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Surgical reconstruction of post-tumoral facial defects

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Abstract

Purpose: The face is an unfortunate location for any type of tumor – malignant or not – with significant esthetic and functional outcomes. To reconstruct a facial defect may seem simple, but can be rather complicated. The aim of this study is to analyze and discuss our results in order to conclude with specific surgical strategies correlated with the morphopathological results. The most important objective for us is to offer the highest level of expertise to our patients and to prove that the symbiosis between the surgical treatment and the work of the Department of Morphopathology is essential in order to maximize the quality of medical care provided for our patients. *Patients, Materials and Methods*: A retrospective study was conducted on 116 patients diagnosed with facial malignant tumors, 70 of which were confirmed as basal cell carcinomas (BCCs), 35 confirmed as squamous cell carcinomas (SCCs) and 11 malignant melanomas (MMs). Most BCC cases (57) showed ulceration, with a long clinical evolution (more than 10 years) in 48 cases. Only in 12 SCC cases, patients showed inflammation and ulceration, with a shorter evolution period (2–5 years). For complete microscopic diagnosis, immunohistochemical (IHC) examination was necessary in 46 cases. The BCC "deceiving" clinical behavior and the generally aggressive character of the MM were found in our patients as well. *Results*: The most frequent sites were the orbital region (27 cases) and the nasolabial sulcus (26 cases). In order to reconstruct the postexcisional defects, we had to perform local flaps in 62 cases (14 frontal flaps for orbital defects, 32 glabellar flaps for medial epicanthus, lower lid and nasal region, 15 nasolabial flaps for lower lid or nasal alae and one "Z"-plasty for the submental region). Oncological follow-up was performed in all patients and in 15 cases re-excision was necessary (11 BCCs, two SCCs and two MMs). Cervical lymph node metastasis occurred in six cases (three BCCs, one SCC and two MMs). *Conclusions*: The cooperation between surgeons and pathologists allowed for good outcomes and the pathology examination can guide the surgical approach towards better results both functionally and esthetically.

Keywords: facial basal cell carcinoma, squamous carcinoma, malignant melanoma, facial local flaps.

Introduction

Skin tumors seem to be very easy to diagnose and the prevention of facial malignant lesions should be the most efficient one, as they develop on exposed areas and can be observed by self-examination. The epidemiological studies of facial tumors demonstrate the contrary. They are still frequent and the patients, very often, avoid asking for the opinion of a specialist [1]. What could account for this peculiar behavior in our modern times? The explanation could be "white coat" anxiety, neglect due to a busy schedule or the initially "benign appearance" of some of the facial malignant tumors [2, 3].

The result is the same: tumors grow and spread to new segments of skin, the inflammation occurs aiding the malignant process to develop and invasion to bone or cartilage occur [4, 5]. Correct and complete excision is difficult to obtain, defect reconstruction being complicated and with uncertain results, from the functional and esthetic point of view [6–9].

When discussing about the treatment of face-located cancer, there will always be a contradiction between the oncological principles in terms of excision "in healthy tissue" and the main rules of reconstructing the defect. In many cases, the surgeon cannot perform a radical excision because the tumor invades important esthetic and functional units, a good example being a cancer located on the medial canthus [10]. It is well known that any incision, excision and reconstruction in the face are planned following the "map" of the main aesthetic units [11].

Many tumors do not abide by this rule; therefore, the surgeon is constrained to use different reconstructive techniques in order to obtain good results.

The aim of this retrospective study conducted on 116 patients diagnosed with facial malignant tumors is to analyze and discuss our results, in order to conclude with

specific surgical strategies correlated with the morpho-pathological results.

Patients, Materials and Methods

We performed a retrospective study on 116 patients diagnosed with malignant facial tumors and hospitalized in the Clinic of Plastic and Reconstructive Surgery, "St. Spiridon" Emergency County Hospital, Iaşi, Romania, over a three-year period (2015–2017). Seventy tumors were histologically confirmed as basal cell carcinomas (BCCs), 35 confirmed as squamous cell carcinomas (SCCs) and 11 as malignant melanomas (MMs) (Figure 1).

