

Prognostic Factors in the Management of Basal Cell Carcinoma: A Single-Center Experience

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ABSTRACT

Objective: Skin cancers are increasingly common, forming a group of diseases that are frequently diagnosed and treated. Basal cell carcinoma (BCC) is the most common type of skin cancer. Its incidence is relatively high, accounting for 75% of all skin cancers and 80% of non-melanoma skin cancers. Identifying prognostic factors for BCC is important, and these factors should be considered in both the surgical management and follow-up of patients. This study aims to analyze patients diagnosed and treated in our clinic and to identify key prognostic factors for BCC.

Materials and Methods: Between January 2008 and December 2022, 1,154 patients with BCC were followed and treated at the Department of Plastic, Reconstructive, and Aesthetic Surgery, Erciyes University. A total of 1,183 lesions were retrospectively analyzed. Lesions were evaluated according to patient age, sex, anatomical location, tumor size, surgical margin status, recurrence, and metastasis.

Results: The average age of patients with BCC was 67 years, with a higher prevalence in males. Lesions were most commonly located on the nose, infraorbital region, and frontal region. Recurrence occurred in 29 patients. The surgical margins were associated with recurrence in BCC patients, whereas tumor size had no significant effect.

Conclusion: In BCC patients, positive surgical margins are significantly associated with recurrence, underscoring the importance of complete excision. Because the risk of recurrence is higher in BCC lesions located in high-risk areas, particular care should be taken during both surgery and postoperative follow-up of these patients.

Keywords: Basal cell carcinoma, prognosis, recurrence, skin cancers, surgery.



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INTRODUCTION

Basal cell carcinoma (BCC) is the most common malignancy worldwide, and its incidence continues to rise. It accounts for approximately 75% of all skin cancers and 80% of non-melanoma skin cancers (NMSC).¹ Given its minimal mortality risk, BCC is primarily associated with local morbidity.²



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BCC develops in the basal layer of the epidermis or from pluripotent stem cells around the pilosebaceous glands. It is more commonly seen in individuals with chronic sun exposure and most frequently occurs in the head and neck region, followed by the trunk, extremities, and genital areas.^{1,3,4} Ultraviolet (UV) radiation exposure is considered the primary cause, although genetic, phenotypic, and environmental factors also contribute.¹ Male gender, Fitzpatrick skin types I and II, chronic arsenic exposure, exposure to ionizing radiation, long-term immunosuppression, and genetic syndromes such as albinism and xeroderma pigmentosum are additional risk factors. BCC can also develop from previous scars.^{5,6} Patients often present with a non-healing wound or bump that gradually enlarges, appearing translucent and pearly, with intermittent bleeding, scaling, or crusting. Diagnosis is made through clinical evaluation and confirmed by histopathological examination.^{6,7}

BCC has several subtypes, including nodular, pigmented, superficial, cystic, morpheaform, and infiltrative. The nodular type is the most common, while infiltrative and morpheaform types tend to be more aggressive.⁸ BCC rarely metastasizes, with a metastasis rate of 0.1%. However, it is more likely to cause local tissue invasion, particularly in morpheaform and infiltrative types, where invasion is more common. Tumors larger than 2 cm in diameter also have a higher risk of invasion and recurrence. Immunosuppressed patients also have a higher likelihood of recurrence. Although BCC metastases are rare, when they do occur, the lungs, bones, and lymph nodes are most commonly affected, with hematogenous spread being the primary route of metastasis. Among patients with metastasis, the average survival time is approximately eight months.¹

The main treatment options for BCC include surgical excision, curettage, electrodesiccation, cryotherapy, immunotherapy, and radiotherapy. Imiquimod can be used for superficial and small lesions. The most effective treatment is surgery: for lesions smaller than 2 cm, a 4 mm surgical margin is typically used; for larger lesions, a margin of 4–10 mm is recommended, depending on tumor characteristics. This approach achieves a cure rate of over 95%. After surgery, patients are followed according to pathology results, and if necessary, re-excision is performed.^{1,9,10}

This study aims to analyze patients diagnosed and treated in our clinic and to identify key prognostic factors for BCC. Specifically, recurrence and metastasis, considered poor prognostic factors, were compared with age, sex, tumor size, histopathological subtype, lesion location, and positive surgical margin. The main factors influencing recurrence and metastasis were then determined.

