diagnosis and first definitive (operative or non-operative) treatment, and the time between these can be measured (Figure 1). Various factors can contribute to delays in getting the first definitive care, and these factors could range from patient

Figure 1: Pathway to BCA care

factors such as lack of health education and transportation challenges to fear of the healthcare system and use of alternative care providers. Healthcare system-related factors, such as lack of diagnostic or treatment resources or shortage of operating facilities, may also delay receiving definitive care.[5,6]

The South African Breast Cancer Control Policy states that all women with suspected BCA should have access to a specialised breast unit to direct definitive diagnostics and treatment. It also recommends that women with confirmed BCA should start definitive treatment within 31 days of diagnosis.[7] Definitive treatment for early BCA typically begins with either surgery or neoadjuvant chemotherapy (NAC), depending on the tumour stage and molecular subtype. In cases of advanced, non-metastatic BCA, treatment generally starts with NAC followed by surgery. In a 2015–2016 study from the Cape Metro West, the median time from diagnosis to first treatment was 40 days for a study cohort of 157 BCA patients among those whose first treatment was surgery.[7] In 2019, a Rwandan study reported a median time to operative care (TOC) of 122 days for BCA women undergoing surgery first. These findings highlighted the fact that women who undergo surgery as the first definitive treatment have a delay in receiving care. Access to surgical care, including for cancer, is limited worldwide, and the situation in SA is no exception. TOC defined as the interval between diagnosis and surgery, is a critical quality care indicator in BCA women who have surgery as the first definitive treatment.[8] If surgery is the first treatment and TOC is prolonged, there can be higher mortality.[9] In a study from China, TOC > 2 weeks after BCA diagnosis was linked to poorer survival, while a study in the US associated increased mortality with TOC ≥ 36 days.[10] Another study reported a 10% increase in all-cause mortality with each incremental 30-day interval.[11]

In SA, the majority of operations are done at regional and tertiary hospitals.[12] Factors that influence TOC include patient factors, such as fitness for anaesthesia, and health systems factors, such as hospital resources.[7] The shortage of BCA surgeons, limited operating theatre time, lack of surgical capacity at district hospitals, and lack of surgical outreach can all contribute to increased TOC.[13] The primary objective of our study was to determine TOC in women with BCA who had surgery as their first definitive treatment. The secondary objective was to identify potential associations with operating hospital type and TOC. These results can help to inform the allocation of appropriate surgical resources to improve timely access to BCA care in SA and those at greatest risk for operative treatment delays.

Methods

Study population and study design

This was a retrospective review of women with BCA reviewed by the BCA multidisciplinary unit at Groote Schuur Hospital (GSH) from 1 January 2018 to 31 December 2019. The study period ended before the COVID-19 pandemic, which changed TOC for most surgical conditions, including cancer.[14]

Eligibility criteria

The study included women with BCA aged 18 years and older who had a confirmed BCA diagnosis and underwent primary surgery as a component of their treatment. Men with BCA and women who did not have primary BCA surgery were excluded.

Study setting

GSH is a public tertiary hospital located in Cape Metro West health district of the Western Cape province of SA with an estimated catchment of 6 million.[15] BCA services included the open-access specialised breast unit, a BCA multidisciplinary unit, radiation and chemotherapy, and operative care. Women with breast masses or suspected BCA were referred from any clinic or hospital in the Cape Metro West or other districts to the open-access specialised breast unit. Same-day clinical and cytological evaluations were provided if needed, and all confirmed BCA cases were referred to the BCA multidisciplinary unit where surgeons, oncologists, radiologists, and pathologists review new cases and formulate a comprehensive treatment plan,[6] including surgery if appropriate. Four hospitals (two districts, one regional, and one tertiary hospital) offered BCA operative care. All hospitals were staffed by general surgeons who were able to perform mastectomies. Sentinel lymph node biopsy (SLNB) was done at regional and tertiary hospitals, and oncoplastic reconstruction was done at the tertiary hospital. BCA patients who were older or had multiple comorbidities were operated on at tertiary and regional hospitals only. Radiation and chemotherapy were only offered at the tertiary hospital.

