

Original Research Article**Surgeons' Experience In Breast Conserving Surgery: Does It Influence Surgical Margin?**Shahrin Niza AS¹ (✉), Ussof Eskaandar MH², Nani Harlina ML¹, Razrim R¹, Rohaizak M¹¹Endocrine and Breast Surgery Unit, Department of Surgery, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia.²Department of Surgery, Hospital Sultanah Aminah, Jalan Abu Bakar, 80100 Johor Bahru, Johor.**Abstract**

A surgeon's experience plays an important role in breast conserving surgery (BCS). The common conception is that, the more junior is the operating surgeon, the surgical margin will be wider or closer to the tumour edge. Thus the aim of this study is to look into the adequacy of surgical margin performed by different level of surgeons' experience in patients whom underwent wide local excision (WLE) and hook-wire localization (HWL) in our surgical unit. The surgical experience of the operating surgeon and their surgical margins will be analyzed. This is a retrospective study from January 2000 to December 2012. Eighty-eight patients with early breast cancer underwent WLE and HWL by 3 different groups of surgeons (breast surgeons, junior surgeons and surgical registrars) were included. The surgical margins were analyzed for involved-margin, closed-margin or excessed-margin. The incidence of involved-margin, closed-margin and excessed-margin is the lowest among breast surgeons compared to other groups. However, the results were not statistically significant. The incidence of involved surgical margin is significantly higher within junior surgeons for HWL compared to the breast surgeons. The incidence of involved, closed or excessed surgical margin were lowest when performed by breast surgeon but not significantly different between the three groups. However, for HWL the breast surgeons significantly better compared to the other groups.

Keywords: breast cancer, breast surgeons, junior surgeons, registrars, surgical margins**Correspondence:**

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Introduction

Breast conserving surgery (BCS) is the main option for surgery in small breast carcinoma replacing mastectomy. Several studies comparing BCS (with radiotherapy) and mastectomy revealed no difference in long-term survival (1,2,3). On the other hand, recent advances in breast imaging with the use of radiological placed guide-wires have improved the technique of BCS. Both have improved surgeons' ability to localize and remove the tumor with an adequate surgical margin. Furthermore, surgeons were able to preserve as much normal breast tissue in order to obtain optimal cosmetic outcome of the breast. Currently the

operative techniques in BCS are wide local excision (WLE), hookwire localization (HWL) and other techniques which are termed as 'oncoplastic breast surgery' where surgical techniques are combined with reconstructive surgery of the breast.

However, our main concern is - would a surgeon's experience have an influence on surgical margin? The common conception is the more junior is the operating surgeon, the wider is the surgical margin or higher chance of surgical margin to be involved. Few studies have indicated that an experienced surgeon plays major role in the outcome of BCS with lower local recurrence and better long-term survival (4,5,6). Thus

the aim of this study was to look into at the adequacy of surgical margin performed by different level of performing surgeons in patients whom underwent WLE from 2000 until 2012 in Universiti Kebangsaan Malaysia Medical Centre (UKMMC). The surgical experience of the operating surgeon and their surgical margins were analyzed.

Materials and Methods

This was a retrospective study conducted within Breast and Endocrine Surgery Unit in UKMMC with the approval of our local ethic committee (FF-2014-194).

Patient

We identified 88 patients whom had BCS from 2000 until 2012 from our breast cancer database. The following parameters were included in the analysis: surgical margin, tumor type, size, tumor grading and axillary lymph nodes. Patients who had received neoadjuvant chemotherapy or previous breast surgery for any benign breast lesion were excluded. Surgical margins were divided into involved-margin (tumor seen at surgical margin), closed-margin (Margin < 2 mm), good-margin (Margin > 2mm but < 10 mm) and excessed-margin (Margin > 10 mm).

Surgical Experience

There are three levels of surgical experience identified, namely Breast Surgeon (BS), Junior Surgeon (JS) and Surgical Registrars (SR). A BS is a consultant in breast surgery and had completed 3 years in subspecialty training in breast surgery, after completion of general surgery training. A JS is a newly qualified surgeon whom had completed the 4-year course as a general surgeon without the subspecialty training. SRs are trainees in masters of general surgery course who already had 3-4 years in surgical training. For each of the surgery performed, the performing surgeons' experiences were based on their position at that time as the criteria above. All SRs were supervised during surgery by either the BSs or JSs. The allocation of the performing surgeon for each case was considered as random based on the availability of the scheduled operating list.

