

# Incomplete excision of basal cell carcinoma and its associated risk factors

Yalda Nahidi, MD<sup>1</sup>

Naser Tayyebi Meibodi, MD<sup>2</sup>

Habiballah Esmaeili, PhD<sup>3</sup>

Zahra Tafazzoli, MD<sup>4\*</sup>

1. Department of Dermatology,  
Cutaneous Leishmaniasis Research  
Center, Mashhad University of  
Medical Sciences, Mashhad, Iran

2. Cutaneous Leishmaniasis Research  
Center, Mashhad University of  
Medical Sciences, Mashhad, Iran

3. Department of Social Sciences,  
Faculty of Health, Mashhad  
University of Medical Sciences,  
Mashhad, Iran

4. Department of Dermatology,  
Cutaneous Leishmaniasis Research  
Center, Mashhad University of  
Medical Sciences, Mashhad, Iran

\*Corresponding author:

Zahra Tafazzoli,

Department of Dermatology, Mashhad  
University of Medical Sciences,  
Mashhad, Iran

Address: Department of Dermatology,  
Imam Reza Hospital, Ibne Sina Street,  
Mashhad, Iran

Email: tafazzoliz951@mums.ac.ir

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**Background:** Basal cell carcinoma (BCC) is the most common type of skin tumor. Surgical removal has remained the gold standard of treatment for BCC, but incomplete removal is an important clinical challenge. The goal of our study was to evaluate the incomplete excision of BCC and the factors affecting it.

**Methods:** In this retrospective study, 361 histological samples of BCC excisions referred to the Pathology Department of Imam Reza Hospital, Mashhad, Iran, from 2004 to 2018 were reviewed. Data including age, gender, tumor site, size, histopathologic subtype, surgical margin involvement, and the surgeon's specialty were recorded.

**Results:** The incomplete removal rate was 20%. Ten percent of the lesions had deep margin involvement, 5.8% had lateral margin involvement, and both margins were involved in 4.2% of cases. Incomplete excision had a significant relationship with the following variables: nodular, mixed, and sclerosing types; the 60-70 years age group; lesions larger than 2 cm, location in nose and canthi; and excision by an otorhinolaryngologist, ophthalmologist, or dermatologist.

**Conclusion:** In this study, the frequency of incomplete excision was relatively high compared with other studies. Therefore, it is suggested to perform a diagnostic biopsy before the complete excision of BCC. Excision with a wider margin or using Mohs surgery is recommended for midface lesions, older individuals, nodular, mixed, or sclerosing lesions, and for tumors larger than 2 cm.

**Keywords:** skin, basal cell carcinoma, surgical margins

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## INTRODUCTION

Basal cell carcinoma (BCC) is the most common type of tumor in humans, being responsible for almost 70% of malignant diseases of the skin. Compared to squamous cell cancer, which is more prevalent in elderly individuals, this disease is more common at younger ages and incurs high costs and morbidity. It is more prevalent in men but has had increased incidence in women in recent years<sup>1-5</sup>.

The risk factor for this disease is the cumulative effect of damage caused by sunlight or exposure to ionizing radiation<sup>6,7</sup>. BCC occurs mostly in body parts exposed to sunlight including the head, face, and neck, with lower incidence on the trunk and extremities<sup>8</sup>. If untreated, BCC becomes gradually larger and invades its surrounding tissue, causing destruction<sup>8,9</sup>. Various methods have been developed to treat BCC, but surgical excision remains the gold standard, especially Mohs surgery, which

has the highest cure rate. Incomplete excision of surgical margin remains a challenge in the follow-up of BCC patients, with rates between 1.54 and 25.4% reported in different regions<sup>10-16</sup>.

Incomplete excision is the main factor in tumor recurrence after surgery, which causes morbidity and increased treatment costs. Recurrence rates increase up to 30% in cases of incomplete excision. As there has been no study in this regard in Northeastern Iran, we set out to evaluate incomplete excision rate and factors affecting it in BCC samples referred to the Pathology Department of Imam Reza Hospital, Mashhad, Iran. Also, we measured the histologic and surgical margins of the samples.

## METHODS

In this cross-sectional study, we reviewed all BCC samples excised using standard surgical methods by dermatologists, plastic surgeons, general surgeons, otorhinolaryngologists, and ophthalmologists before being sent to the Pathology Department of Imam Reza Hospital from 2004 to 2018 for diagnosis and evaluation of excision efficacy. Microscopic slides of 347 patients (361 specimens of BCC excision) were recovered. The slides were reviewed by a dermatopathologist to confirm the diagnosis, evaluate the histologic type, and measure the histological margin. Patient information including age, sex, location of BCC, pathological type of BCC, surgeon's specialty, the quality of excision (complete or incomplete), positive margin site (existence of basaloid nests or stroma in the margin) in cases of incomplete excision (lateral or deep), history of previous BCC, tumor size, and history of radiotherapy (due to ringworm in childhood) were extracted from the patient files. The collected data were described and analyzed using statistical tests and SPSS 15.

