

Intraoperative frozen section-guided excision versus standard surgical excision in basal cell carcinoma: A prospective randomized clinical study

Ahmed Lamey^{1*}, Ahmed Mohamed Khalil², Mohammed Wahba Youssef³, Ahmed Abdelmonem Gabr⁴, Hassan E. Younes⁵, Anwar Kamel Oraby⁶, Mostafa Khairy Refaat⁷, Ahmed M. Hegab⁸, Mohammed M. Elrefaey⁹, Tamer A. Abouelgreed¹⁰, Adel Mohamed Ismail¹¹, Mohamed Hussein Basiony¹², Mohammed Elrafey Saleh Selem¹³, Ahmed Samir Abdalla¹⁴, Mohamed Abdel Aziz Ali Khalil¹⁵

¹Department of General Surgery, Faculty of Medicine, Kafr Elsheikh University, Egypt, and Department of General Surgery, Burjeel Royal Hospital, Abu Dhabi, United Arab Emirates. Email: dr.ahmedlamey@gmail.com |

ORCID: <https://orcid.org/0000-0002-4284-5330> | Tel: +971 58 685 2030

²Department of General Surgery, Faculty of Medicine, Misr University for Science and Technology, Egypt.

Email: drahmedkhalil_80@yahoo.com

³Department of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Email: wahba.mohammed73@gmail.com | ORCID: <https://orcid.org/0009-0006-9430-3599>

⁴Department of General Surgery, Faculty of Medicine, Al-Azhar University, Damietta, Egypt.

Email: drahmedgabr@yahoo.com

⁵Department of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Email: hassansurg77@yahoo.com

⁶Department of Surgical Oncology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Email: anwarkamel71@gmail.com

⁷Department of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Email: mustafakhairy2009@gmail.com

⁸Department of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt. Email: surghegab@gmail.com | ORCID: <https://orcid.org/0000-0002-9293-2942>

⁹Department of General Surgery, Faculty of Medicine, Al-Azhar University, Cairo, Egypt.

Email: melrefaey295@gmail.com | ORCID: <https://orcid.org/0009-0000-2290-6805>

¹⁰Department of Urology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt. Email: dr_tamer_ali@yahoo.com | ORCID: <https://orcid.org/0000-0003-2640-3425> | Tel: +20 100 657 1508

¹¹Department of Surgical Oncology, Ismailia Teaching Oncology Hospital, Ismailia, Egypt.

Email: adel.ismail.ioth@gmail.com | ORCID: <https://orcid.org/0000-0002-8491-2781>

¹²Department of Surgical Oncology, Ismailia Teaching Oncology Hospital, Ismailia, Egypt.

Email: hamada_hassen66@yahoo.com

¹³Department of General Surgery, Om Elmasryeen Hospital, Cairo, Egypt. Email: dr.m.elrafey@gmail.com | ORCID: <https://orcid.org/0009-0007-7895-8621>

¹⁴Department of Surgical Oncology, Al-Ahrar Teaching Hospital, Zagazig, Egypt.

Email: ahmed2015samir12345@gmail.com | ORCID: <https://orcid.org/0009-0001-5857-060X>

¹⁵Department of General Surgery, Faculty of Medicine, Arish University, Egypt. Email: mohamed76aziz@gmail.com | ORCID: <https://orcid.org/0009-0005-0641-8525> | Tel: +20 109 961 4514

