

Algorithm of skin malignancies therapy at Department of Plastic and Aesthetic Surgery in Brno and achieved results

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Summary

Introduction: Skin malignancy is one of the most common reasons for seeking out a plastic surgery clinic. This article presents an overview of the therapeutic results at Department of Plastic and Aesthetic Surgery Brno and includes an algorithm according to which we proceed in the treatment of patients with skin malignancy. **Material and methods:** Retrospective analysis of data for the year 2022, including a set of 791 patients with a total of 1,117 procedures to remove skin malignancy. The representation of cutaneous malignancy was as follows – basalioma (51%), squamous cell carcinoma (14%), and other malignancies including precancerous lesions were represented in 35%. Age, sex, a character and a number of procedures (excision, re-excision, controlled excision), and the histological results of resected specimens (with a sufficient margin or ingrowth) were evaluated. Based on the analysis of the patient cohort, an algorithm is presented to guide the surgical management of the patient. **Results:** Patients' age ranged from 26 to 102 years. There was a discrete male predominance in the cohort (51%). Tumour localization was most frequently on the skin of the face, cleavage, and extremities. Regarding the spectrum of procedures, excision accounted for the largest proportion (83%). Re-excision accounted for the rest of the procedures (10%), controlled excision was performed in 6% and excisional biopsy accounted for 1%. Primary sanative excision with a histologically sufficient margin was performed in 96%. In the group of controlled excisions, 59% were sanative. Overall, 73% of patients in our cohort underwent a single operation only to remove a cutaneous malignancy. **Conclusion:** The results of the therapy and the algorithm of the care for patients with skin malignancy can be evaluated as successful based on the analysis performed. The determination of the surgical strategy according to the algorithm appears to be effective. The authors recommend its use in practice, especially with the current trend of the increasing incidence of skin malignancies and the desire to improve the effectiveness of surgical interventions.

Key words

basalioma – spinalioma – excision – controlled excision – skin cancer – algorithm

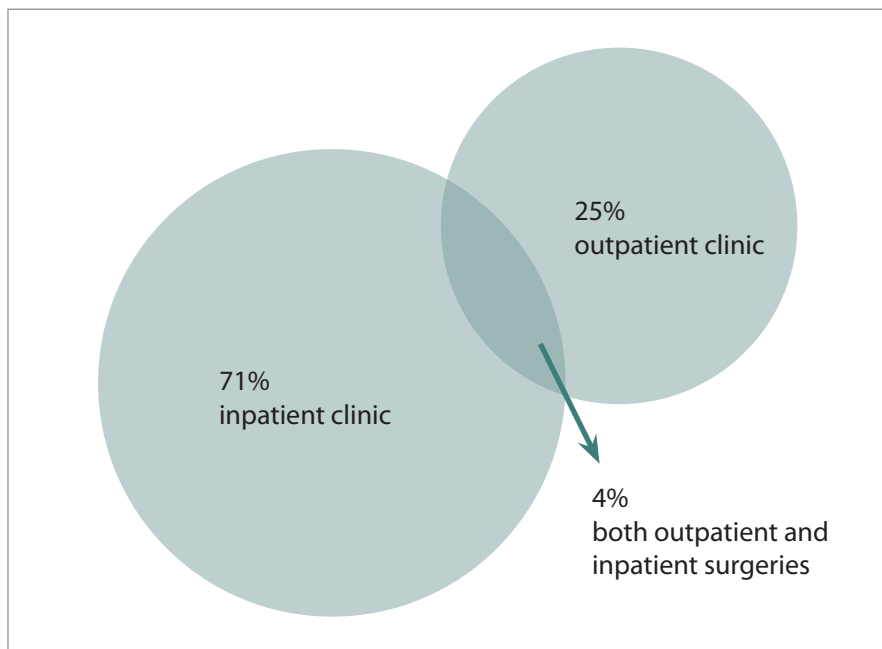
Ferkodičová I, Dvořák Z, Svobodová K et al. Algorithm of skin malignancies therapy at Department of Plastic and Aesthetic Surgery in Brno and achieved results. *Acta Chir Plast* 2024; 66(2): 67–72.