Data collection

Potential study participants were extracted from the BCA database. BCA diagnoses were confirmed using histopathology results from the National Health Laboratory Services. The primary outcome was the time (days) from breast biopsy to operation (TOC) for women who had surgery as their first definitive treatment. Women who had NAC as their first definitive treatment were identified through specific laboratory tests and clinic visits. NAC start date was not available, so TOC for women undergoing NAC was not calculated. Rural residence was defined as those from the West Coast subdistrict, and urban residence were all other subdistricts. Hospital type was district, regional, or tertiary.

Data analysis

Data were extracted and imported into STATA 17 (College Park, TX, USA) for statistical analysis. Median and interquartile range were used to describe age and TOC due to their non-normal distributions. TOC was only calculated for women who had surgery as their first definitive treatment. Quantile regression was used to explore associations with TOC, including age, cancer stage, operating hospital type, year of operation, and rural residence. This regression version was chosen because TOC was a continuous variable and not normally distributed. Univariate regression was done, and all factors with $p < 0.10$ were included in the multivariable analysis.

Sample size estimation

All BCA women who had surgery as their first definitive treatment during the 2-year period were identified. Based on a simple parametric test to detect a difference of 20% between the reported median delay of 40 days[7] at the tertiary

Table I: Demographic characteristics of women with breast cancer undergoing neoadjuvant therapy vs surgery as first definitive treatment

Variable	Neoadjuvant therapy	Surgery	*p*-value	All
***n* (%)**	**193 (34.3)**	**370 (65.7)**		**563 (100.0)**
Median age (IQR) years	50 (43–60)	59 (49–68)	< 0.001	56 (46–65)
Stage				
I	65 (46.4)	236 (79.5)	< 0.001	301 (68.9)
II	37 (26.4)	39 (13.1)		76 (17.4)
III	38 (27.1)	22 (7.4)		60 (13.7)
Year of operation				
2019	133 (68.9)	207 (56.0)	0.003	340 (60.4)
2018	60 (31.1)	163 (44.0)		223 (39.6)

hospital in a previous study and a reported median of 32 days at the district hospital, and a standard deviation of 20 days, 92 people were required at each of the three settings, in total 276 people were required. To account for the three additional variables in the regression model, we increased the estimated sample size by 30%, which resulted in a minimum sample size of 359. We identified 370 participants who met the inclusion criteria, ensuring sufficient power for our planned analyses.

Ethical considerations

Ethical approval was obtained from the University of Cape Town Research Ethics Committee. Given the retrospective nature of this study and the low risk to participants, informed consent was waived. All personal data were de-identified before analysis.

Results

Participants' characteristics

There were 794 women with BCA during the study period. Of these, 563 (70.9%) had a biopsy and an operation. Three hundred and seventy (65.7%) had surgery as their first definitive treatment, and l93 (34.3%) had NAC as their first definitive treatment. The median age of those who had surgery first was 59 (interquartile range [IQR] 49–68) years compared to 50 (IQR 43–60) years ($p < 0.001$) for those who had NAC first. Those who had surgery first were more likely to be stage 1 (79.5%) compared to those who had NAC (46.4%, $p = 0.003$) (Table I). BCA surgery volume increased over the study period.

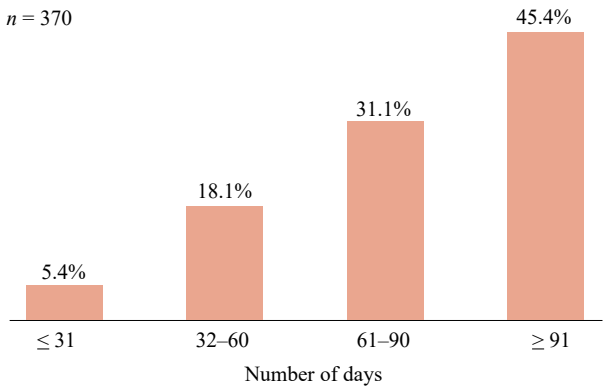

Figure 2: Time to operative care for breast cancer patients who had surgery as first definitive treatment in Cape Town, South Africa