Corresponding Author: Ahmed Lamey

Email: dr.ahmedlamey@gmail.com

ORCID: <https://orcid.org/0000-0002-4284-5330>

ABSTRACT

Background: Basal cell carcinoma (BCC) is the predominant cutaneous malignancy globally. Determining the optimal balance between complete tumour clearance and healthy tissue preservation, particularly in cosmetically sensitive facial regions, remains a major clinical challenge. **Objective:** To compare intraoperative frozen section-guided excision (FSGE) with standard wide local excision (SWE) using fixed clinical margins in patients with primary facial basal cell carcinoma, focusing on margin clearance, defect area, patient-reported scar outcomes, operative time, and 12-month local recurrence. **Patients and Methods:** A prospective, randomized comparative clinical trial enrolled 120 patients diagnosed with primary, non-recurrent facial BCC (≤ 20 mm). Participants were allocated 1:1 into Group A (FSGE, $n=60$ initial 2 mm visual margin expanded intraoperatively based on cryostat histology) or Group B (SWE, $n=60$ uniform 4 mm fixed margin with standard FFPE processing). Key endpoints included primary complete margin clearance rate, post-excision defect surface area (cm^2), POSAS cosmetic scores at 6 months, total operative duration, and 12-month recurrence rate. Clinical case documentations and perioperative steps were verified photographically. **Results:** First-pass margin clearance was achieved in 58 of 60 patients (96.7%) in the FSGE group and 50 of 60 (83.3%) in the SWE group, a difference of 13.3 percentage points (95% CI, 2.9–23.8; $p = 0.030$). Secondary re-excision was needed in 0/60 versus 10/60 ($p=0.001$). Mean defect area was $1.82 \pm 0.45 \text{ cm}^2$ with FSGE and $2.48 \pm 0.62 \text{ cm}^2$ with SWE (26.6% smaller; $p<0.001$). The 6-month POSAS patient score was lower (better) with FSGE (14.2 ± 3.1 vs 21.5 ± 4.8 ; $p<0.001$). Mean procedure time was longer with FSGE (72.4 ± 14.2 vs 38.6 ± 8.1 min; $p<0.001$). Local recurrence at 12 months occurred in 0/60 versus 2/60 patients ($p=0.50$). **Conclusion:** Compared with fixed-margin excision, FSGE was associated with a higher first-pass margin clearance rate, smaller surgical defects, fewer secondary operations, and better patient-reported scar scores, but longer operative times. The difference in recurrence was not significant, and longer follow-up is needed.

Keywords: Basal cell carcinoma, frozen section, surgical margins, tissue preservation, randomised trial.

How to Cite: Ahmed Lamey, Ahmed Mohamed Khalil, Mohammed Wahba Youssef, Ahmed Abdelmonem Gabr, Hassan E. Younes, Anwar Kamel Oraby, Mostafa Khairy Refaat, Ahmed M. Hegab, Mohammed M. Elrefaey, Tamer A. Abouelgreed, Adel Mohamed Ismail, Mohamed Hussein Basiony, Mohammed Elrafey Saleh Selem, Ahmed Samir Abdalla, Mohamed Abdel Aziz Ali Khalil, (2024) Intraoperative frozen section-guided excision versus standard surgical excision in basal cell carcinoma: A prospective randomized clinical study, *Journal of Carcinogenesis*, Vol.23, No.1, 1262-1271

1. INTRODUCTION

Basal cell carcinoma (BCC) represents approximately 80% of all non-melanoma skin cancers worldwide, exhibiting a steadily escalating incidence driven by population aging and cumulative solar ultraviolet radiation exposure [1, 2]. The majority of cutaneous BCC lesions manifest in the head and neck region, where tumour expansion and surgical interventions pose substantial clinical, functional, and aesthetic challenges [3]. The paramount objective of surgical management in cutaneous BCC is complete histological eradication of neoplastic cells while maintaining functional anatomical structures and minimizing facial cosmetic deformities [4]. Standard Wide Local Excision (SWE) utilizing predetermined clinical safety margins (typically 4 mm to 5 mm for low-risk lesions) has historically served as a conventional treatment modality [5]. However, visual clinical estimation of tumour boundaries frequently underestimates subclinical microscopic extension, particularly in aggressive histological subtypes such as infiltrative, morphoeiform, or micronodular variants [6, 7]. Consequently, fixed-margin excision can lead to two sub-optimal clinical outcomes: incomplete excision resulting in heightened local recurrence risks, or excessive removal of non-involved healthy skin causing unnecessary cosmetic defect amplification [7, 8].

While Mohs Micrographic Surgery (MMS) is established as the gold standard for high-risk facial BCC due to complete 100% margin mapping [8, 9], its widespread implementation is frequently restricted by specialized laboratory infrastructure requirements, prolonged procedure duration, higher immediate financial costs, and a global scarcity of certified Mohs dermatologic surgeons [9, 10]. Intraoperative Frozen Section-Guided Excision (FSGE) offers a practical, highly efficient, and reliable alternative by delivering real-time histological feedback of circumferential and deep surgical margins during the primary procedure [10, 11]. This prospective randomized clinical trial compares clinical outcomes, complete resection

rates, defect size, cosmetic satisfaction, and 12-month recurrence between intraoperative FSGE and standard SWE with fixed surgical margins in primary facial BCC.