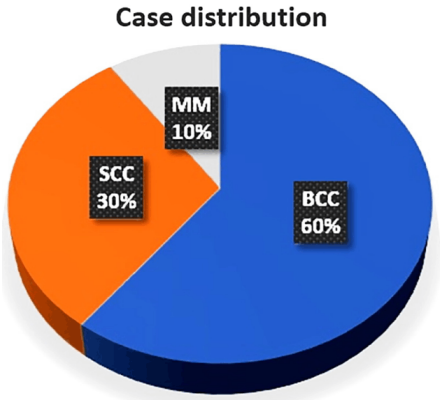

Figure 1 – ***Case distribution of the facial malignant tumors. BCC: Basal cell carcinoma; MM: Malignant melanoma; SCC: Squamous cell carcinoma.***

We included in our study all the aesthetic units of the face, excepting the lips and oral cavity. The facial cancers affected 47 males and 69 females, most of them aged over 60 (87 patients). The most frequent locations were the orbital region (27 cases: 24 BCCs, three SCCs) and the nasogenian sulcus (26 cases, all BCCs). Fifty-six tumors involved the nasal region (17 cases: nine BCCs, eight SCCs), the zygomatic region (16 cases: five BCCs, nine SCCs, two MMs), the auricular area (12 cases: two BCCs, six SCCs and four MMs), the forehead unit (10 cases: three BCCs, five SCCs, two MMs), the temporal region (six cases: two BCCs, three SCCs and one MM) and the submental region (one MM) (Figure 2). For complete microscopic diagnosis, immunohistochemical (IHC) examination was necessary in 46 cases.

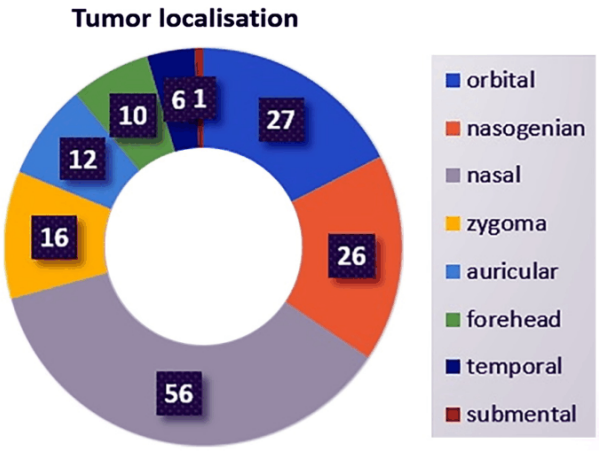

Figure 2 – ***Sites of facial malignant tumors.***

Results

We found that in our 69 studied patients the tumors were ulcerated (57 BCCs, 12 SCCs), neglected many years (more than 10 years in 48 patients with BCC, 2–5 years in 21 cases with SCC). In six patients (three BCCs, one SCC, two MMs), cervical enlarged lymph nodes were detected clinically and using sonography, at the initial exam of the tumor.

To reconstruct the post-excisional defects, we performed local flaps in 62 cases [14 frontal flaps to cover the orbit, 32 glabellar flaps for medial epicanthus, lower lid and nasal region (Figure 3, a–c), 15 nasogenian flaps for lower lid or nasal alae and one "Z"-plasty for submental region]. We performed excision and direct suture in 35 cases (four tumors located on the auricular region, 31 on the nasogenian fold, frontal and temporal arias). The skin grafts were used to reconstruct the defect in 19 cases (full thickness skin graft in seven patients, partial skin graft in 12 patients). Oncological follow-up was performed in all patients and in 15 cases re-excision was necessary (11 BCCs, two SCCs, two MMs).

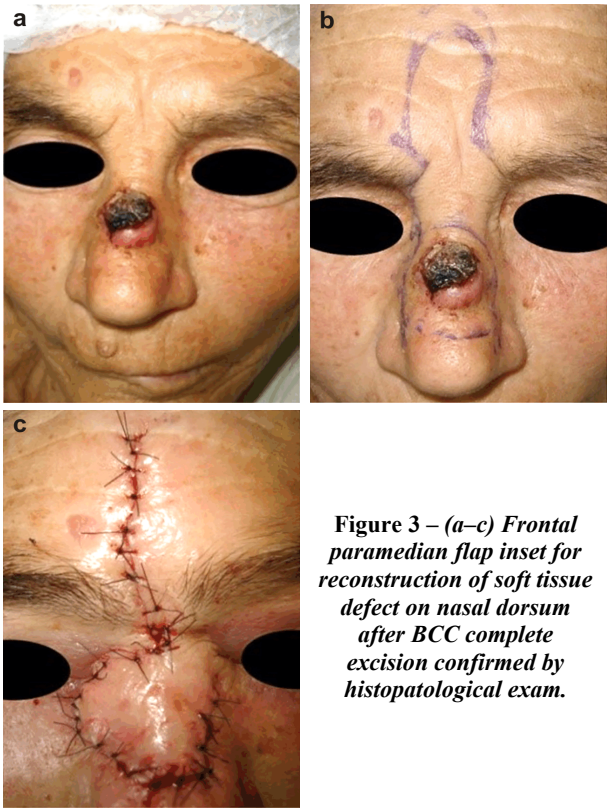

Figure 3 – ***(a–c) Frontal paramedian flap inset for reconstruction of soft tissue defect on nasal dorsum after BCC complete excision confirmed by histopatological exam.***