KEY MESSAGES

- Basal cell carcinoma is the most common skin cancer, and identifying factors affecting its prognosis is vital for patient follow-up.
- The most important factors influencing recurrence of basal cell carcinoma are complete excision, lesion size, and localization. We believe these should be prioritized in patient monitoring.
- In patients at high risk of recurrence, more aggressive surgical approaches should be adopted, and meticulous attention should be given during follow-up.

MATERIALS AND METHODS

Patients

This study was conducted with the approval (#24/187) of the Erciyes University Ethics Committee. Patients who presented to the Plastic Surgery Clinic of the Erciyes University Faculty of Medicine with skin cancer between 2008 and 2022 were reviewed using the hospital's patient information management system. Inclusion criteria were: pathologically confirmed BCC diagnosis, availability of complete patient data, surgical treatment performed, and at least 1.5 years of postoperative follow-up. Patients were excluded from the study if the relevant lesion was any skin cancer other than BCC, if their treatment was performed at another center for any reason, if they did not have at least 1.5 years of follow-up, or if their data were incomplete. This study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Data Collection

For all patients included in the study, age, sex, lesion locations, average tumor diameter, follow-up details, and surgical margins were evaluated. Tumor locations were classified as face, scalp, postauricular region, neck, trunk, upper extremity, and lower extremity. The facial region was further subdivided into: auricle, frontal region, medial canthus, nose, perioral region, malar region, periorbital region, infraorbital region, nasolabial region, periauricular region, mental region, chin, and lower lip. The periorbital region was categorized into upper eyelid, lower eyelid, lateral canthus, and eyebrow region, while the perioral region was subdivided into upper lip, lower lip, and other areas (gingiva, commissure, etc.). For statistical analysis, tumor locations were grouped into two categories based on the clinical risk of recurrence: high-risk (H-zone) and low-risk (L-zone) anatomical areas. The H-zone included the medial canthus, nose, nasolabial region, periorbital region, auricle, periauricular area (preauricular and postauricular), and scalp.

The L-zone included the cheek (malar region), frontal region, infraorbital area, and other facial regions outside the H-zone. Tumors located on the neck, trunk, and extremities were also classified as low-risk due to their lower recurrence potential and were included in the L-zone for comparative analysis. Surgical margins were assessed based on pathology results after complete tumor removal and categorized as “clear,” “deep margin positive,” or “margin positive.” The appearance of any new lesion during follow-up, regardless of the time interval, was considered a recurrence.

The key prognostic factors evaluated included recurrence, metastasis, age, sex, tumor diameter, and tumor location. Accordingly, the number of patients with recurrence or metastasis, along with their sex, age, degree of differentiation, and lesion locations, were recorded. Significant prognostic parameters were investigated by comparing the characteristics of patients with and without recurrence or metastasis.

Statistical Analyses

For statistical analysis, data from the Excel spreadsheet were imported into IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated for all variables. Means and standard deviations were reported for continuous variables, while frequencies and percentages were used for categorical variables. Associations between categorical variables were primarily evaluated using the chi-square test. In cases where expected cell frequencies were less than 5 in more than 20% of cells, violating the chi-square test assumptions, the Fisher-Freeman-Halton exact test was applied as an alternative. A p-value of ≤0.05 was considered statistically significant for all tests.

RESULTS

A retrospective study was conducted on 1,154 patients with BCC treated at the Plastic, Reconstructive, and Aesthetic Surgery Clinic of Erciyes University Medical Faculty Hospital between 2008 and 2022. In total, 1,183 lesions were evaluated. Of the patients, 650 were male and 503 were female. The average age of male patients was 68.2±12.1 years, and that of female patients was 65.6±15.2 years, with an overall average age of 67.1±13.5 years. The youngest patient with BCC was 12 years old (with xeroderma pigmentosum), and the oldest was 103 years old. The average follow-up period was 3.1±1.6 years, ranging from 1.5 to 8 years.