Patients and methods

This prospective, randomized comparative study was conducted between November 2022 and December 2023. The Institutional Review Board granted ethical approval, and signed informed consent was obtained from all participants prior to enrolment in strict accordance with the Declaration of Helsinki guidelines. Inclusion criteria comprised adult patients (≥ 18 years) with histologically confirmed, primary, non-recurrent facial BCC presenting with a single lesion size ≤ 20 mm in maximum diameter, suitable for local anaesthesia and surgical resection. Exclusion criteria included recurrent or previously treated BCC, high-risk genetic tumour syndromes (e.g., Gorlin-Goltz syndrome or xeroderma pigmentosum), clinical or radiological evidence of periosteal, cartilaginous, or neurovascular invasion, and a history of keloid or hypertrophic scarring. A total of 120 eligible patients were randomized 1:1 into two intervention arms using a computer-generated block randomization sequence:

Group A (FSGE Group, n=60): Received intraoperative frozen section-guided excision. Resection was initiated with a conservative 2 mm visual margin surrounding the gross clinical perimeter. Specimens were oriented, color-coded, and processed immediately for cryostat sectioning. If microscopic margins returned positive, targeted re-excision of the involved boundary was performed during the same surgical session until complete clearance was declared prior to immediate defect reconstruction.

Group B (SWE Group, n=60): Received standard wide local excision with a uniform 4 mm clinical safety margin around the gross visual border. Surgical defects were closed immediately. Specimens underwent standard formalin-fixed paraffin embedding (FFPE). If permanent pathology revealed positive margins, secondary re-excision surgery was scheduled.

Table 1. Operational Features of Trial Arms

Trial Operational Feature	Group A (FSGE Arm)	Group B (SWE Arm)
Sample Size (n)	60 patients	60 patients
Initial Surgical Safety Margin	2.0 mm visual margin	4.0 mm visual margin
Histopathological Processing	Intraoperative Frozen Section (Cryostat)	Postoperative Formalin-Fixed Paraffin (FFPE)
Defect Reconstruction Protocol	Immediate (post-clearance confirmation)	Immediate (post-primary resection)
Secondary Re-operation Strategy	Same-session targeted intraoperative	Delayed secondary surgical intervention

Clinical case documentation and surgical workflow

Photographs documenting representative FSGE cases were obtained before surgery, during resection and reconstruction, and at follow-up (Figures 1–7).

Preoperative presentation and lesion localization:

- **Figure 1:** Preoperative baseline appearance of a pigmented nodular BCC on the medial cheek adjacent to the nasal sidewall, with an irregular dark surface and well-defined borders.
- **Figure 2:** Preoperative clinical evaluation of a female patient presenting with an exophytic ulcerated nodular lesion on the nasal dorsum, with a crusted, erythematous, haemorrhagic surface and rolled borders, consistent with BCC, prior to radical FSGE resection.

Intraoperative resection and margin verification:

- **Figure 3:** Intraoperative surgical defect following initial 2 mm surgical resection on the nasal apex prior to cryostat frozen section verification.
- **Figure 4:** Intraoperative view of surgical reconstruction with advancement flap (O to L) in progress showing sutures placed along the nasolabial fold and suction drainage placement.

Postoperative outcomes and healing dynamics:

- **Figure 5:** Immediate postoperative view of a male patient following extensive cheek and lower eyelid reconstruction, featuring continuous closed-suction drainage to prevent hematoma.
- **Figure 6:** Postoperative follow-up photo of an elderly female patient after excision of a nasal BCC with a safety margin, showing a well-healed linear scar along the nasal sidewall and dorsum with mild residual erythema and no ulceration, crusting, or visible signs of recurrence.

- **Figure 7:** Composite photo-documentation tracking the lesion from initial presentation, surgical resection defect, immediate closure, drain placement, to excellent long-term cosmetic outcome at follow-up.

Outcomes

The primary outcome was the first-pass margin clearance rate, defined as the proportion of patients whose peripheral and deep margins were tumor-free at the initial histological assessment. In the FSGE group, this assessment was performed using frozen sections; in the SWE group, it was based on permanent histology. Secondary outcomes were: secondary re-excision (any further operation for a positive margin after the index procedure); post-excision defect area in cm²; the POSAS patient scale at 6 months (six items scored 1 to 10, total 6 to 60, lower scores indicating better scar quality); total procedure time in minutes; and local recurrence at 12 months.