Introduction

The most frequent patients of the plastic surgery outpatient clinic are patients with skin malignancies. In the Czech Republic, more than 22,000 patients are diagnosed with skin cancer every year, which represents almost a third of all patients diagnosed with malignant neoplasms [1]. For these patients, an algorithm of care has been developed over the years at Department of Plastic and Aesthetic Surgery Brno, according to which the choice of the type of proce-

cedure is made. In addition to a dermatologist, a surgeon, a plastic surgeon, an oncologist, a radiation oncologist, an otorhinolaryngologist or other specialists are often involved in the treatment of a patient with a skin malignancy, depending on the type and localization of the malignancy. Once the patient is referred for surgical therapy by the dermatologist, it is the next step to determine the correct surgical approach. In indicated cases, we do not hesitate to use multidisciplinary cooperation. To unify

the strategy, interdisciplinary cooperation is ensured at St. Anne's University Hospital by regular indication multidisciplinary committees, such as the head and neck cancer committee or the non-melanoma skin cancer committee. The aim is to ensure the radicality of the procedure regarding the cost-benefit ratio for the patient and, at the same time, to make the therapy more effective. In this paper, the management of patient care is presented with a focus on the treatment of basalioma and squamous cell carcino-



Scheme 1. Percentage of procedures by procedure mode.

mas. The safety margins of the excision of individual tumours according to their histology and possible adjuvant management correspond to the individual recommended procedures in the Blue Book of the Czech Oncological Society [2].

Materials and methods

A retrospective statistical analysis of the data of 791 patients operated for the diagnosis of C44 malignant neoplasm of the skin for the year 2022 at the Clinic of Plastic and Aesthetic Surgery, St. Anne's University Hospital in Brno, was used. Patients' data were collected and classified according to the hospital data, including age, sex, numbers of excisions, re-excisions, and controlled excisions, as well as complete and incomplete histological results of resections. The terms non-complete, incomplete, non in sano, and RpTx were searched to find patients with incomplete histological results due to the different reporting of findings by multiple pathologists. The data were processed from the hospital inpatient and outpatient information systems. For procedures, a chosen patient treatment strategy and its final effectiveness were monitored. Based on the results,

a general algorithm for the care of patients with cutaneous malignancy was developed.

Operations related to skin malignancy but not leading to tumour removal were excluded from the dataset. These include, for example, flap modelling and thinning, disconnection of the nutritive pedicle of the flap, complex reconstructive surgery to replace removed body parts with malignancy – nose, eyelids, lips, ears, etc. [3–5]. Due to the complications of healing, operations requiring further coverage, such as skin autograft necrosis, were also excluded from the dataset. Furthermore, three patients in our cohort underwent tumour re-excision in 2023 and these surgeries were not included in the dataset.

For some patients, the data were confirmed from multiple sources due to inconsistencies. An example is a patient with a histological result of non in sano, but without further resection surgery. It was not a refusal of further surgery by the patient nor a surgeon's error. In this case, we took two samples. The superficial sample proved malignant, while the base of the defect was free of cancer

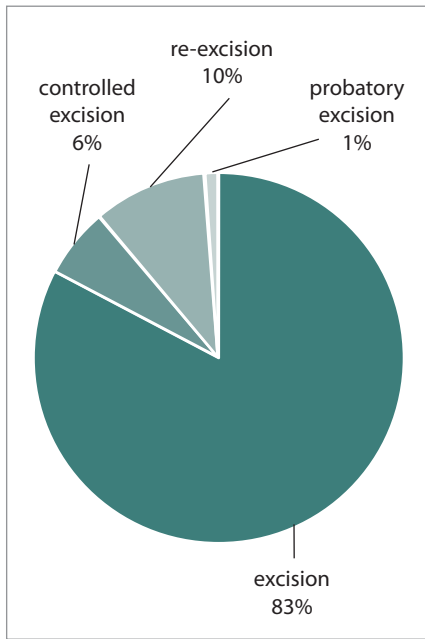
cells, thus the procedure was sanative. In the outpatient mode, 25% of patients were operated on. The rest of the patients was treated in the inpatient mode, and a total of 4% of patients had surgery to remove a cutaneous malignancy in both modes (Scheme 1).

