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Research Article

Prevalence and Impact of Postmastectomy Pain Syndrome Among Breast Cancer Survivors at the Tumor Therapy and Cancer Research Center, Shendi, Sudan

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Abstract

Introduction: Postmastectomy Pain Syndrome (PMPS) is a chronic neuropathic pain condition affecting a significant proportion of breast cancer (BC) survivors, compromising their quality of life (QoL). Despite its clinical significance, PMPS remains underreported and inadequately managed, particularly in resource-limited settings such as Sudan. This study aimed to assess the prevalence, severity, and QoL impact of PMPS among breast cancer survivors in Sudan, while exploring risk factors and current gaps in pain management. Methods: A cross-sectional study was conducted among 116 postmastectomy patients at the Tumor Therapy and Cancer Research Center, Shendi. Data were collected through structured interviews and questionnaires, evaluating demographic characteristics, pain characteristics (prevalence, severity), and QoL. Associations between PMPS and clinical variables (surgery type, radiotherapy (RT), chemotherapy) were analyzed using statistical tests. Results: The prevalence of PMPS was 35.3%. Pain was predominantly mild to moderate but significantly impaired physical functioning and social participation. PMPS was associated with the type of surgery (P = 0.021), radiotherapy (RT) (P = 0.024), and neoadjuvant chemotherapy (NACT) (P = 0.016). Notably, there was a low utilization of pain management strategies, with only 21.9% of participants used analgesic medications, and 85.4% reported no preoperative counselling about PMPS. Conclusion: PMPS is highly prevalent and debilitating among breast cancer survivors in Sudan, marked by significant gaps in pain management and patient education, which substantially impair their quality of life. These findings underscore the need for standardized pain management protocols, routine preoperative counselling, and multidisciplinary support services to improve PMPS care. Future research should explore context-specific interventions to reduce the burden of PMPS and enhance the long-term well-being of breast cancer survivors."

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Keywords

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1. Introduction

Breast cancer (BC) is the most common malignancy and a leading cause of cancer-related mortality among women worldwide [1]. Management strategies depend on disease staging, with significant improvements in treatment modalities and outcomes in recent decades. Surgical resection remains a cornerstone of curative treatment, encompassing various mastectomy techniques with or without reconstruction, such as radical mastectomy, skin-sparing mastectomy, and simple mastectomy. [2]. The choice of surgical approach depends on tumor size, location and patient preference, with the aim of balancing oncologic and aesthetic outcomes [3]. Despite its effectiveness, surgical treatment for breast cancer is associated with various complications including chronic pain, which affects around 20% to 68% of postmastectomy patients and can last for months to years [4, 5].

Persistent postmastectomy pain was first described in 1978, as intercostobrachial nerve entrapment syndrome, and later termed Postmastectomy Pain Syndrome (PMPS) [6]. PMPS is defined as chronic neuropathic pain occurring in the chest, armpit, upper arm, and shoulder at least 3 months following a mastectomy [4]. Its pathophysiology involves persistent inflammation and neuropathic pain. Potential contributing factors include peripheral nociceptor sensitization, primary afferent neurons sensitization, neuroma formation on pain-sensing fibres, and sensitization of nerve cells in the brain [7]. Furthermore, severe acute postoperative pain is associated with increased incidence of persistent postoperative pain. [8, 9].

Chronic pain significantly impacts patients' emotional well-being, daily functioning, social interactions, and imposes a major economic burden on healthcare systems [4, 10]. Several factors have been identified to increase the risk of acute postoperative pain progressing to a chronic condition; these include patient related factors such as age, gender, patient psychological and social status, genetic predisposition, pre-existent pain, and treatment related factors such as adjuvant therapy, surgery type, analgesic treatment [11, 12]. However, the relative contributions of these factors remain unclear, particularly in resource-limited settings. This study aimed to assess the prevalence of PMPS among Sudanese breast cancer survivors, identify associated risk factors, and evaluate PMPS's impact on QoL to inform population-specific prevention and management strategies.

2. Methods

Descriptive cross-sectional hospital-based study was conducted at the Tumor Therapy and Cancer Research Center (TTCRC), Shendi, Sudan, from January to June 2024. Participants were recruited via purposive convenience sampling. Total of 116 patients were surveyed.