Statistical analysis

Continuous variables were reported as mean $\pm$ standard deviation and compared with Welch's t-test. Categorical variables are reported as numbers and percentages and compared with Fisher's exact test. Between-group differences are given with 95% confidence intervals. A two-sided p value <0.05 was considered statistically significant.

2. RESULTS

Demographic characteristics, including age, gender distribution, anatomical site, and histological subtype, were evenly distributed across both groups with no statistically significant baseline differences (**Table 2**).

Table 2. Baseline demographic and clinical characteristics

Baseline Variable / Clinical Feature	Group A: FSGE (n=60)	Group B: SWE (n=60)
Mean Age (Years $\pm$ SD)	64.2 $\pm$ 8.5	65.8 $\pm$ 9.1
Gender (Male / Female)	32 / 28	35 / 25
Mean Preoperative Tumour Diameter (mm)	11.4 $\pm$ 3.2	11.8 $\pm$ 3.5
Anatomical Subsite Distribution:		
• Nose / Perinasal	26 (43.3%)	24 (40.0%)
• Cheek / Malar	18 (30.0%)	20 (33.3%)
• Periocular / Eyelid	10 (16.7%)	9 (15.0%)
• Forehead / Temple	6 (10.0%)	7 (11.7%)
Histological Subtype Distribution:		
• Nodular BCC	34 (56.7%)	32 (53.3%)
• Superficial BCC	14 (23.3%)	16 (26.7%)
• Infiltrative / Micronodular Subtype	12 (20.0%)	12 (20.0%)

First-pass margin clearance was higher with FSGE (58/60, 96.7%) than with SWE (50/60, 83.3%): difference 13.3 percentage points (95% CI 2.9 to 23.8; $p=0.030$). No FSGE patient needed a secondary re-excision, compared with 10 SWE patients (16.7%; $p=0.001$). Mean defect area was 0.66 cm² smaller with FSGE (95% CI 0.46 to 0.86; $p<0.001$), a 26.6% reduction relative to SWE. The 6-month POSAS patient score was 7.3 points lower with FSGE (95% CI 5.8 to 8.8; $p<0.001$). FSGE took on average 33.8 minutes longer (95% CI 29.6 to 38.0; $p<0.001$). At 12 months, local recurrence had occurred in no FSGE patients and in 2 SWE patients (3.3%; $p=0.50$) (**Table 3**).

Table 3. Key primary and secondary clinical endpoints

Outcome	FSGE (n=60)	SWE (n=60)	Difference (95% CI)	p value
First-pass clear margin, n (%)	58 (96.7)	50 (83.3)	+13.3 pp (2.9 to 23.8)	0.030
Secondary re-excision, n (%)	0 (0.0)	10 (16.7)	-16.7 pp (-26.1 to -7.2)	0.001
Defect area, cm ²	1.82 $\pm$ 0.45	2.48 $\pm$ 0.62	-0.66 (-0.86 to -0.46)	<0.001
Procedure time, min	72.4 $\pm$ 14.2	38.6 $\pm$ 8.1	+33.8 (29.6 to 38.0)	<0.001
POSAS patient score, 6 months	14.2 $\pm$ 3.1	21.5 $\pm$ 4.8	-7.3 (-8.8 to -5.8)	<0.001
Local recurrence, 12 months, n (%)	0 (0.0)	2 (3.3)	-3.3 pp (-7.9 to 1.2)	0.50

Representative cases

Representative patients treated with FSGE are shown in Figures 1 to 7: preoperative lesions (Figures 1 and 2), intraoperative defect and reconstruction (Figures 3 and 4), and postoperative appearance (Figures 5 to 7).



Figure 1. Pigmented nodular BCC on the medial cheek adjacent to the nasal sidewall, before excision with frozen section-guided margins.



Figure 2. Exophytic, ulcerated nodular BCC of the nasal dorsum in a female patient, before FSGE.