From all the tumors included in the study, the histo-pathological exam of the specimens revealed that 60.3% were BCCs (Figures 4 and 5, a–d), 30.1% were SCCs (Figure 6, a and b) and 9.4% MMs. The BCC "deceiving" clinical behavior and the generally aggressive character of the MM were found in our patients as well.

The male-to-female ratio was 1:1.46. Almost half of the patients showed tumors in the orbital and nasogenian areas (45.6%), whereas 54.3% of them had tumors in the other regions evaluated (nasal, zygomatic, auricular, forehead, temporal and submental). Ulceration was present in 59.4% of the cases. In 5.17% of the cases, large lymph nodes were associated with facial tumors from the initial evaluation but half of these cases were in fact metastatic)

(Figure 7, a–c). As for reconstructive procedures, we used flaps in 53.4% of the cases and in 46.7% cases the flap reconstructions were done in the central "T-area" of the face (eyelid, canthal area, and nasal region); these were followed by excision and direct suture in 30.1% of the cases and skin graft coverage was preferred in 16.3% of the cases (52.6% after BCC, 36.8% cases skin grafted were performed after melanoma excision and 10.5% after SCC).

From the total local flaps performed for covering the defects in the "T-area", 72% were represented by glabellar flaps considering that they offer the best esthetic and functional results. Usually, this flap needs a revision after 2–3 months in order to correct the tissue fold developed at the base of the flap. Only 5% of the patients who underwent glabellar flap reconstruction needed and agreed to be submitted to revision surgery.

As for the full thickness skin grafts used, we preferred the donor sites surrounding the auricular region, in 82% of the cases who underwent grafting (giving the similar texture and pigmentation with the defect zone). The rest of the grafts were harvested from the supraclavicular or brachial region when the skin surrounding the auricular region was damaged (scars or ulcerations).

Re-excision was necessary in 12.9% of the cases from which 51% were BCCs with periorbital localization. We performed re-excision for three of the 11 MMs (23.2% from the re-excision cases), the rest consisting of SCCs.

The histopathological examination decided the BCC lymph nodes were inflammatory in all cases, whilst the SCC and MM lymph nodes were actually metastatic. For accurate microscopic diagnosis, IHC examination was necessary in 46 cases, 35 SCCs and 11 MMs (Figure 8, a and b).

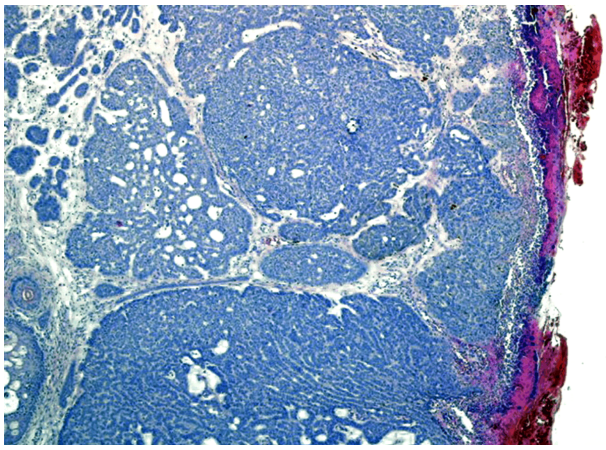

Figure 4 – ***Nests of basaloid cells showing peripheral palisading, reduce desmoplastic stroma and ulceration of the surface. Hematoxylin–Eosin (HE) staining, ×40.***