Results

In total, 1,117 procedures were performed at our clinic in 2022 to remove malignant skin neoplasms in 791 patients. The age range of the patients was 26 to 102 years, with a discrete male predominance (male – 403 patients, 51%; female – 388 patients, 49%). Most of the tumours were localized in the areas of the human body most exposed to sunlight – face, cleavage, and extremities. The results show a 96% success rate (883 procedures) in terms of primary salvage excision with a histologically verified safety margin. When converted to patients, we are talking about 73% of patients (577 patients) who underwent one operation only. In 6% of the procedures, controlled excision was chosen using a temporary skin cover, usually COM 30 (three-layer combined dressing consisting of polyester mesh, polyurethane foam and polyamide knit, VUP Medical Brno, Czech Republic). During controlled excisions, the malignancy was removed at the primary procedure in 59% of patients, while in 41% further resection procedures were necessary. Of the total number of procedures, secondary re-excision for non in sano histological result accounted for 10%. Excisional biopsy was performed in 1% of the procedures (Graph 1).

Merkel cell carcinoma, dermatofibrosarcoma protuberans, melanomas, or sarcomas were incidental histologic findings in suspected basalioma or squamous cell carcinoma cases (Fig. 1–5) [6].

One patient was referred for tumour growth into the auditory canal and further managed within the ENT specialty. One patient was referred to the Masaryk Memorial Cancer Institute for metastatic



Graph 1. Percentage distribution of types of surgical procedures.



Fig. 1. Adnexal adenocarcinoma of the left ear and back of the ear.



Fig. 2. Cylindromas of the scalp.



Fig. 3. Extensive squamous cell carcinoma of the scalp.



Fig. 4. Exulcerated basal cell carcinoma of the temple.



Fig. 5. Pleomorphic dermal sarcoma of the scalp.

involvement of the cervical nodes and parotid gland. One patient was referred to haematology for a secondary finding of concomitant lymph node metastasis due to lymphoma. In one patient, the outer lamina of the skull had to be removed due to tumour ingrowth. Less than 1% of patients in the older cohort did not present for re-excision and follow-up for unknown reasons.

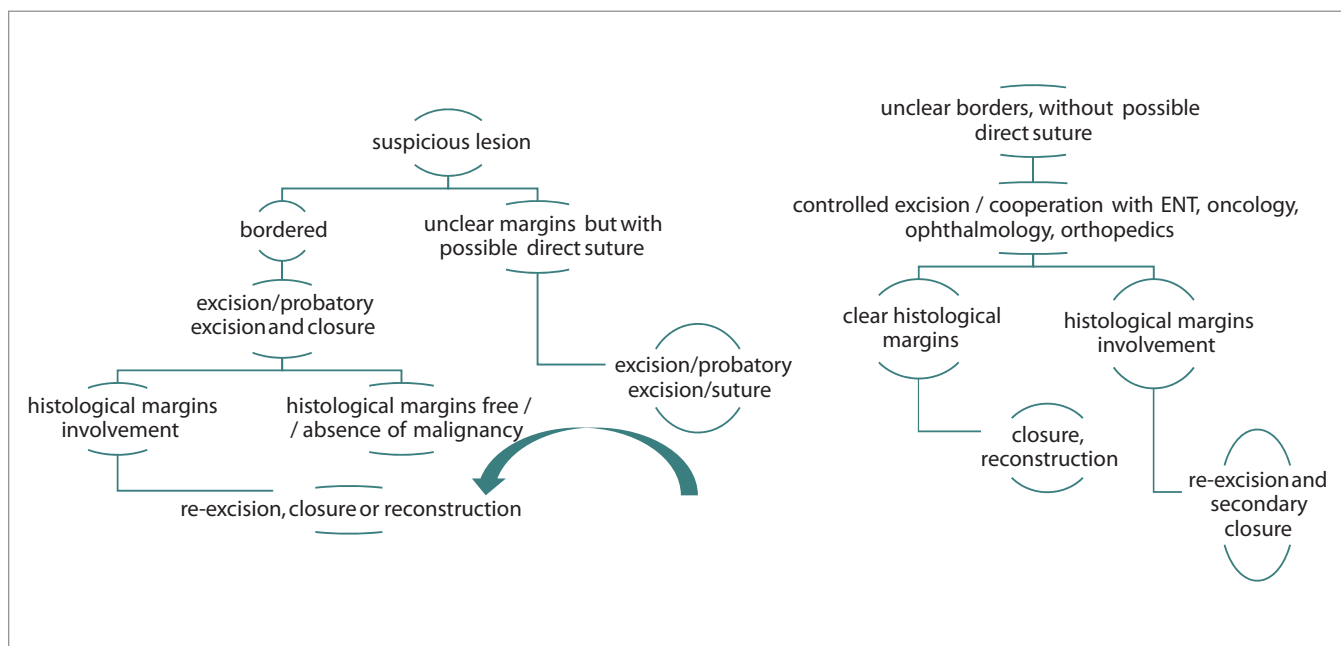
Among the reconstructive procedures, direct suture (35%), local displacement (50%) and skin autograft (15% of patients)