Shendi is located in the North of Sudan, about 173 km to the North of Khartoum. The town is considered a center for the Gaalein tribe, as well as other tribes such as Shygia, Hssania, and others. The major professions in the town include farming, trading, factory work, and crafting. The town is home to several general service centers, as well as Shendi University, which encompasses faculties of Medicine, Arts, Economics, Law, Social development, and Sciences and Technology. Shendi also boasts notable healthcare facilities, including El-Mak Nimer University Hospital, Shendi Teaching Hospital, and the Tumor Therapy and Cancer Research Center. These institutions feature various departments that provide comprehensive services to the town's population. Additionally, there are numerous health centers serving the community.

The study included all patients aged 18 to 85 years with pathologically confirmed breast cancer who had undergone surgical resection at least three months before the start of data collection. Patients with secondary tumors, metastases, and other chronic pain were excluded from the study. Data was collected with the use of a pre-coded and pretested questionnaire that was designed by the authors for this study. Pilot study was done and the questionnaire was modified accordingly.

2.1. Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS version 23). Numerical data were summarized using descriptive statistics (mean, standard deviation, and median), while categorical data were presented in frequency tables. Associations between categorized variables were assessed using inferential tests (chi-square and binary logistic regression). P value less than 0.05 was considered statistically significant.

2.2. Ethical Approval and Consent to Participate

Ethical approval was obtained from Shendi University Institutional Review Board (IRB) and the Tumor Therapy and

Cancer Research Center in Shendi. Written informed consent was obtained from all participants with guarantees of confidentiality. The study was conducted in accordance with ethical committee guidelines and the Declaration of Helsinki principles. Participation was voluntary, with the right to withdraw at any time. All collected data were used exclusively for research purposes with strict privacy protection.

3. Results

Among the 116 patients, 99.9% (115/116) were female, and 94% (109/116) were married. The majority were aged 46 to 55 years (33.6%, 39 /116) or 56 to 65 years, (23.3%, 27/116). Most had primary education (52.6%, 61/116), and 81% (94/116) were housewives, Table 1.

Table 1. *Demographic characteristics of breast cancer patients (n=116).*

Variable	Frequency	%
Age:		
25 to 35 years	6	5.2
36 to 45 years	26	22.4
46 to 55 years	39	33.6
56 to 65 years	27	23.3
66 to 75 years	14	12.1
76 to 85 years	4	3.4
Gender:		
Male	1	0.9
Female	115	99.1
Marital status:		
married	109	94
not married	7	6
Educational level:		
primary school	61	52.6
secondary school	24	20.7
Collage	31	26.7
Occupation:		
housewife	94	81
employee	20	17.2
Free worker	2	1.7

Invasive ductal carcinoma (IDC) was the most prevalent type of breast cancer, accounting for 94.8% (110/116) of cases, followed by invasive lobular carcinoma (ILC) (3.4%, 4/116) and other types (1.7%, 2/116). The majority of patients were diagnosed between the ages of 46–55 years (36.2%, 42/116), followed by 36–45 years (24.1%, 28/116) and 56–65 years (19%, 22/116).

Stage 3 was the most common stage at diagnosis, affecting 59.5% (69/116) of patients, while 21.6% (25/116) were diagnosed at stage 2, 16.4% (19/116) at stage 4, and only 2.6% (3/116) at stage 1.

Mastectomy was the most frequently performed surgical procedure (81.9%, 95/116), whereas wide local excision (WLE) was conducted in 18.1% (21/116) of cases. Time since surgery varied where most patients (34.5%, 40/116) underwent surgery 1–2 years prior, followed by 24.1% (28/116) who had surgery 2–5 years prior, 22.4% (26/116) within the past year, and 19% (22/116) more than 5 years ago. Additionally, 37.9% (44/116) received radiation therapy, and 25.9% (30/116) were administered neoadjuvant therapy, as detailed in Table 2.