## RESULTS

During the 14-year period, 361 BCC samples had been excised from 347 patients, of which 289 samples (80%) were excised completely and 72 samples (20%) were excised incompletely. Among cases of incomplete excision, the lateral margin was involved in 21 (5.8%) cases, the deep margin in 36 (10%), and both lateral and deep margins in 15 (4.2%).

## I. Histological type of BCC

Among all the BCC samples, 192 were of the nodular type, 65 were mixed (nodular, adenoid, and sclerosing), and 6 were sclerosing. There was a significant relationship between incomplete excision and the tumor type ( $P < 0.001$ ) (Table 1).

## II. Location of the excised BCC

The most common location of the tumor in the 72 cases of incomplete excision was the nose (19 cases, 26.4%), followed by the cheek and nasolabial fold (15 cases, 20.8%). All samples from the chest, neck, and extremities were completely excised. The chi-squared test showed a significant relationship between incomplete excision and tumor location ( $P = 0.021$ ) (Table 2).

**Table 1.** Distribution of different tumor types between basal cell carcinoma (BCC) removed completely or incompletely

Tumor Type	Excision of BCC		P-Value*
	Complete (N=289)	Incomplete (N=72)	
Nodular (solid)	167 (58.6%)	25 (35.2%)	<0.001
Superficial	7 (2.5%)	0 (0.0%)	
Micronodular	18 (6.3%)	4 (5.6%)	
Adenoid	25 (8.8%)	2 (2.8%)	
Infiltrative	11 (3.9%)	4 (5.6%)	
Sclerosing	2 (0.7%)	4 (5.6%)	
Keratotic	1 (0.4%)	2 (2.8%)	
Metatypical	0 (0.0%)	1 (1.4%)	
Basosquamous	2 (0.7%)	1 (1.4%)	
Nodulocystic	12 (4.2%)	3 (4.2%)	
Mixed	40 (14.0%)	25 (35.2%)	

\*Chi-squared test

**Table 2.** Frequency of incomplete excision of basal cell carcinoma (BCC) in different tumor locations.

Tumor Location	Excision of BCC		P-Value*
	Complete (N=289)	Incomplete (N=72)	
Scalp	58 (20.1%)	9 (12.5%)	0.021
Periorbital and palpebral	25 (8.7%)	9 (12.5%)	
Canthi	8 (2.8%)	6 (8.3%)	
Periauricular	33 (11.4%)	5 (6.9%)	
Lips and perioral	5 (1.7%)	2 (2.8%)	
Forehead	29 (10.0%)	7 (9.7%)	
Cheeks and nasolabial folds	71 (24.6%)	15 (20.8%)	
Nose	40 (13.8%)	19 (26.4%)	
Chest, trunk and neck	17 (5.9%)	0 (0.0%)	
Limbs	40 (1.0%)	0 (0.0%)	

\*Chi-squared test

### III. Tumor size

Overall, 320 (88.6%) of the samples were smaller than 2cm, and 41 (11.4%) were larger than 2 cm. Out of the 41 tumors larger than 2 cm, 17 were incompletely excised and 24 were completely excised. Among the 320 cases of tumors smaller than 2 cm, 268 cases (83%) were completely excised and 55 cases (17%) were incompletely excised. There was a significant relationship between incomplete excision and a tumor size larger than 2 cm ( $P < 0.001$ ).

### IV. History of BCC

Out of the 361 samples, 106 (29.4%) belonged to patients with a history of BCC. From the total cases of incomplete removal, 24 (33.3%) were positive for a patient history of BCC, and from the total cases of complete removal, 82 (28.4%) were positive for a patient history of BCC. The chi-squared test showed no significant association between a history of BCC and incomplete excision ( $P = 0.408$ ).

### V. History of head radiotherapy

Eleven BCC samples had a history of exposure to radiation, including 2 (2.8%) cases with incomplete excision. Tumors in 20% (70 of 350) of BCC cases without a history of radiotherapy and 18% (2 of 11) of cases with a history of radiotherapy were incompletely excised. Based on the chi-squared test, there was no relationship between a history of radiotherapy and incomplete excision ( $P = 0.40$ ).