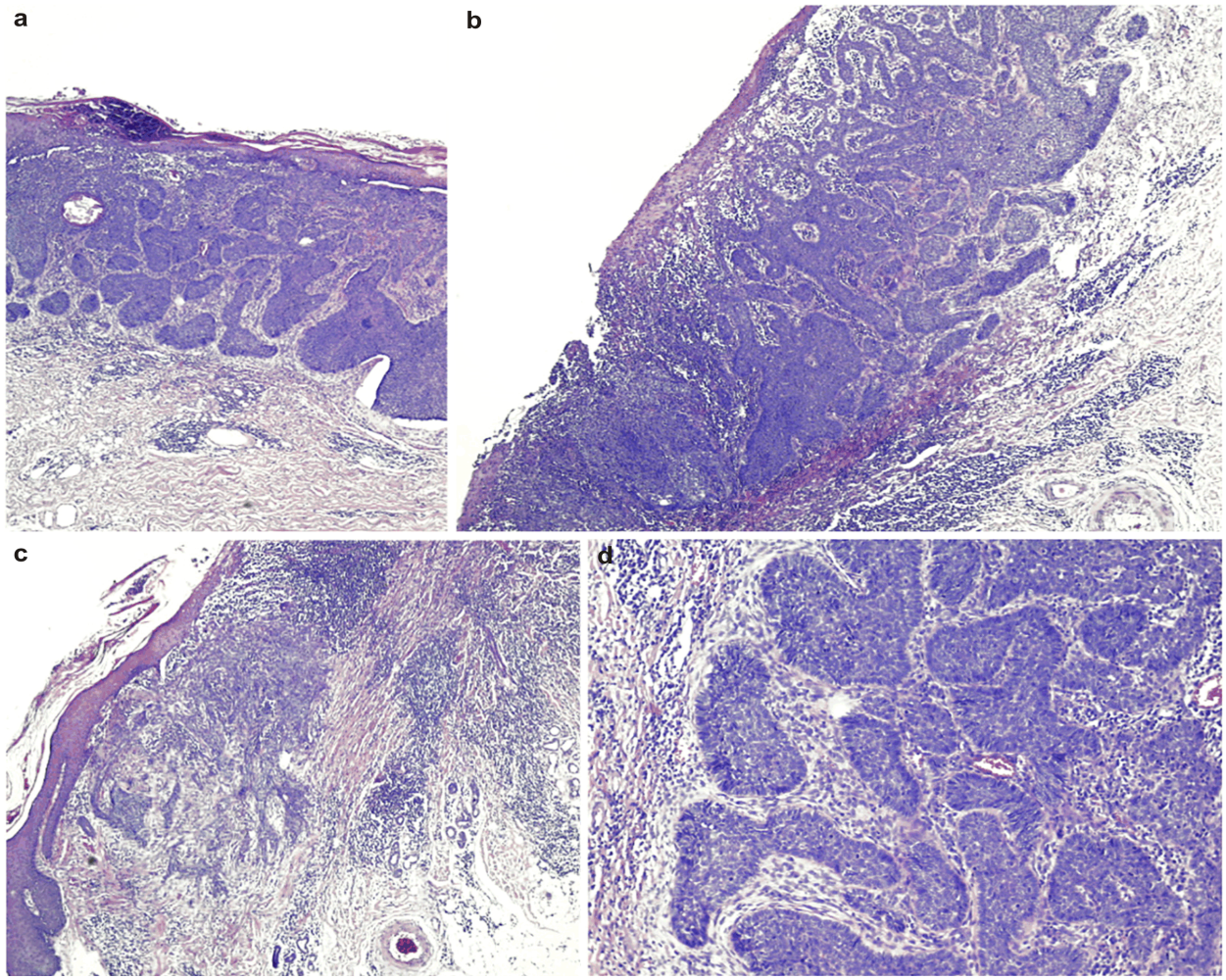

Figure 5 – ***(a–d) BCC, nodular type. The figures show a BCC, nodular type with surface ulceration and morpheiform areas. The tumor is composed of nests or islands of basaloid cells showing peripheral palisading, with scant cytoplasm and hyperchromatic nuclei surrounded by desmoplastic stroma with diffuse lymphocytic infiltrate it is shown. HE staining, ×40. BCC: Basal cell carcinoma.***