Table 2. *Clinical characteristics and treatment modalities of the breast cancer patients (n=116).*

Variable	Number	%
Type of breast cancers:		
invasive ductal carcinoma	110	94.8
invasive lobular carcinoma	4	3.4
others	2	1.7
Age at diagnosis:		
25 to 35 years	14	12.1
36 to 45 years	28	24.1
46 to 55 years	42	36.2
56 to 65 years	22	19
66 to 75 years	7	6
76 to 85 years	3	2.6
Stage:		
Stage 1	3	2.6
Stage 2	25	21.6
Stade 3	69	59.5
Stage 4	19	16.4
Type of surgery:		
wide local excision	21	18.1
mastectomy	95	81.9
Time since surgery		
less than one year ago	26	22.4
1-2 years ago	40	34.5

Variable	Number	%
2-5 years ago	28	24.1
over 5 years ago	22	19
Radiation therapy:		
yes	44	37.9
no	72	62.1
Neo-advent therapy:		
yes	30	25.9
no	86	74.1

Post-mastectomy pain in the chest or axillary area was reported by 35.3% (41/116) of patients, with a median pain intensity of 3 (IQR: 2–4) on a 10-point scale. Among those experiencing pain, the most common description was pinpricking (43.9%, 18/41), followed by aching (24.4%, 10/41), burning (17.1%, 7/41), and numbness (14.6%, 6/41). Additionally, 19.5% (8/41) of patients with post-mastectomy pain reported limitations in arm or shoulder movement, as detailed in Table 3.

Table 3. *Prevalence of postmastectomy pain and movement limitations among breast cancer patients (n=116).*

Variable	Frequency	%
Presence of post-mastectomy pain:		
yes	41	35.3
No	75	64.7
Pain intensity (0–10 scale):		
Median (IQ)	3 (2,4)	
Range	1.0 - 9.0	
Description of pain (n = 41):		
Pinpricking 18 43.9		
Aching 10 24.9		
Burning	7	17.1
Numbness	6	14.6
Limitation in arm/shoulder movement (n = 41):		
yes	8	19.5
no	33	80.5

Among patients with post-mastectomy pain, 12.2% (5/41) impaired ability to participate in social activities. Quality of life was assessed on a 1–10 scale, with a median score of 8 and interquartile range (IQR) of 7–9. Concerning emotional well-being post-mastectomy, the majority of patients (53.7%, 22/41) reported a neutral state, while 24.4% (10/41) felt negative, and 22% (9/41) described their emotional well-being as positive. Additionally, 85.4% (35/41) of patients expressed satisfaction with their body image post-mastectomy, whereas 14.6% (6/41) were dissatisfied, as shown in Table 4.

Table 4. *Impact of Post-Mastectomy Pain on quality of life and social activities among breast cancer patients (n=116).*

Variable	Number	%
Impaired ability to engage in social activities:		
yes	5	12.2
no	36	87.8
Overall quality of life (1–10 scale):		
Median (IQ)	8 (7,9)	
Range	2.0-10.0	
Emotional well-being post mastectomy (n = 41):		
positive	9	22
neutral	22	53.7
negative	10	24.4
Satisfaction with body image post mastectomy (n = 41):		
yes	35	85.4
no	6	14.6

Few patients with post-mastectomy pain received psychological support (9.8%, 4/41), while the vast majority (90.2%, 37/41) lacked access to such services. Strikingly, none of the affected patients (100%, 41/41) were aware of existing support groups or resources for managing post-mastectomy pain. Post-mastectomy pain management included medication use followed by a minority of patients (22%, 9/41), whereas 14.6% (6/41) explored alternative therapies.

Follow-up appointments with healthcare providers was inconsistent as more than half of the patients (53.7%, 22/41) reported never being followed up, 36.6% (15/41) had frequent follow-ups, and 9.8% (4/41) had infrequent follow-ups.

Preoperative information about potential post-mastectomy pain was inadequate for 85.4% (35/41), though 75.6% (31/41) were satisfied with overall support. Suggested improvements in post-mastectomy pain management included more information on pain management options (80.5%, 33/41) and enhanced emotional support programs (19.5%, 8/41), Table 5.

Table 5. Satisfaction of breast cancer patients in post-mastectomy pain management and support services (n=41).