### VI. Surgeon's specialty

Overall, 172 (47.6%) of the samples were excised by dermatologists, 95 (26.3%) by otorhinolaryngologists, and 29 (8%) by ophthalmologists. Of all cases with incomplete excision, the highest frequency was found for otorhinolaryngologists (31 cases, 43.1%), followed by dermatologists (21 cases, 29.2%), and ophthalmologists (10 cases, 13.9%). All six tumors excised by plastic surgeons were completely removed. The chi-squared test showed that the surgeon's specialty was significantly associated with the risk of incomplete excision ( $P = 0.001$ ).

### VII. Patient's gender

Of the patients, 125 (34.6%) were female and 236 (65.4%) were male. Out of the 72 cases with incomplete excision, 26 (36.1%) were female and 46 (63.9%) were male. The chi-squared test showed that there was no significant relationship between incomplete excision and the patient's gender ( $P = 0.767$ ).

### VIII. Patient's age

The majority of cases were in the 50-60 years age range. The highest frequency of incomplete excision was seen in the 60-70 years age group (34.7%), followed by the 50-60 years group (25%), and the 70-80 years group (23.6%). Among all cases of complete excision, the most frequent age range was 50-60 years. Based on the chi-squared test, there was a significant association between incomplete excision and age ( $P = 0.011$ ). The mean age of the incomplete excision group was  $63.8 \pm 12.4$  years, compared with  $59.2 \pm 12.8$  years in the complete excision group. According to the Mann-Whitney test, age was significantly associated with incomplete excision ( $P = 0.006$ ).

### IX. Tumor age

Mean tumor age was  $40.9 \pm 37.8$  months in the incomplete excision group and  $31.5 \pm 35.9$  months in the complete excision group. The tumor age was not significantly associated with incomplete excision based on the Mann-Whitney test ( $P = 0.101$ ).

### X. Tumor excision margin

The minimum surgical margin in 25% of cases with incomplete excision was less than 1 mm, while in 50% it was less than 2 mm and in 75% less than 3 mm. The minimum histological margin in 25% of the cases was less than 0.75 mm, in 50% less than 1.25 mm, and in 75% less than 1.75 mm. The Wilcoxon rank-sum test showed a significant difference between the minimum surgical and histological margins ( $P < 0.001$ ). In our study, the minimum surgical margin was larger than the minimum histological margin in 275 samples, the histological margin was larger than the surgical margin in 39 samples, and the margins were equal

in 41 samples. All 72 samples with incomplete excision had surgical margins larger than the histological margin.

## DISCUSSION

The incomplete excision rate in our study was 20% (72 out of 361 samples). This number is relatively high compared to other studies, probably due to the high prevalence of excision with surgical margins less than 3 mm in our cases. Out of these 72 cases, 21 cases (5.7%) were incomplete excision of lateral margin, 36 cases (10%) of deep margin, and 15 cases (4.2%) of both margins. In other studies, incomplete removal rates between 1.54% and 25.4% have been reported<sup>2-4,6,7,9,12-24</sup>. Unlike a number of studies that indicate a higher prevalence of incomplete excision in the lateral margin<sup>2,10,13</sup>, in our study as well as in that of Shahshahani<sup>24</sup>, incomplete excisions were more common in the deep margin. Given the inverse relationship between depth and tumor visibility, we can expect more cases of incomplete excision in the deep margin.

In the present study, incomplete excision was significantly higher in the nodular, mixed, and sclerosing tumor types. In most studies, morphoeic and infiltrative tumors were reported to have a higher incidence of incomplete excision<sup>10,24,25</sup>, which could be due to the indefinite nature of the tumor margin in these cases. In the study by Betti *et al.*, margin involvement in mixed BCC (16.7%) was higher than single BCC (9.6%)<sup>11</sup>. Similarly, in our study, the frequency of incomplete excision was higher in mixed-type tumors than single-type tumors (38% vs. 15%), probably due to the fact that incompletely excised mixed-type tumors often had a sclerosing component. In our study, nodular-type tumors constituted 35.2% of incomplete excisions, which was higher than other studies<sup>10,24</sup>, possibly due to the location of most of these tumors in areas with a high risk of incomplete excision (midface). In our study, all cases of superficial BCC were completely excised.

In our study, incomplete excision was considerably more common for tumors in the nose and canthi. In most studies, a higher frequency of incomplete excision has been reported for midface tumors (nose; internal canthus)<sup>10,14,20</sup>. This is probably because in this region, insufficient skin and

aesthetic concerns about excising the lesion result in physicians' reluctance to make excisions with more extensive margins. Moreover, the presence of embryonic connection planes in the midface causes invasive expansion of tumors in this area<sup>24</sup>.

In the present study, similar to that of Shahshahani<sup>24</sup>, incomplete excision was significantly more frequent in tumors larger than 2 cm, likely due to the limitation of removing more tissue since extensive removal hinders repair and regeneration of the operation site.