When examining the localization of the 1,183 total BCC lesions, the following distribution was observed: 438 lesions (37%) were located on the nose, 99 lesions (8%) in the infraorbital area, 95 lesions (8%) in the frontal region, 90 lesions (8%) in the malar region, 76 lesions (6%) on the scalp, 70 lesions (6%) in the periorbital region, 54 lesions (5%) in the nasolabial sulcus, 45

Table 1. Distribution of histopathological subtypes of basal cell carcinoma (BCC)

Subtype	n	%
Nodulocystic	187	35.6
Morpheaform	96	18.3
Adenoid	50	9.5
Basosquamous	47	8.9
Superficial spreading	13	2.5
Infiltrative	13	2.5
Keratotic	22	4.2
Pigmented	16	3.0
Mixed	16	3.0
Nodular	14	2.7
Micronodular	6	1.1
Follicular	5	1.0

lesions (4%) in the perioral region, 41 lesions (3%) on the ear, 31 lesions (3%) in the medial canthal region, 39 lesions (3%) in the preauricular region, 22 lesions (2%) in the postauricular region, 20 lesions (2%) on the trunk, 17 lesions (1%) on the upper extremities, 14 lesions (1%) in other parts of the chin, 12 lesions (1%) on the neck, 10 lesions (1%) in the mental region, five lesions (0.4%) on the lower lip, and two lesions (0.1%) on the lower extremities.

When evaluating the relationship between anatomical localization and recurrence, all lesions were grouped into high-risk (H-zone) and low-risk (L-zone) categories based on anatomical site. Recurrence was observed in 21 out of 693 lesions (3.0%) located in the H-zone and in 8 out of 490 lesions (1.6%) located in the L-zone. Since more than 20% of the expected frequencies in the contingency table were less than 5, the assumptions for the chi-square test were not met. Therefore, Fisher’s exact test was used to assess the association between anatomical risk zone and recurrence. The test revealed no statistically significant association.

Of the total 1,183 BCC lesions, histopathological subtypes were definitively identified in 526 patients. The most common subtype was nodulocystic, found in 187 patients (37%). This was followed by the morpheaform type in 96 patients (19%), the adenoid type in 50 patients (10%), and the basosquamous type in 47 patients (9%). Other subtypes included the superficial spreading and infiltrative types in 26 patients (5%), the keratotic type in 22 patients (4%), the pigmented type in 16 patients (3%), the nodular type in 14 patients (3%), the mixed type in 16 patients (3%), the micronodular type in six patients (1%), and the follicular type in five patients (1%) (Table 1).

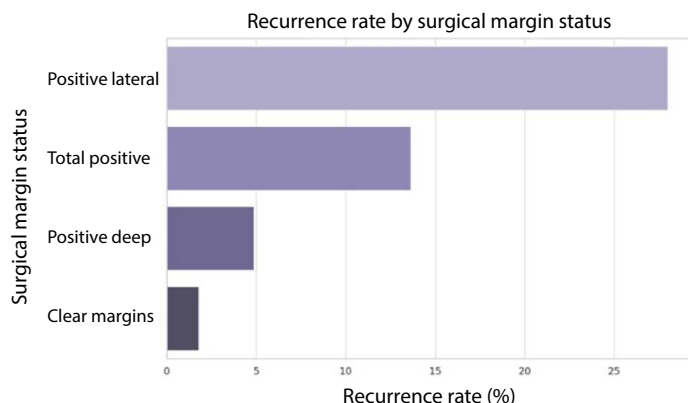


Figure 1. Recurrence rates by surgical margin status.

Out of the total 1,183 BCC lesions, recurrence occurred in 29 lesions (2.5%). Among the 66 lesions with a positive surgical margin, recurrence was observed in nine lesions (13.6%). Of the 25 lesions with a positive lateral surgical margin, recurrence occurred in seven lesions (28.0%); of the 41 lesions with a positive deep surgical margin, recurrence occurred in two lesions (4.9%); and of the 1,117 lesions with clear surgical margins, recurrence was observed in 20 lesions (1.8%). Chi-square test analysis showed a statistically significant relationship between positive surgical margins and recurrence ($p < 0.01$) (Fig. 1).