were the most used. For more extensive defects of the ears, nose, eyelids, or lips, multistage complex reconstructive procedures were frequently used [7–9]. The reconstructive procedures followed the basic principles of the reconstructive ladder, with adherence to the rules of preserving aesthetic lines [10,11].

Discussion

In the care of a patient with a skin malignancy, an algorithm helps us to navigate the treatment options (Scheme 2).

When we see sharp edges during tumour inspection and the tumour is smaller in size, we usually opt for a direct closure. When the lesion is larger, but the malignant nature of the tumour is in doubt, an excisional biopsy, followed by re-excision with confirmation of the diagnosis and reconstructive surgery is indicated. In the case of an indistinct lesion with the impossibility of direct closure and necessary coverage of the defect, controlled re-excision is appropriate. In the first



Scheme 2. Algorithm of treatment of a patient with suspected skin malignancy.

operation, the visible lesion is removed, and the defect is covered with a temporary skin substitute. Depending on the histology results, re-excision or definitive coverage of the defect is then performed.

The effort to minimize the size of the defect should never outweigh the effort to be radical in surgery. The surgeon should not succumb to pressure from the patient or other circumstances and should choose the type of the procedure according to his best knowledge. In addition, the use of a general algorithm comes into consideration. It can not only help the surgeon in the choice but also help to demonstrate the correctness of the procedure in a hesitant patient. However, we must always bear in mind that even apparent success in removal of a tumorous lesion may not lead to a long-term cure for the patient in terms of future prognosis. Every patient should be educated about the risk of new lesions or recurrence, which is related to the nature and biological behaviour of cutaneous malignancies.

According to the recommendations in the Blue Book of 2024 of the Czech Oncological Society, the minimum

safety margin for low risk basalioma is 2–3 mm [2]. Furthermore, local therapy is possible – cryotherapy, photodynamic therapy or imiquimod application. For extensive but still operable basalioma, the safety margin for surgical removal is at least 5–10 mm, or Mohs micrographic surgery could be an option [12,13]. For extensive inoperable basalioma, radiotherapy, brachytherapy or targeted therapy is reserved [14,15]. For low risk and small squamous cell carcinoma (less than 20 mm with a depth of less than 6 mm), surgical removal with a safety margin of at least 4–6 mm is recommended. Local therapy is only possible for precancerous lesions such as actinic keratosis or morbus Bowen, with cryopreservation, photodynamic therapy, or application of imiquimod or 5-fluorouracil. For prognostically unfavourable or extensive but still operable squamous carcinomas (i.e., tumours larger than 20 mm, depth greater than 6 mm, presence of perineural propagation, dedifferentiation, recurrent tumours, and localization on ears, temples, and lips), surgical removal with a safety margin of at least 6–10 mm or Mohs microsurgery is recommended [12,13].

According to a 2013 study by Schell et al., the recommended margins based on Mohs micrographic surgery are 4.75 mm and 8 mm for basalioma and 5 mm/13.25 mm (low risk/high risk) for squamous cell carcinomas, respectively [12,13].