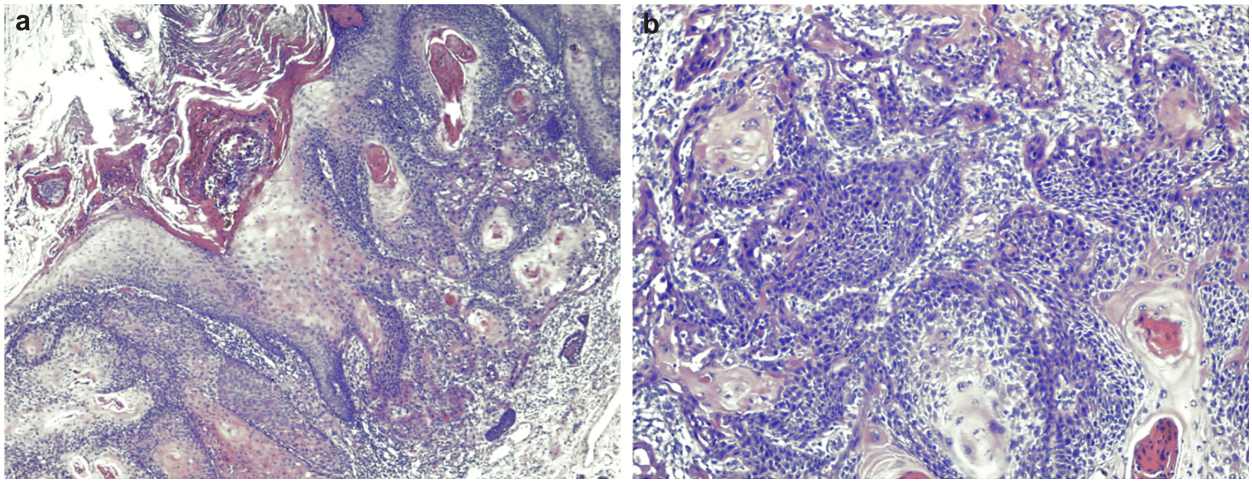

Figure 6 – ***(a and b) Well-differentiated SCC. The figures show a well-differentiated SCC, with keratinization, extending into the dermis and moderate mixed inflammatory infiltrate associated. The tumor is composed of nests or islands of squamous epithelial cells, with abundant eosinophilic cytoplasm, large nuclei and mitotic activity present. There is no vascular or neural infiltration in the evaluated sections. HE staining: (a) ×40; (b) ×100. SCC: Squamous cell carcinoma.***