Variable	Frequency	%
Psychological support or counselling received for post-mastectomy pain		
Yes	4	9.8
No	37	90.2
Awareness of available support groups or resources for post-mastectomy pain		
Not aware	41	100
Use of medication or surgical intervention for pain management		
Taking medication	9	22
No medication or intervention	32	78
Exploration of alternative therapies for pain management		
Yes	6	14.6
No	35	85.4
Frequency of follow-up appointments with healthcare provider		
Frequent follow-ups	15	36.6
Infrequent follow-ups	4	9.8
Never followed up	22	53.7
Adequate preoperative information about possible post-mastectomy pain		
Yes	6	14.6
No	35	85.4
Satisfaction with information and support provided by healthcare professionals		
Satisfied	31	75.6
Dissatisfied	10	24.4
Suggested improvements for post-mastectomy pain management		
More information on pain management options	33	80.5
Enhanced emotional support programs	8	19.5

The analysis of demographic characteristics revealed several key findings regarding post-mastectomy pain. Among the 116 breast cancer patients, 41 (35.3%) reported experiencing post-mastectomy pain while 75 (64.7%) did not. Age distribution was similar between groups (p=0.973), with the highest proportion of pain cases occurring in patients aged 46-55 years (36.6%). Marital status showed no significant association with pain (p=0.668), with married women comprising 92.7% of pain cases versus 94.7% of non-pain cases, Table 6.

Educational attainment demonstrated a significant association (p=0.006), with pain patients more likely to have only primary education (39.0% vs 60.8% in non-pain group) and less likely to have college education (24.4% vs 28.0%). Occupational status showed a non-significant trend (p=0.148), with housewives comprising 90.2% of pain cases compared to 76.4% of non-pain cases, while only 9.8% of pain patients were formally employed versus 21.3% of non-pain patients.

Table 6. Cross-tabulation of Post-Mastectomy Pain and demographic characteristics of breast cancer patients (n=116).

Variable	*P value*
Experience post mastectomy pain	

Variable			*P value*
	yes (N=41)	no (N=75)	
Age:			
25 to 35 years	2.0 (4.9%)	4.0 (5.3%)	
36 to 45 years	10.0 (24.4%)	16.0 (21.3%)	
46 to 55 years	15.0 (36.6%)	24.0 (32.0%)	0.973
56 to 65 years	8.0 (19.5%)	19.0 (25.3%)	
66 to 75 years	5.0 (12.2%)	9.0 (12.0%)	
76 to 85 years	1.0 (2.4%)	3.0 (4.0%)	
Marital status:			
married	38.0 (92.7%)	71.0 (94.7%)	0.668
not married	3.0 (7.3%)	4.0 (5.3%)	
Educational level:			
primary school	16.0 (39.0%)	45.0 (60.8%)	
secondary school	15.0 (36.6%)	9.0 (12.0%)	0.006
Collage	10.0 (24.4%)	21.0 (28.0%)	
Occupation:			
housewife	37.0 (90.2%)	57.0 (76.4%)	
employee	4.0 (9.8%)	16.0 (21.3%)	0.148
Free worker	0.0(0.0%)	2.0(2.7%)	

Clinical characteristics analysis showed several significant associations with post-mastectomy pain. The type of surgery was significantly associated with pain (p=0.021), with mastectomy patients experiencing more pain (70.7%) compared to wide local excision patients (29.3%). Radiation therapy showed a strong association (p=0.029), with 51.2% of pain patients having received radiation versus only 30.7% of non-pain patients. Neoadjuvant therapy was also significantly associated (p=0.017), reported by 39.0% of pain patients versus 18.7% of non-pain patients, Table 7.

No significant associations were found for age at diagnosis (p=0.762), cancer type (p=0.514), or cancer stage (p=0.411). However, stage III cancer was most common in both groups (63.4% pain vs 56.8% no pain). Time since surgery showed no significant pattern (p=0.449), though a higher proportion of pain cases (29.3%) had surgery within the past year compared to non-pain cases (18.7%).