Pre-operative Workup

Pre-operatively all patients already had mammograms (with complimentary breast ultrasonography) and fine needle cytology aspirations (FNA). The decision for BCS was based on the radiological findings, size of the tumor and the discussion between the surgeons and the patients. All of them would have an either axillary

clearance or sentinel lymph node biopsy based on the clinical assessment of the axilla. Clinically there are two types of breast lesion in this study: palpable mass and non-palpable mass. For a palpable breast mass, the type of surgery required is wide local excision (WLE). A non-palpable lesion will be removed using hook-wire localization and excision (HWL), requiring a radiologist to insert a hook-wire as a marker for the small lesion in the breast. After removal of the lesion, the specimen was placed in a container (TRANSPAC) and sent to the radiologist to confirm complete removal of the lesion. Whether WLE or HWL, the specimen was tagged for margin orientation and sent to pathologists for histopathology analysis.

Statistical Analysis

SPSS version (16.0) was used for the statistical evaluation of all data in this study. The calculation between surgical margins with tumor size, tumor type, tumor grade and lymph node status were done using Kruskal-Wallis Test to in order to determine their significance level.

Results

Descriptive Analysis

A total of 88 female patients were identified for analysis. The mean age was 52.86 ± 11.53 years. 85.2% (n=75) of the cases were palpable breast tumor while the remaining lesions were non-palpable (n=13, 14.8%). All palpable breast tumors had WLE while the non-palpable lesions had HWL. The BSs performed majority of the surgery cases (n=41, 46.5%), followed by JSs (n=25, 28.5%) and SRs (n=22, 25). JSs (n=6, 46.1%) had performed more HWL compared to other groups (BSs – n=5, 38.4%) (Rs – n=2, 15.3%). T1 and T2 tumor lesions were 94.5% (n=83) of the cases while the remaining 5.5% (n=5) were T3 tumors. The types of breast cancer encountered were as followed: Infiltrating ductal carcinoma (IDC) (n=79, 87.9%) followed by infiltrating lobular carcinoma (ILC) (n=4, 5.5%) and the remaining tumors were papillary carcinoma, mucinous carcinoma of breast and mixed ductal-lobular carcinoma (n=5, 6.6%). Most of the tumors were grade 1 (n= 45, 49.5%) followed by grade 2 (n= 34, 37.4%) and grade 3 (n=12, 13.2%). 48.4 % (n=44) were without nodal involvement while 51.6% (n=47) had axillary lymph nodes metastases. Table 1 summarizes the above findings.

Analysis of Surgical Margin

There were 5 surgical margins, which were analyzed in this study: superior, inferior, lateral, medial and

Table 1: Surgical procedure and distribution of cases

Characteristics	Number (percentage), n (%)
Number of procedure	88
Patients age, mean \pm s.d.	52.86 \pm 11.53
Surgeon group	
Consultant	41 (46.6)
Specialist	25 (28.4)
Master Student	22 (25.0)
Tumour type	
Infiltrating Ductal Carcinoma (IDC)	79 (87.9)
Infiltrating Lobular Carcinoma (ILC)	4 (5.5)
Others	5 (6.6)
Tumour size	
T1	40 (44.0)
T2	43 (50.5)
T3	4 (4.4)
T4	1 (1.1)
Lymph Node Status	
Negative	44 (48.4)
Positive	32 (35.2)
Not applicable	15 (16.5)
Tumour grade	
Grade I	45 (49.5)
Grade II	34 (37.4)
Grade III	12 (13.2)

s.d.: standard deviation

deep margin. Anterior margin was not included as the margin of interest because it is anterior to the tumor and it is our standard practice to remove the whole thickness of the skin over the lesion including the biopsy site. Table 2,3,4 shows the difference among the performing surgeons and the incidence of involved-margin and closed-margin accordingly.