At our clinic, we choose a margin of at least 1 cm to achieve free resection margins (more than 5 mm). Palliative radiotherapy and brachytherapy are still possible for large inoperable squamous cell carcinomas [14,15].

The basic treatment method for primary melanoma is surgical excision of the suspicious lesion, which takes place in two sessions. The first excision is performed with a thin margin of 1–3 mm of healthy skin. The extent of the following radical excision is determined by the depth of the invasion according to Breslow, if malignant melanoma is confirmed. For melanoma *in situ*, the recommended total surgical safety margin is 0.5 cm; for melanoma with Breslow up to 2 mm, excision should be performed with a margin of 1 cm of healthy skin (pT1 and pT2); for melanoma with Breslow above 2 mm, excision with a margin of 2 cm is recommended (pT3 and pT4). In acrolentiginous melanoma of the fin-

ger, amputation in the adjacent phalanx is performed after histological verification. Of course, we encounter cases where the extent of the surgery is not feasible due to the localization of the melanoma and requires an individualized approach. In melanomas with Breslow below 0.8 mm with ulceration or with Breslow 0.8–1.0 mm with/without ulceration (pT1b), sentinel lymph node biopsy (SLNB) should be considered as a part of the second radical operation to exclude microscopic regional dissemination. In melanoma with Breslow above 1.0 mm, SLNB should be performed automatically.

For Merkel cell carcinoma, surgical removal with a 10–20 mm margin is recommended; sentinel node examination may also be considered; if positive, dissection of the relevant lymphatic area is indicated. According to the oncologist, adjuvant radiotherapy of the primary tumour area or regional lymphatic area in the case of nodal involvement follows [15].

In terms of age distribution, there is an increase in the number of patients at a younger age. The differences in the incidence in both sexes were not significant. As the population ages, there are more patients at older ages with the need for multiple excisions – in our cohort there were 23 patients with 4 to 17 lesion excisions per patient, and this was performed in 2022 alone. There is an effort to follow up these patients by dermatologists and regular check-ups by the committee for non-melanoma skin tumours, which meets regularly at St. Anne's University Hospital in Brno and is attended by experts from the fields of dermatology, oncology, radiotherapy, and plastic surgery.

The use of controlled excision and the need for further re-excision is eliminated by Mohs' microscopically controlled surgery, in which the tumour margins are histologically evaluated during the operation [12]. However, this option is not currently available at our institution.

Reconstruction of the nose, eyelids, or ears after complete excision of basalioma is done immediately. In case of the morphea type of basalioma, spilioma, or melanoma, reconstruction after 6 weeks is appropriate [16].

Goulding et al. compared the success rate of excision of cutaneous malignancies across specialties in the UK in a 2009 study. He found out that 19% of excisions referred by a plastic surgeon were not complete. Furthermore, 8% of excisions performed by dermatologists and up to 68% of excisions performed by general practitioners were not complete [17]. In a Scottish study by Dr Hawes team, the success rate of sanative excision of cutaneous malignancy by plastic surgeons was around 90% [18]. In a 2019 study by Ramdas et al. in the Netherlands, plastic surgeons had a success rate in sanative excision of 83%, compared to dermatologists with 93% and general practitioners with 70% [19]. All studies reported that cutaneous malignancies removed by plastic surgeons were most commonly in the head and neck region, and in the sites which are more challenging for defect closure after surgical excision.

Conclusion

Due to the large number of patients, our clinic has gained extensive experience in the removal of skin malignancies. This work also confirms the good results and the achievement of radical removal of tumours in a high percentage of patients. The choice of the therapeutic approach is based on a general algorithm individually, according to the local findings in each patient (Scheme 2). For recurrent affections and those with unclear margins, the first choice is the so-called controlled excision, where the tumour is removed and replaced with a temporary skin substitute. Final coverage of the defect is performed only after confirmation of the complete tumour excision. In our cohort, only 10% of procedures with the necessity of re-excision were performed,

thus the use of controlled excision could be discussed retrospectively, obviously according to the local findings and the type of the malignancy.