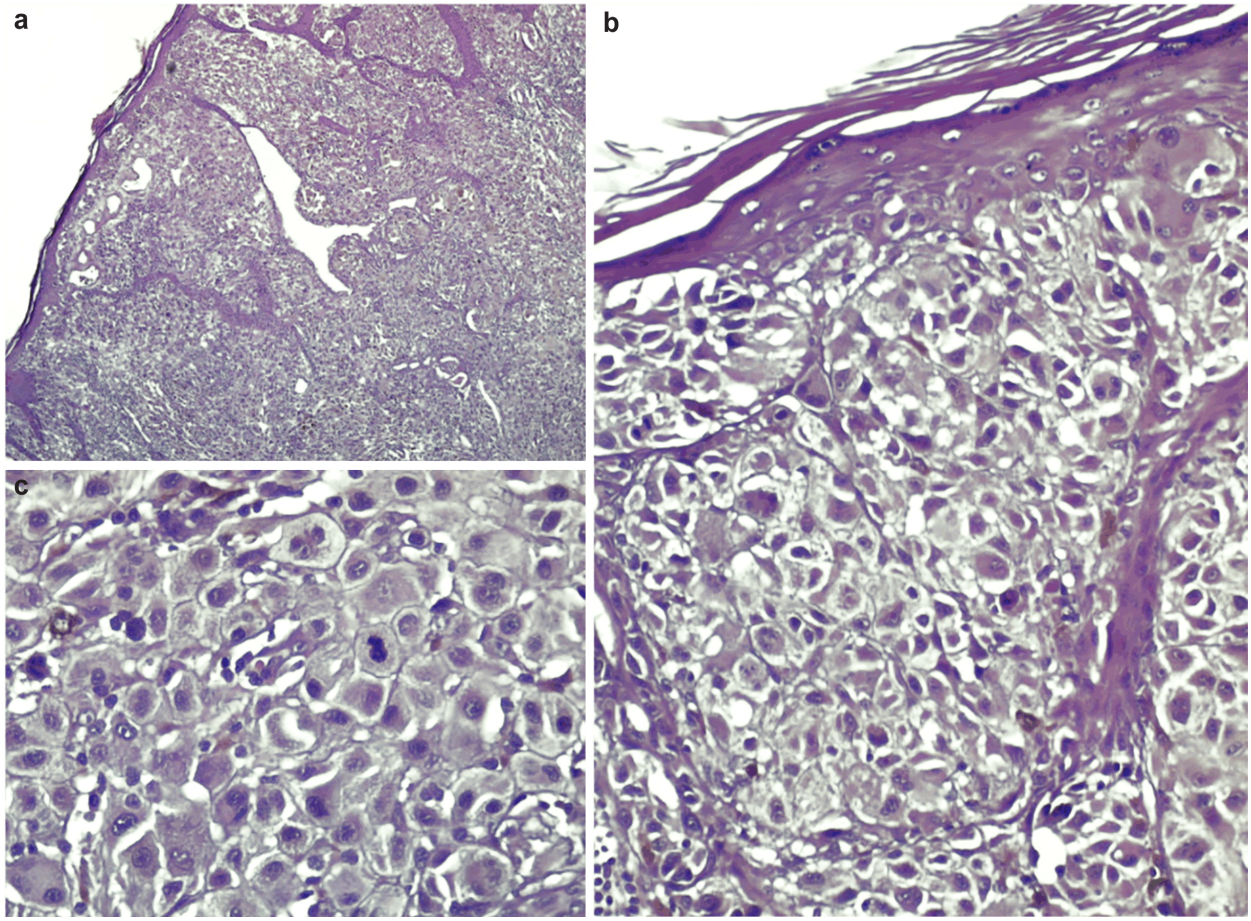

Figure 7 – ***(a–c) The figures show a malignant melanoma, nodular type with extension limited to the papillary dermis and the epidermis, without ulceration. The tumor is composed of large epithelioid cells, with vesicular nuclei and eosinophilic prominent nucleoli, some multinucleated with high nuclear-to-cytoplasmic ratios and abundant eosinophilic cytoplasm. There is a high mitotic activity (4 mitoses/mm^2), diffuse lymphocytic infiltrate associated and pigmentation of tumor cells. Clark level: III, Breslow thickness: IV. HE staining: (a) ×40; (b) ×200; (c) ×400.***

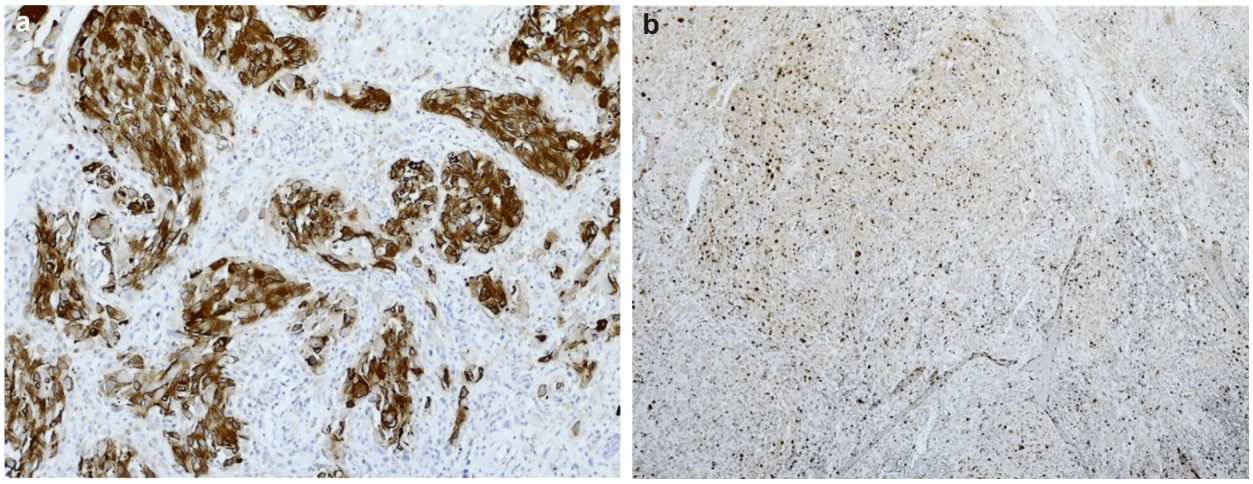

Figure 8 – *(a and b) Immunohistochemistry shows human melanoma black-45 (HMB-45) positivity in tumor cells and Ki67 positivity in 30% of tumor cells. Immunostaining for: (a) Anti-HMB-45 antibody, ×100; (b) Anti-Ki67 antibody, ×40.*

Discussions

When approaching cases of skin tumors, especially those located on the face, the plastic surgeon deals with a set of aspects concerning the treatment: excision in oncological margins, soft tissue defects of different thicknesses and different anatomical regions reconstruction. The face is the most important anatomic area for most patients, and because of this cosmetic importance, tumors of the facial skin are a great challenge for both oncological surgery and cosmetic and functional outcome [12].