Involved-Margin

Involved-margins were 23.9% (n=21) and 22.7% (n=20) had closed surgical margin. The BSs had 22% (n=9) incidence of involved-margins, followed by JSs (n=4, 16%) and SRs (n=8, 36%). Deep margin involvement occurred as the tumor had infiltrated the underlying muscle and this is not necessarily a technical error. By excluding the deep margin, the incidence of involved-margin was: BSs (n=2, 4.9%), JSs (n=3, 12%) and SRs (n=2, 9.1%). By calculating per single margin (excluding deep margins) the incidence of involved-margin: BSs (n=5, 3.0%), GSs (n=5, 5%), SRs (n=3, 3.4%) (p=0.074).

Closed-Margin

The incidence of close-margin (excluding deep margin) was highest in the GSs (n=4, 16%) followed by SRs (n=1, 4.5%) and BSs (n=3, 7.3%). The incidence of close-margin per single margin (excluding deep margin) was: BSs (n=3, 1.8%), GSs (n=5, 5%) and SRs (n=1, 1.1%). Total incidence of close surgical margin in our center is 2.5%

Excessed-Margin

Excessed surgical margin was defined as more than 10mm from the tumor margin. We omitted anterior and deep margin from calculation, as technically a surgeon should remove the entire depth of the anterior margin while the deep margin should be excised until the pectoralis major muscle. The incidence of excessed-margin was highest among GSs (n=68, 68%) and SRs (n=59, 67%) compared to BSs (n=88, 53.6%). The overall incidence of excessed-margin is 61.1%.

Table 2: Percentage of margins (per single margins) between the three groups

	Breast Surgeon (BS)	Specialist Surgeon (SS)	Surgical Registrars (RS)
Involve Margins	3%	5%	3.4%
Close Margins	1.8%	5%	1.1%
Excessive Margins	53.6%	68%	67%

excluding the anterior and deep margins p=0.56

Table 3: Percentage of margin (per individual patient)

Surgeon Group	Total Number of Patients Operated	Involved Margins (All Margins)	Involved Margins (Excluding deep and anterior margin)	Close margins (excluding deep and anterior margin)
Consultants	41 patients	9 (22%)	2 (4.9%)	3 (7.3%)
Specialist	25 patients	4 (16%)	3 (12%)	4 (16%)
Masters Students	22 patients	8 (36%)	2 (9.1%)	1 (4.5%)
P value			p=0.88	p=0.73

Table 4: Distribution of main surgical margin (excluding deep and anterior margins) based on surgeon group

Surgical Margin	Surgeon		
	C n:164 (%)	S n: 100 (%)	MS n: 88 (%)
Superior			
Involved	1 (2.3)	1 (4.0)	1 (4.3)
Close	1 (2.3)	0 (0.0)	1 (4.3)
Adequate	17 (44.2)	10 (40.0)	6 (30.4)
Excessive	22 (51.2)	14 (56.0)	14 (60.9)
Inferior			
Involved	1 (2.3)	1 (4.0)	1 (4.3)
Close	1 (2.3)	3 (12.0)	0 (0.0)
Adequate	20 (51.2)	5 (20.0)	7 (34.8)
Excessive	19 (44.2)	16 (64.0)	14 (60.9)
Medial			
Involved	1 (2.3)	2 (8.0)	1 (4.3)
Close	0 (0.0)	2 (8.0)	0 (0.0)
Adequate	20 (51.2)	5 (20.0)	10 (47.8)
Excessive	20 (46.5)	16 (64.0)	11 (47.8)
Lateral			
Involved	2(4.7)	1 (4.0)	0 (0.0)
Close	1 (2.3)	0 (0.0)	0 (0.0)
Adequate	11 (30.2)	2 (8.0)	2 (13.0)
Excessive	27 (62.8)	22 (88.0)	20 (87.0)
Recurrence			
Yes	2	6	2
No	39	19	20

C: Consultant; S: Specialist; MS: Master Student

The patients were followed-up for 2 years and the incidence of local recurrence in all our patients were 9.1% (8 cases).