Table II: Associations with time to operative care for women with breast cancer undergoing surgery as first definitive treatment in Cape Town, South Africa

		Univariate					Multivariable				
				95% confidence interval					95% confidence interval		
Variable	Median (IQR)	Co-efficient	SE	Lower bound	Upper bound	*p*-value	Co-efficient	SE	Lower bound	Upper bound	*p*-value
Patient age	59 (49–68)	-0.3	0.2	-0.7	0.1	0.114	-0.2	0.2	-0.6	0.14	0.220
Hospital level											
Tertiary (REF)	98 (76–116)										
Regional	76 (63–97)	-22	5.3	-32.5	-11.5	**< 0.001**	-16.3	6.1	-28.3	-4.3	**0.008**
District	66 (45–84)	-32	4.9	-41.7	-22.3	**< 0.001**	-35.1	5.7	-46.3	-23.9	**< 0.001**
Place of residence											
Others (REF)	85 (62–108)										
Rural	88 (69–113)	3.0	6.6	-9.9	15.9	0.649	-6.5	6.3	-18.8	5.8	0.300
Postoperative Stage											
I (REF)	84 (62–106)										
II	80 (59–102)	-4.0	7.7	-19.2	11.2	0.604	-1.2	6.8	-14.6	12.2	0.864
III	85 (63–116)	4	9.9	-15.6	23.6	0.687	6.7	8.7	-10.5	23.9	0.446

REF – Reference group, SE – Standard error

Time to operative care

The median TOC for the 370 women who had surgery as their first definitive treatment was 86 days (IQR: 63-109). Of these, 20 (5.4%) were operated within the recommended 31 days, and 350 (94.6%) waited longer than 31 days (Figure 2).

Factors associated with time to operative care

For the 370 BCA women who had surgery as their first definitive treatment, operating hospital type was significantly associated with TOC in the univariate analysis. This association remained significantly associated with TOC in the multivariable analysis. TOC at the district hospital was 35.1 days shorter ($p < 0.001$) than at the tertiary hospital, and 16.3 days shorter ($p = 0.008$) at the regional hospital compared to the tertiary hospital after controlling for age, rural residence, and stage of cancer (Table II).

Discussion

BCA is the most common cancer in women, and delays in care can result in poorer outcomes. A large US study of over 150 000 women with BCA demonstrated a 10% increase in mortality for each 60-day delay, most prominently in those with early-stage disease.[11] Our study assessed the TOC for BCA women attending a multidisciplinary unit in SA. The median time from biopsy to operative care was 86 days (63% > 90 days), with the majority having stage 1 disease. Only 5.4% achieved the 31-day time to definitive treatment recommended by the SA BCA national guideline.[16] Delays in receiving care for BCA are a common challenge in LMICs compared to high-income countries (HICs).[7,17] The median time from first treatment to definitive care for LMICs ranges from 2.6 to 6.5 months compared to 15 days in Germany, a HIC.[18] Delays due to a lack of hospital resources affect LMICs more than HICs.[18]

Time to treatment is a measure of health system efficiency. Timely treatment, including surgery, is crucial to reducing cancer-related mortality.[19] In addition, early treatment brings about symptom relief and cancer clearance and reduces patient anxiety.[20,21] Access to timely surgery is particularly important in LMICs, where access to other effective and innovative cancer therapies, including new drugs, and human resources are limited compared to HICs.[22] Cost-effective approaches are required to improve the overall health system efficiency for BCA management. While increasing and training healthcare professionals involved in cancer care and using telemedicine to enhance patients' navigation of the fragmented health systems in LMICs[19] are possible strategies, the provision of resources to provide operative care is a significant barrier that needs to be overcome.