Table 7. *Association between Post-Mastectomy Pain and clinical characteristics of breast cancer patients (n=116).*

Variable			*P value*
	Experience post mastectomy pain		
	yes (N=41)	no (N=75)	
Age at diagnosis:			
25 to 35 years	6.0 (14.6%)	8.0 (10.7%)	
36 to 45 years	12.0 (29.3%)	16.0 (21.3%)	0.762
46 to 55 years	14.0 (34.1%)	28.0 (37.3%)	
56 to 65 years	7.0 (17.1%)	15.0 (20.0%)	

Variable			*P value*
66 to 75 years	1.0 (2.4%)	6.0 (8.0%)	
76 to 85 years	1.0 (2.4%)	2.0 (2.7%)	
Type of breast cancers:			
invasive ductal carcinoma	40.0 (97.6%)	70.0 (93.3%)	
invasive lobular carcinoma	1.0 (2.4%)	3.0 (4.0%)	0.514
others	0.0 (0.0%)	2.0 (2.7%)	
Stage:			
Stage 1	2.0 (4.9%)	1.0 (1.3%)	
Stage 2	6.0 (14.6%)	19.0 (25.3%)	0.411
Stade 3	26.0 (63.4%)	43.0 (56.8%)	
Stage 4	7.0 (17.1%)	12.0 (16.0%)	
Type of surgery:			
wide local excision	12.0 (29.3%)	9.0 (12.0%)	0.021
mastectomy	29.0 (70.7%)	66.0 (88.0%)	
Date of surgery:			
less than one year ago	12.0 (29.3%)	14.0 (18.7%)	
1-2 years ago,	12.0 (29.3%)	28.0 (37.3%)	0.449
2-5 years ago,	11.0 (26.8%)	17.0 (22.7%)	
over 5 years ago	6.0 (14.6%)	16.0 (21.3%)	
Radiation therapy:			
yes	21.0 (51.2%)	23.0 (30.7%)	0.029
no	20.0 (48.8%)	52.0 (69.3%)	
neoadjuvant therapy:			
yes	16.0 (39.0%)	14.0 (18.7%)	0.017
no	25.0 (61.0%)	61.0 (81.3%)	

Table 8. *Binary logistic regression analysis of predictors for post-mastectomy pain among breast cancer patients (n=116).*

Variable in equation	B	S.E.	Wald	df	p-value	Odds ratio	95% CI for EXP (B)	
							Lower	Upper
Age	-.004	0.192	0.000	1	0.985	0.996	0.683	1.453
Educational level	-.081	0.262	0.095	1	0.758	0.923	0.552	1.541
Surgery	- 1.043	0.530	3.877	1	0.049	0.352	0.125	0.995
Radiation therapy	0.776	0.425	3.333	1	0.068	2.173	0.945	4.997
Neoadjuvant chemo	0.794	0.457	3.016	1	0.082	2.213	0.903	5.422
Constant	-.594	1.556	0.146	1	0.703	0.552		

A binary logistic regression analysis was performed to identify predictors of post-mastectomy pain among breast cancer patients (n=116). The model examined five potential predictors: age, educational level, type of surgery, radiation therapy, and neoadjuvant therapy (NACT).

Type of surgery emerged as the only statistically significant predictor (B = -1.043, p = 0.049), with mastectomy associated with significantly lower odds of pain compared to wide local excision (OR = 0.352, 95% CI: 0.125-0.995). None of the other variables reached statistical significance: age (B = -0.004, p = 0.985, OR = 0.996, 95% CI: 0.683-1.453), educational level (B = -0.081, p = 0.758, OR = 0.923, 95% CI: 0.552-1.541), radiation therapy (B = 0.776, p = 0.068, OR = 2.173, 95% CI: 0.945-4.997), and NACT (B = 0.794, p = 0.082, OR = 2.213, 95% CI: 0.903-5.422). The complete regression results are presented in Table 8.

4. Discussion

This study examined 116 participants, predominantly female (99.1%), with the most common age group being 46-55 years (33.6%). This demographic skew is consistent with existing literature, where breast cancer incidence peaks in middle-aged women. Most participants were married (94%) and had primary school education (52.6%), with a significant portion being housewives (81%). Comparatively, a study conducted in Nigeria also found a high incidence of breast cancer among middle-aged women, with a peak incidence in the 40-49 age group [13]. Similarly, in a South African study, the majority of breast cancer patients were reported to be in their late 40s to early 50s [14]. These findings are consistent with global data indicating that breast cancer predominantly affects women in their mid-life years, emphasizing the need for targeted awareness and screening programs within this age demographic.