We also compared involved and excessed surgical margin for non-palpable lesion. The involved-margins were: BSs (14.2%), JSs (66.7%) and SRs (20%) (p=0.044) while the excessed-margin were: BS (10.6%), JS (15.9%) and SR (8%) (p=0.67) (Table 5)

Discussion

This study addresses a clinically relevant question: Are junior surgeons adequately removing cancer tissue while preserving the normal tissue? To answer the above question we assessed surgical margin as a surgical tool. In Malaysia, an adequate surgical margin has been widely accepted at 2 mm (7). Anything below 2 mm were considered close-margin and involve-margin is when the tumor seen at the surgical margin. In most medical literature surgical margin is the most important risk factor for local recurrence (8,9,10). Even though other studies showed contrasting result (11,12,13). The other factor that carries significant risk for local recurrence is the tumor biology such as HER2 and TNBC subtypes (14,15). Removing too much normal breast tissue than what is needed results in poor cosmetic outcome with no added benefit in terms of survivability or risk of local recurrence (16). Similarly, an involved or closed surgical margin is associated with an increased local recurrence (17) which will in turn leads to a decrease in survival (18). Our study showed BSs has the lowest incidence of involve-margin, close-margin and excess-margin. This is followed by SRs had almost similar incidence rate of involve-margin or excess-margin with the GSs (3.4% vs. 5%) (67% vs. 68%). This is because in our centre the JSs would supervise the SRs during the surgery hence leading to similar incidence of involve or excess margin between both groups. The SRs had lower incidence of close surgical margin than the JSs (1.1% vs. 5%). However, all of above the findings were not statistically significant probably due to low number of patients included in the study. Hence our conclusion, there was no difference between the three groups regarding involved, excessed or closed-margin. The above analysis was based on 'per single margin'. We think this calculation will depict the true event of the margins. Moreover, we exclude deep margin and anterior margin for several reasons. The deep margin is the margin between the tumor and the pectoral muscles and technically a surgeon should remove the tumor up to pectoralis muscle, posteriorly. Hence, an involved deep margin may not be reflected as a technical error during surgery but more of the tumor extension itself. Similarly an anterior margin is the

Table 5: Surgical margins after HWL

	Involve margin	Excess margin
BS	14.2%	10.6%
SS	66.7%	15.9%
SR	20%	8%
P value	0.044	0.67

margin anterior to the tumor up to the skin and a surgeon should remove this area in entirety as necessary. We also analyzed the margins as per individual patient. The incidence of involved-margin and closed-margin for BSs was high but interestingly after omitting the deep and anterior margin the incidence was the lowest among the other groups. However, the calculation of 'per single patient' had one disadvantage: two involved margin in a single specimen is considered as a single incident margin. This might not be reflective of a true incidence of analyzed surgical margins. Hence, we think 'per single margin' is more accurate than 'per single patient'.

There are major difference for surgery between a palpable tumor and a non-palpable tumor. For a non-palpable tumor the surgeon need to have a hook-wire placed at the tumor to act as guide for its location. Hence, a surgeon will need to have a 3-D imagination for the tumor location. Meanwhile for a palpable lesion, a surgeon has a constant reference of the gross tumor by palpation of the tumor. This means HWL is more challenging than WLE. Our data suggest that HWL should be performed by an experienced breast surgeon rather than junior surgeons as the incidence of involve-margin was significantly lower in BSs than GSs or SRs. Currently in our center, HWL is only credentialed for breast surgeons whom had adequate trained for this surgery.

Admittedly, our study is not without limitations. The small number of cases enrolled for this study may leads to several non-significant results. Furthermore the cases were not equally distributed among the three groups with the BSs had the highest number of patients compared to the JSs and SRs. Similarly, the cases for HWL were smaller compared to WLE. We were also unable to get data on specimen weight and the cosmetic outcome. Excessive specimen weight has been associated with poor cosmetic outlook (19). We acknowledged a study analyzing performance in BCS should include cosmetic outlook and patient's satisfaction. However, the amount of breast tissue removed is not the only factors crucial for breast cosmeses as placement of scar and the type of 'oncoplastic surgery' may also play a pivotal role for that matter.

In conclusion for BCS, the junior surgeons have comparable results compared with their senior counterparts. However, hook-wire-guided surgery should be reserved for credentialed breast surgeons.

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