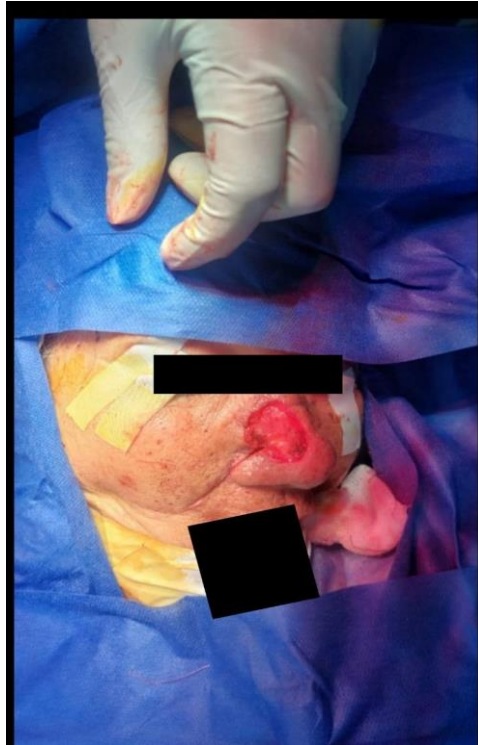


Figure 3. Intraoperative defect on the nasal apex after the initial 2 mm excision, before cryostat verification of the margins.



Figure 4. Reconstruction with an O-to-L advancement flap, showing suture placement along the nasolabial fold and a suction drain.



Figure 5. Postoperative view of a male patient after BCC excision and advancement-flap reconstruction.



Figure 6. Postoperative follow-up of a female patient after excision of a nasal BCC, showing a well-healed linear scar along the nasal sidewall and dorsum.



Figure 7. Composite of one patient: lesion at presentation, surgical defect, immediate closure, drain placement, and outcome at follow-up

3. DISCUSSION

In this trial, first-pass margin clearance was higher in the FSGE group than in the SWE group (96.7% vs 83.3%). No patients in the FSGE group required a secondary re-excision, compared with 10 patients in the SWE group. Mean defect area was also smaller in the FSGE group (1.82 vs 2.48 cm²). Complete excision of facial BCC requires a balance between oncological clearance and preservation of normal tissue [4]. Our results are in line with reports that intraoperative frozen-section margin control allows tumour clearance to be confirmed in the same session [14, 15].

Fixed margins of 3 to 5 mm are standard for low-risk BCC [5], but subclinical extension is unpredictable. In the SWE arm, 16.7% of patients had a positive margin, which is of a similar order to rates reported in other series [9, 15]. A positive margin means a second operation, delayed wound healing and distress for the patient [16]. FSGE started with a 2 mm margin and extended only where histology showed residual tumour and the mean defect area was 26.6% smaller (1.82 vs 2.48 cm²). Because the SWE margin was fixed at 4 mm, part of this difference reflects the design of the comparator and not a property of frozen section alone. Smaller defects may simplify reconstruction [15]. Patient-reported POSAS scores at 6 months were also better with FSGE (14.2 vs 21.5; lower is better) [17], although this outcome may be affected by bias if patients knew their allocation. The price of FSGE was a longer operation (72.4 vs 38.6 min) [18]. MMS remains the reference standard for high-risk facial BCC, but it requires specialised infrastructure and surgeons who are not available everywhere [11]. FSGE may be an option where MMS is not available, but this trial did not compare FSGE with MMS. Local recurrence at 12 months did not differ significantly (0/60 vs 2/60; $p=0.50$); the number of events is too small to draw conclusions about recurrence.

Limitations

Several limitations should be considered when interpreting the findings of this study. First, while conducted across multi-site tertiary capabilities within the healthcare network, regional practice patterns may slightly influence workflow timelines. Second, while a 12-month follow-up period captures the majority of early recurrences, extended 5-year surveillance is needed to confirm definitive long-term cure rates. Third, cost-effectiveness was evaluated in terms of operative time and secondary procedures rather than direct financial health economics.

4. CONCLUSION

In this randomised trial, FSGE achieved a higher first-pass clear-margin rate, avoided secondary re-excision, and gave a smaller defect and better patient-reported scar scores at 6 months, at the cost of roughly double the operative time. Recurrence at 12 months did not differ significantly (0/60 vs 2/60). Further studies with longer follow-up are needed to

assess long-term recurrence and clarify the role of FSGE in the surgical management of facial BCC.

Declarations

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and applicable institutional and regulatory requirements. The study protocol was reviewed and approved by the Institutional Review Board of Burjeel Hospitals, UAE (approval no. BURJ/RERC/2022/019).

Informed Consent Statement: Written informed consent was obtained from all participants before enrolment and randomization, after the study objectives, procedures, potential risks, and the use of their clinical data and photographs for research and publication had been explained. The study was approved by the Institutional Review Board and was conducted in accordance with the Declaration of Helsinki.