Out of the total 1,183 BCC lesions, metastasis developed in two patients (0.2%). One patient with metastasis had a positive deep surgical margin, while the other had a clear surgical margin. Chi-square test analysis showed no statistically significant relationship between positive surgical margins and metastasis ($p = 0.256$).

When examining the relationship between lesion size and recurrence, 1,088 lesions measured less than 2 cm in diameter, with 25 recurrences (2.29%), while 95 lesions measured more than 2 cm, with four recurrences (4.29%). The chi-square test revealed no statistically significant association between lesion size and recurrence ($p = 0.243$) (Fig. 2).

DISCUSSION

Non-melanoma skin cancers are the most prevalent malignancies worldwide, with BCC accounting for the majority. The incidence of BCC continues to rise, particularly among aging populations, largely due to cumulative ultraviolet exposure and phenotypic susceptibility, including fair skin, light eye color, and actinic damage.^{1,11,12}

This 15-year retrospective study presents one of the largest single-center BCC cohorts managed by a plastic surgery department in Türkiye. Unlike many previous reports, it

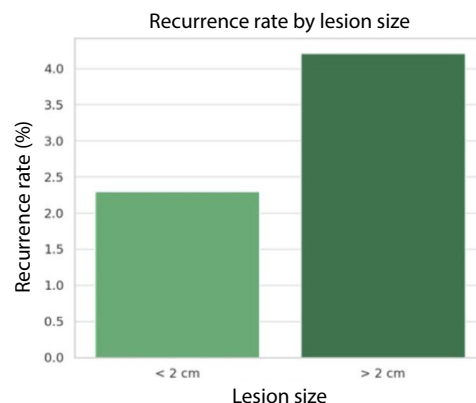


Figure 2. Recurrence rates by lesion size.

provides a focused investigation into the relationships between tumor localization, surgical margin status, and recurrence, offering clinically meaningful data to guide surgical planning and postoperative surveillance protocols.

Consistent with prior literature, the mean age in our cohort was 67 years, aligning with previous studies that report peak incidence in the sixth to seventh decades of life.¹³ This finding underscores the importance of regular dermatologic screening in elderly populations, particularly in those with established risk factors.

Histopathological subtypes were identified in 526 of the 1,183 BCC lesions. The most common was the nodulocystic subtype (37%), followed by morpheaform (19%), adenoid (10%), and basosquamous (9%). Less frequent variants included superficial spreading and infiltrative types (5%), keratotic type (4%), pigmented, nodular, and mixed types (~3% each), as well as micronodular and follicular types (1% each). These distributions are clinically relevant, as aggressive subtypes such as morpheaform and basosquamous often require wider excision margins and closer postoperative surveillance, consistent with prior reports.

Surgical excision remains the gold standard for BCC management, and achieving negative margins is essential to reduce the risk of recurrence. Nagore et al.¹⁴ reported recurrence rates ranging from 1.3% to 46%, depending on the completeness of excision. Similarly, Płaszczczyńska et al.¹⁵ reported a recurrence rate of 3.3% in a cohort of 1,097 patients, with the infiltrative subtype most commonly associated with recurrence. In our study, the recurrence rate was 2.5%, consistent with existing data. To mitigate recurrence risk, our clinic employs a standardized postoperative follow-up protocol consisting of eight visits over two years—six in the first year and two in the second.

In terms of anatomic distribution, BCC lesions were most frequently located in the head and neck region, particularly on the nose (37%), infraorbital area (8.3%), and frontal region (8%). This aligns with the findings of Ulkur et al.,¹⁶ who reported that 86.8% of lesions occurred in the head and neck region. When lesion sites were categorized into high-risk (H-zone) and low-risk (L-zone) anatomical areas, recurrence appeared more frequent in the H-zone (3.0%) compared with the L-zone (1.6%). However, this difference did not reach statistical significance. Because the chi-square test assumptions were violated due to small expected counts in some categories, Fisher's exact test was used as a more appropriate alternative, and no significant association between risk zone and recurrence was found ($p>0.05$). These findings suggest that while recurrence may be slightly more common in high-risk anatomical zones, anatomical localization alone may not be a strong predictor of recurrence, underscoring the multifactorial nature of BCC recurrence.