Also, similar to Shahshahani<sup>24</sup>, we found no relationship between incomplete excision and history of radiotherapy; therefore, although radiotherapy is an important risk factor for BCC, it does not seem to be a risk factor for incomplete excision.

We found that the surgeon's specialty significantly influenced the frequency of incomplete removal. In the study by Hansen, the frequency of incomplete excision varied between different clinics, from 3.3% to 24.7%. The same figure for different physicians ranged from 0% to 31.1%<sup>19</sup>. In the study by Twist, the frequency of incomplete excision by general practitioners was 1.6% (2 from 124 samples)<sup>21</sup>. In the study by Macbeth, the frequency of incomplete excision of BCC was 5% for excision by dermatologists (6 of 105 samples) and 20% for excision by general practitioners (2 of 10 cases)<sup>18</sup>.

In our study, excision was mainly performed by dermatologists (47.6%). The proportion of incomplete excision by dermatologists was 29.2%, which was statistically higher compared to specialties other than otorhinolaryngology, contrasting with other studies<sup>26,27</sup>. The reasons for this high rate can be the larger number of BCC excisions performed by dermatologists, operating on face tumors (which have a higher risk of incomplete excision), and limitation of the size of excision margin due to the problems resulting from excision on the face. In most cases, dermatologists perform the excision using local anesthesia; according to the study by Shahshahani, local anesthesia increases the chance of incomplete excision compared to general anesthesia<sup>24</sup>.

Otorhinolaryngologists had the highest frequency of incomplete excision, representing 43.1% of all cases of incomplete excision. The rate of incomplete excision by ophthalmologists was 12.9%. One

reason for the higher frequency of incomplete excision among otorhinolaryngologists relative to dermatologists is tumor size. Dermatologists usually excise smaller BCCs with a lower likelihood of incomplete excision, while otorhinolaryngologists generally excise larger lesions, increasing the risk of incomplete excision. Also, due to beauty concerns and lack of skin in the midface (nose and canthi), excision has certain limitations that increase the likelihood of incomplete excision by ophthalmologists and otorhinolaryngologists. Additionally, dermatologists usually perform a biopsy before excision. Absence of cases of incomplete excision by plastic surgeons could be due to the small number of cases excised by them, having access to operating rooms and general anesthesia, and increased familiarity with flaps and grafts for repair of the excision site <sup>26,27</sup>.

In our study, there was no correlation between BCC excision and patient gender, which is similar to other studies <sup>10,24,27</sup>. Similar to that of Kumar <sup>28</sup>, our study found that incomplete excision became more common with increasing age, possibly because the elderly cannot endure lengthy and extensive surgeries. Other studies, however, have not mentioned age as a factor for incomplete excision <sup>10,29,30</sup>. Also, similar to the study by Goh <sup>29</sup>, no significant relationship was found between tumor age and incomplete excision.

In our study of 275 samples, 195 had a minimum surgical margin larger than the minimum histological margin, 39 had a minimum surgical margin smaller than the minimum histological margin, and in 41 samples the margins were equal. The Wilcoxon rank-sum test showed that the minimum size of the surgical and histological margins was significantly different. In the study by Kumar, the incidence of incomplete excision had a significant relationship with the minimum excision margin <sup>28</sup>.

Cigna showed that despite guidelines stipulating a 3-mm margin for excision of BCCs under 2 cm, margins smaller than 5mm are a risk factor for incomplete excision <sup>18</sup>. In most patients, tumor excision was performed with a margin smaller than 3mm, accounting for the relatively high frequency of incomplete excision in our study.

In our study, histological margins were smaller than surgical margins in the majority of cases, probably due to contraction of the elastic tissue

after excision, and retraction of the sample during fixation <sup>31</sup>. In the study by Bisson, the surgical margin was larger than the histological margin in 27 samples, and the histological margin was larger than the surgical margin in 69 samples <sup>31</sup>. Some degree of enlargement may also occur, dependent upon the temperature of the water in which the samples are plunged, sample drying protocol, and thickness of paraffin blocks. Erythema and inflammatory changes around a tumor are clinically considered as part of the tumor, making the surgical margin smaller. However, in histology, erythema and inflammation are regarded as the histological margin since they are tumor-free, which increases the histological margin. Instances of increase are more frequent than decrease and can be somewhat controlled <sup>31</sup>.

## CONCLUSION

In this study from northeastern Iran, the frequency of incomplete excision was relatively high compared with other studies. Therefore, it is suggested to perform a diagnostic biopsy beforehand so that a larger excision margin can be planned if the tumor type indicates a high risk of incomplete excision. For lesions in the midface, in the elderly, of nodular, mixed, and sclerosing tumor types, and tumors larger than 2 cm, excision with a wider margin or using Mohs surgery is recommended.

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