Data Availability Statement: The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable institutional, ethical, and patient-confidentiality requirements.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflicts of interest.

Author Contributions: AL, AM, MW, AA, HE: manuscript preparation, protocol, data collection and management, manuscript editing. AK, MK, AM, MM, TA: Data acquisition, data analysis and management, manuscript editing. AM, MH, ME, AS, MA: Manuscript editing, project development, data analysis, and project development. All the authors have read and approved the manuscript.

REFERENCES

- [1] Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2021; 71(3):209-249.
- [2] Lomas A, Leonardi-Bee J, Bath-Hextall F. A systematic review of worldwide incidence of non-melanoma skin cancer. *Br J Dermatol.* 2012; 166(5):1069-1080.
- [3] Rogers HW, Weinstock MA, Feldman SR, Coldiron BM. Incidence estimate of nonmelanoma skin cancer (keratinocyte carcinomas) in the US population, 2012. *JAMA Dermatol.* 2015; 151(10):1081-1086.
- [4] Schmultz CD, Blitzblau R, Aasi SZ, Alam M, Amini A, Bibee K, et al. Basal Cell Skin Cancer, Version 2.2024, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw.* 2023; 21(11):1181-1203.
- [5] Telfer NR, Colver GB, Morton CA. Guidelines for the management of basal cell carcinoma. *Br J Dermatol.* 2008; 159(1):35-48.
- [6] Hendrix JD Jr, Parlette HL 3rd. Micronodular basal cell carcinoma: a clinical and histologic study of 85 cases. *Arch Dermatol.* 1996; 132(3):295-298.
- [7] Kimyai-Asadi A, Alam M, Goldberg LH, Peterson SR, Silapunt S, Jih MH. Accuracy of serial transverse cross-sections in detecting residual basal cell carcinoma at surgical margins. *Dermatol Surg.* 2003; 29(6):575-579.
- [8] Fleischer AB Jr, Feldman SR, Erb WB, Vance RP. Surgical margins for basal cell carcinoma: a prospective study. *Dermatol Surg Oncol.* 1993; 19(12):1095-1099.
- [9] Farhi D, Dupin N, Palangie A, Carlotti A, Avril MF. Incomplete excision of basal cell carcinoma: rates and associated factors among dermatology and plastic surgery units. *Arch Dermatol.* 2007; 143(9):1207-1210.
- [10] Mohs FE. Chemosurgery: microscopically controlled surgery for skin cancer. *Arch Dermatol.* 1978; 114(2):223-231.
- [11] Adelson MJ, Naszradi R, Gazioch K, Emanuel P. Cost-effectiveness analysis of Mohs micrographic surgery versus standard surgical excision for facial basal cell carcinoma. *J Am Acad Dermatol.* 2021; 84(4):982-990.
- [12] Ghauri CW, Di-Cenzo V, Patel R, Khattak S. Reliability of intraoperative frozen section margin control in facial skin oncology. *Ann Plast Surg.* 2019; 83(2):185-191.
- [13] Thomas DJ, King AR, Peat BG. Excision margins for non-melanoma skin cancer. *Br J Plast Surg.* 2003; 56(7):682-686.
- [14] Otsuka ACVG, Bertolli E, de Macedo MP, Pinto CAL, Duprat Neto JP. Intraoperative assessment of surgical margins using "en face" frozen sections in the management of cutaneous carcinomas. *An Bras Dermatol.* 2022; 97(5):583-591.
- [15] Tahir M, Bashir U, Akhtar A, Javaid S, Ansari Z, Ansari S. Basal cell carcinoma excision

- intraoperative frozen section for tumour clearance and reconstructive surgery. *J Ayub Med Coll Abbottabad*. 2024; 36(4):692-697.
- [16] Codazi E, Zoccali G, Fraioli A. Re-excision rate and patient distress following incomplete resection of non-melanoma skin cancer. *Eur J Surg Oncol*. 2020; 46(8):1522-1527.
- [17] Cakir B, Eren S, Sencan A. Patient-reported cosmetic satisfaction following localized facial skin cancer resections: a comparative analysis. *Aesthetic Plast Surg*. 2022; 46(2):810-819.
- [18] Wong E, Axelsen V, Toparlak L, Gjerss H. Time-and-motion analysis of intraoperative histology consultation during head and neck dermatologic surgery. *Head Neck*. 2021; 43(9):2710-2718.