Roles of the authors

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Disclosure: The authors have no conflicts of interest to disclose. The authors declare that this study has received no financial support. All procedures performed in this study involving human participants were in accordance with ethical standards of the institutional and/or national research committee and with the Helsinki declaration and its later amendments or comparable ethical standards.

References

1. Krejci D., Muzik J., Dusek L. Cancer incidence 2019–2021 in the Czech Republic. [online]. Available from: <https://www.uzis.cz/res/f/008447/novotvary2019-2021.pdf>.
2. Modrá kniha České onkologické společnosti. Brno: Masarykův onkologický ústav 2024.
3. Dvořák Z., Heroutová M., Sukop A., et al. Příčina, diagnostika, klasifikace defektů nosu a historie rekonstrukce nosu. *Otorinolaryngol Foniatr.* 2018, 67(4): 95–99.
4. Dvořák Z., Novák P., Výška T., et al. Reconstruction of defects with forehead flap. *Acta Chir Plast.* 2015, 57(3–4): 46–48.
5. Dvořák Z., Kubek T., Pink R., et al. Moderní principy rekonstrukce nosu. *Otorinolaryngol Foniatr.* 2018, 67(4): 100–106.
6. Dvořák Z., Pink R., Heinz P., et al. Rare syringoid eccrine carcinoma of the upper lip and nasal base treated with resection and subsequent innovative reconstruction using an Abbé flap, turbinate flaps and three-stage forehead flap: a case report. *World J Surg Oncol.* 2022, 20(1): 288.
7. Dvořák Z., Cheimaris A., Knoz M., et al. Three-stage paramedian forehead flap reconstruction of the nose using the combination of composite septal pivot flap with the turbinate flap and L-septal cartilaginous graft – a case report. *Acta Chir Plast.* 2021, 63(1): 6–13.
8. Thornton JF., Griffin JR. Nasal reconstruction. *Sel Read Plast Surg.* 2006, 10(12): 1–39.
9. Tvrděk M., Kozák J. Reconstruction of eyelids with Washio flap in anophthalmia. *Acta Chir Plast.* 2014, 56(1–2): 20–22.
10. Boyce DE., Shokrollahi K. Reconstructive surgery. *BMJ.* 2006, 332(7543): 710–712.

11. Guo L., Pribaz JR., Pribaz JJ. Nasal reconstruction with local flaps: a simple algorithm for management of small defects. *Plast Reconstr Surg.* 2008, 122(5): 130e–139e.
 12. Schell AE., Russell MA., Park SS. Suggested excisional margins for cutaneous malignant lesions based on Mohs micrographic surgery. *JAMA Facial Plast Surg.* 2013, 15(5): 337–343.
 13. Wong E., Axibal E., Brown M. Mohs micrographic surgery. *Facial Plast Surg Clin North Am.* 2019, 27(1): 15–34.
 14. Delishaj D., Rembielak A., Manfredi B., et al. Non-melanoma skin cancer treated with high-dose-rate brachytherapy: a review of literature. *J Contemp Brachytherapy.* 2016, 8(6): 533–540.

15. Veness MJ., Delishaj D., Barnes EA., et al. Current role of radiotherapy in non-melanoma skin cancer. *Clin Oncol.* 2019, 31(11): 749–758.
 16. Nahhas AF., Scarbrough CA., Trotter S. A review of the global guidelines on surgical margins for nonmelanoma skin cancers. *J Clin Aesthet Dermatol.* 2017, 10(4): 37–46.
 17. Goulding J., Levine S., Blizard R., et al. Dermatological surgery: a comparison of activity and outcomes in primary and secondary care. *Br J Dermatol.* 2009, 161(1): 110–114.
 18. Haw WY., Rakvit P., Fraser SJ., et al. Skin cancer excision performance in Scottish primary and secondary care: a retrospective analysis. *Br J Gen Pract.* 2014, 64(625): e465–e470.
 19. Ramdas K., van Lee C., Beck S., et al. Differences in rate of complete excision of basal cell

carcinoma by dermatologists, plastic surgeons and general practitioners: a large cross-sectional study. *Dermatology.* 2018, 234(3–4): 86–91.

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Submitted: 15. 5. 2024

Accepted: 16. 6. 2024