Repairing a post-excisional soft tissue defect yields a dichotomic approach, as the purpose is the restoration of function in a specific area and, to a certain extent, of the appearance in the damaged region. In his reconstructive endeavors, the surgeon is supported in judging defect coverage by the use of an algorithm supplied by the reconstructive scale. This means that the evaluation of soft tissue thickness in the damaged area and the exposed tissue guides the treatment, which consists of excision and direct suture, followed by skin grafts, or local flaps. Tumor aggressiveness can be clinically evaluated by following its progress, and also relying on macroscopic aspects like ulceration [13, 14]. Especially for the tumors that are associated with a high risk of local recurrence and inflammation (BCCs), the skin grafts offer the advantage of a better long term monitoring of the region. However, many of the tumor locations and the invasion of deep structures (cartilage, bone) require a wider and deeper excision. It is obvious that in such cases the skin graft is not suitable as a reconstruction option, flaps remaining the only available choice. In addition, local flaps offer better long term results especially for facial soft tissue defects from the esthetic and functional point of view.

In our retrospective study, BCCs (60.3%) were the most common tumors, followed by SCCs, which amounted to 30.1%. Our findings confirmed literature data, according to which BCC is the most common skin malignant tumor, with up to 70–80% of these occurrences [15]. Its occurrence percentage in the general population is 4–5 BCC cases for each SCC case and 8–10 BCC cases for each newly diagnosed melanoma (eight BCCs for one MM in our group) [15]. An increase in BCC worldwide incidence has been lately noted [16].

Respecting the histological tumor types, the results of our studies confirm that there is a high occurrence of BCCs in elderly patients, while MMs are more frequent in younger patients. We found BCCs in younger patients as well (four cases less than 35 years old, 5.5% from BCCs). Seventy-five percent of the 116 patients diagnosed with face tumors were aged 60 years old and over (87 patients). This result is in accordance with literature studies, in which more than half of the cases occur between the ages of 50 and 80 years old [17].

Regarding the anatomic location of face tumors, in our group, the most frequent for BCCs were placed in the orbital region and the nasogenian sulcus, followed by the nasal region. There is a strong correlation between the final histological diagnosis and the planning of the long-term surgical strategy. It is preferred to begin with choosing the option of local small flaps in order to save the more distant and complex reconstructive techniques as a last solution in case of late local and regional tumor recurrence. In our study, the BCC predominates, and although exposure to UV radiation has been shown to be the main risk factor associated with this tumor genesis, the relationship between patterns of sun exposure, age of patient and histological aggressiveness is still controversial among researchers and therefore epidemiological and anatomopathological studies involving different population groups are needed [18]. Indeed, BCC most commonly occurs on sun exposed areas of the skin, in 80% of cases being located on the face, and only in 15–43% of the cases on the trunk [19]. BCC may occur and develop 10 to 50 years after sun damage [20]. In our study, 69 patients had ulcerated tumors (57 BCCs, 12 SCCs), neglected many years (more than 10 years in 48 patients with BCC, 2–5 years in 21 cases with SCC). It has also been noted that autoimmune conditions may promote the development of skin cancer [21–23].

BCC may have various macroscopic aspects, ranging from erythematous plaques (three cases in our group, 4.2% of BCCs) to pigmented lesions (10 cases in our group, 14.2% of BCCs), making the histopathological examination obligatory to set a certain diagnosis.

In microscopic examination, BCC is characterized by tumor cell proliferation with small oval and hyperchromic nuclei, and little nest- or strand-shaped cytoplasm.

Neoplastic cells are relatively uniform in appearance and sometimes have significant anaplasia and mitotic figures. On the border of the nests, they are usually arranged in a radial pattern, called "palisading". Although this does not allow the setting of a definite diagnosis, in its absence, the diagnosis of basal cell carcinoma should be questioned [24].

Regardless of their extent or cell disposition, basal cell carcinomas include the same cell type. Tumor cells, all identical, basophilic, resemble the basal cells of the epidermis, hence the name of basal cell carcinoma, but in fact they are undifferentiated tumor epidermal cells. They are elongated, have an oval or elongated nucleus with dense chromatin; the cytoplasm is very low, often poorly defined. Mitoses have variable frequency from one tumor to another [24]. Although typical cutaneous BCCs and SCCs are morphologically dissimilar, it is well known that poorly-differentiated SCC may assume a basaloid phenotype, making the histological distinction between these two tumors difficult (seven cases in our group, 6% from the tumors) [25].