Surgical margin status emerged as a critical prognostic factor. In our study, 66 lesions (5.6%) had positive margins, and among these, 13.5% experienced recurrence. Lateral margin involvement demonstrating a particularly high recurrence rate of 28%. These findings are consistent with earlier research; for instance, Fitzpatrick et al.¹⁷ reported that one-third of patients with positive surgical margins developed recurrence. This highlights the importance of meticulous surgical technique and supports considering re-excision or more intensive follow-up in cases of margin positivity. Our institutional approach to margin-positive BCCs is individualized based on the tumor's histopathological subtype, anatomical location, and the patient's overall clinical condition. In cases with low-risk features—such as superficial or nodular BCCs located in low-risk anatomical regions—close clinical follow-up is generally recommended, particularly in elderly patients or those with significant comorbidities where re-excision may pose additional risks. In contrast, for tumors with high-risk characteristics (e.g., infiltrative or micronodular histology, or an aggressive growth pattern) or those located in cosmetically and functionally critical areas such as the periorbital or nasal region, surgical re-excision is typically advised to ensure complete tumor clearance and minimize recurrence risk. In selected patients for whom surgery is contraindicated, or in cases where margins remain positive despite re-excision, adjuvant radiotherapy may be considered as an alternative or complementary treatment option. Accordingly, surgical margin status plays a critical role in guiding postoperative management decisions, and a case-by-case, individualized evaluation remains essential in the treatment of margin-positive BCCs.

In addition to conventional surgical excision, advanced techniques such as Mohs micrographic surgery (MMS) and Peripheral and Deep En Face Margin Assessment (PDEMA) are well-represented in the literature. These approaches are particularly recommended for high-risk tumors or lesions in anatomically critical areas, as they allow for more precise margin assessment and may reduce the risk of recurrence.¹⁸

The relationship between tumor size and recurrence remains a subject of debate. While Yildizdal et al.¹⁹ reported a significant correlation, Lara et al.²⁰ found no such association. In our cohort, lesions less than 2 cm in diameter had a recurrence rate of 2.29%, compared with 4.29% for those greater than 2 cm. However, this difference was not statistically significant ($p=0.243$). These results indicate that while size may be a contributing factor, it is likely not an independent predictor of recurrence and should be interpreted in conjunction with histologic subtype and margin status.

Metastasis in BCC is exceptionally rare, with reported rates ranging from 0.0028% to 0.55%.²¹ In our study, only two patients (0.17%) developed metastasis. Both cases involved large, aggressive tumors located in high-risk regions (nose and scalp). One patient had clear surgical margins and presented with hematogenous metastasis, while the other had deep margin involvement and demonstrated aggressive local progression. These outcomes align with the literature and underscore the complexity of metastatic BCC, which remains poorly understood due to its rarity.

This study has several limitations, including its retrospective, single-center design and the absence of detailed histologic subtype analysis. Nevertheless, the large sample size, extended follow-up period, and focus on surgical outcomes contribute meaningful insights to clinical practice. Future prospective, multicenter studies with comprehensive histopathological data are needed to further clarify the prognostic variables influencing recurrence and metastasis in BCC.

CONCLUSION

Identifying prognostic factors for BCC is crucial for both surgical management and follow-up. Lesions, particularly those located in high-risk areas, play a significant role in recurrence, and careful monitoring of these patients is essential. Incomplete excision is also associated with recurrence, and every effort should be made to achieve complete excision. When necessary, re-excision or alternative treatment options should be considered.

Ethics Committee Approval: The Erciyes University Ethics Committee granted approval for this study (date: 09.10.2024, number: 2024/187).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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