Operating hospital type was associated with TOC. Patients operated on at district and regional hospitals had a median TOC of 2–5 weeks less than those operated on at the tertiary hospital. A similar finding was observed in a smaller study from the same health district, although the result did not reach statistical significance.[7] In SA, tertiary hospitals perform relatively large volumes of various operations, which can create longer TOC.[23] In this setting, the tertiary hospital did additional operations on the weekends, which were funded privately, but this still did not reduce TOC.[24] This BCA multidisciplinary unit's successful decentralisation of some BCA operations to regional and district hospitals is a good example of utilising a hub and spoke model to expand operative capacity. Once reviewed at the tertiary hospital multidisciplinary unit, BCA patients were operated on at any of four hospitals spanning three hospital types whenever possible. In this study, the district and regional hospitals had fully qualified general surgeons with BCA operative experience, but were limited in increasing capacity by other factors such as anaesthesia. In health districts where surgeons are not based in lower-level hospitals, outreach from regional and tertiary hospitals could potentially overcome this obstacle. The World Health Organization advocates strengthening district hospital surgical care, where operating theatres often stand empty due to the lack of human or physical resources for surgery. The hub and spoke model of connecting several hospital types within a health district to care for patients has been championed in SA.[25] Within this can be the use of outreach specialist teams to operate at district hospitals. In the KwaZulu-Natal province, outreach surgeons from one regional hospital visited four district hospitals weekly and performed more than 5 000 operations over 15 years. While this provided an invaluable service to persons with surgical conditions, it also left regional hospitals short-staffed, and it did not build enough operative capacity at district hospitals to allow them to perform the same operations independently.[26] In reach, or giving district hospital surgical staff additional training at regional/tertiary hospitals, is another hub and spoke model that could lead to greater district hospital independence.

As patient volume increases, there will be an increased demand for surgical care, which will impact theatre availability and treatment intervals. More efficient strategies and provision of resources for managing the increasing patient volume should be looked into to reduce treatment intervals and improve BCA outcomes. While we did not specifically study reasons for delays to operative care, based on our clinical observations, we have identified three likely causes of delays to BCA operative care in our setting. The primary cause was the time required to complete staging investigations, such as delays in obtaining staging CT scans and bone scans. Additionally, the unavailability of SLNB at district hospitals is a contributing factor. If this procedure, as well as a higher level of anaesthesia and postoperative care, was available at district hospitals, this would alleviate some operative pressures at tertiary and regional levels. Finally, the tertiary hospital theatre capacity is woefully inadequate to handle the number of patients requiring surgery. Additional BCA theatre lists with an increased number of breast surgeons, anaesthetic services, and nursing staff would decrease TOC.

Limitations

This study had some limitations. First, due to the study's retrospective nature, we were unable to fully assess other factors (such as patient sociodemographics and comorbidities) that may influence treatment interval or choice of hospital. We were also unable to analyse the waiting times and the reasons for delay, which is helpful information to inform appropriate interventions. For example, the timing of diagnostic modalities such as radiologic imaging would have added to a deeper understanding of why TOC was long. In addition, data on the number of lists per type of operating hospital level and the type of operations required by each patient (i.e. plastic surgery reconstruction) may have helped explain the longer delays at the tertiary hospital. Also, this

study was limited to those seen at the BCA multidisciplinary unit of a tertiary hospital in a single province in SA. Therefore, findings may not be generalisable to other settings. Notwithstanding, our study provides valuable baseline information for a long BCA TOC that may inform the development of strategies to improve BCA care.

Conclusion

Our study revealed that women with BCA in our setting experience a significant delay between diagnosis and primary surgery, which can result in increased mortality and heightened anxiety. TOC at district hospitals was shorter than at higher-level health facilities. Decentralisation and upgrading of facilities will allow faster access to surgery for patients with early BCA. Additional strategies for decreasing TOC should be implemented, including advanced anaesthesia and sentinel node biopsy availability at the district level. In addition, there is an urgent need for increased human resources, expanded access to operating theatres, and enhanced availability of advanced axial imaging. With over 600 new BCA cases annually, our system is understaffed in terms of breast and plastic surgeons, radiologists, and pathologists to address this important surgical condition.

Conflict of interest

The authors declare no conflict of interest.

Funding source

No funding was required.

Ethical approval

Ethical approval was obtained from the University of Cape Town Research Ethics Committee. Given the retrospective nature of this study and the low risk to participants, informed consent was waived. All personal data were de-identified before analysis.

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