Typically, any tumor developed in the squamous layer of the epidermis pierces the dermal–epidermal basal membrane and invades the dermis. Microscopically speaking, there are strands or nests of atypical squamous epithelial cells with reduced eosinophilic cytoplasm and hyperchromic nuclei with numerous atypical mitoses, acanthosis, parakeratosis and dyskeratosis [24, 26]. The fibrovascular stroma shows inflammatory infiltrates. Histopathological and IHC examination are very important for accurate microscopic diagnosis. IHC examination was absolutely necessary in our study for all SCC and MM cases (46 cases, 39.6% in our group).

In order to reconstruct the post-excisional defects located near medial epicanthus, we preferred glabellar flaps because of its satisfactory coverage potential and the vicinity with the recipient region. Furthermore, the low donor site morbidity offers the best functional and esthetical outcomes.

Fortunately, BCC is usually diagnosed and treated early [27]. As long as it is diagnosed early (18% from our group of BCCs), BCC exhibits only local invasive behavior and has low metastatic potential, being easily treatable by surgical excision [19]. Nevertheless, BCCs may become "advanced BCCs" in two cases: when the patients neglect the tumor (18.1% of our cases) and when the BCCs are intrinsically aggressive and reoccur (7.75% in our study) or are refractory at treatment [16]. Oncological follow-up was performed in all our patients, and in 12.9% of the cases re-excision was necessary due to extensive and infiltrate structures below the skin. Regarding this aspect, the limited excision especially for BCC with facial localization was determined by the vicinity with important orbital structures for the initial tumor (8.5% of BCCs in our group). In this specific situation, the only guide for a correct surgical protocol is the histological result. In addition, we find that preoperative biopsies in such specific cases are not only irrelevant, but even dangerous for a positive long-term evolution; excision with limited margins followed by histological examination is a better option.

In our study, the prevalence of BCC was evident. The slow evolution of this skin cancer was observed to be prolonged, even in the case of neglecting patients, as compared to other skin cancers like SCC. BCC is known as a local aggressive tumor manifested especially as skin ulceration, this being one of the reasons for which patient come to the hospital [28]. SCC was the second most-common cancer in the patients included in our study, a skin cancer with a more rapid evolution, local aggressiveness and distant metastasis. MM had a lower occurrence rate than the other two types, probably dictated by Fitzpatrick skin type of patients included (9.4% in our study) [29, 30].

Heavily sun exposed areas of the face are most frequently affected by skin cancers: orbital region, nasogenian region and nasal regions, zygomatic region, suggesting the important role of UV light exposure [31, 32]. High impact areas of the face with complex anatomy require different techniques of coverage in order to restore local anatomy, function and when possible appearance [33].

Cooperation with the ophthalmologist is of the utmost importance, as numerous intraorbital and ocular tumors requiring orbital exenteration involve reconstruction of the orbital cavity (three cases, 12.5% from BCCs) or of the periocular region [34–36], as well with the otorhinolaryngologist, when the lesion involves the nasal or auricular regions (five tumors, 29% of the nasal tumors).

We found a single case with a melanoma developed between the submental and anterior cervical region, where we had to perform excision followed by "Z"-plasty (two crossed triangular flaps dictated by the mobility of the region).

One third (two) of the cases with cervical lymph node metastasis present at the initial consultation were associated with temporal MM.

Shashanka & Smitha state that more than 70% of head and neck melanomas occur on the face, more frequently affecting the cheek region [37]. In our study, most of the MMs (63.6%) were located on the cheek and temporal region. In the same study [37], MMs of the external ear were rare, with a frequency of around 7%, meanwhile we found 18% of the MMs with this localization in our group. In this particular situation, we could perform a triangular excision of the invaded pavilion, followed by direct suture.

Conclusions

There is a strong correlation between the final histological diagnosis and the planning of the long-term surgical strategy. It is preferred to begin with choosing the option of local small flaps in order to save the more distant and complex reconstructive techniques as a last solution in case of late local and regional tumor recurrence. Although for a plastic surgeon the esthetic result will be of great importance, the objectivity of the anatomopathological diagnosis will always define the surgical behavior.

Conflict of interests

The authors do not have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of the manuscript.

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