The 35.3% prevalence of post-mastectomy pain syndrome (PMPS) aligns with the 20-68% range reported globally [12], though closer to the lower end observed in Sudan (30%) [15]. This variability in PMPS prevalence across different studies likely stems from differences in surgical techniques (mastectomy vs. wide local excision), adjuvant therapies, and pain assessment methods. These comparisons highlight the pervasive nature of PMPS and the importance of standardized pain assessment tools to accurately gauge the extent of this syndrome across different settings.

Among patients experiencing post-mastectomy pain (35.3%, 41/116), the majority reported mild to moderate pain levels, with intensity scores ranging from 1 to 9 (median: 3, IQR: 2-4) on a 10-point scale. Considering only affected patients, pain descriptions across the entire cohort included pinpricking 43.9% (18/41), aching (24.4% (10/41), burning 17.1% (7/41) and numbness 14.6% (6/41).

These findings reflect the characteristic neuropathic profile of PMPS, consistent with nerve damage during surgical procedures. Similar pain patterns have been documented globally, with Egyptian studies reporting comparable neuropathic symptoms including shooting, burning, and stabbing sensations [16], and European research confirming this universal symptom profile [11]. The predominance of pinpricking and burning sensations in our cohort particularly aligns with these international findings, reinforcing the neuropathic basis of PMPS across diverse populations.

PMPS significantly impaired quality of life, with 19.5% of affected patients experiencing arm/shoulder mobility limitations and 12.2% reporting reduced social participation. Quality-of-life scores spanned 2–10 (median: 8), underscoring the condition's heterogeneous impact, as seen in Kenyan and Danish studies linking PMPS to physical dysfunction and psychological distress [17, 18].

Our study revealed critical gaps in post-mastectomy pain management, with only 21.95% (9/41) of affected patients utilizing pain medications. This low intervention rate suggests systemic challenges in either pain management protocols or patient access to effective therapies. The situation is compounded by inadequate patient education - 85.37% (35/41) received no preoperative counseling about PMPS risk, and 75.61% (31/41) expressed dissatisfaction with postoperative support. These findings mirror patterns observed in other resource-limited settings; a Ghanaian study reported only 30% of patients received adequate post-mastectomy pain management [19], reflecting a broader trend across low- and middle-income countries. In contrast, high-income nations demonstrate more robust pain management systems and higher patient satisfaction [20], underscoring the need for healthcare infrastructure improvements in African contexts.

Our statistical analysis identified several significant PMPS predictors. Patients undergoing mastectomy reported higher pain incidence than those receiving wide local excision (p=0.021), consistent with established literature linking extensive surgeries to chronic pain risk. Radiotherapy (RT) showed significant association with PMPS (p=0.024), emphasizing adjuvant therapy's role in postoperative pain. Neoadjuvant chemotherapy correlated with increased pain incidence (p=0.016), suggesting treatment-induced sensitization.

These findings align with an Indian study identifying mastectomy and adjuvant therapies as chronic pain predictors [21], and a meta-analysis confirming radiotherapy/chemotherapy as PMPS risk factors [22]. Collectively, these results highlight the necessity of personalized pain management protocols that account for specific treatment modalities and patient characteristics.

5. Conclusion

PMPS remains a debilitating condition significantly impacting breast cancer survivors' quality of life. Our study identifies critical gaps in pain management and patient education that demand urgent attention. These results highlight the urgent need for comprehensive care protocols that integrate preoperative counseling about PMPS risks with individualized

pain control strategies and sustained postoperative support.

Healthcare systems must prioritize routine PMPS risk assessment during treatment planning while implementing evidence-based multimodal approaches to pain management. The development of robust patient education programs and the integration of psychological support services should form essential components of survivorship care. Future research efforts should focus on developing and validating targeted interventions. By addressing these systemic challenges, clinicians can significantly improve long-term patient outcome.

Abbreviations

PMPS	Postmastectomy Pain Syndrome
BC	Breast Cancer
IDC	Invasive Ductal Carcinoma
ILC	Invasive Lobular Carcinoma
IQR	Interquartile Range
NACT	Neoadjuvant Chemotherapy
PMPS	Postmastectomy Pain Syndrome
QoL	Quality of Life
RT	Radiotherapy
TTCRC	Tumor Therapy and Cancer Research Center
WLE	Wide Local Excision

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Data Availability Statement

The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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