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Case report

ARTIFICIAL INTELLIGENCE DERMOSCOPY AND A-T ADVANCEMENT FLAP FOR BASAL CELL CARCINOMA OF THE SCALP.

Preslav Vasilev[1], Dragomir Bogdanov[2], Sibel Ramadan [3], Martin Karamanliev[4], Dobromir Dimitrov[4]

1)Department of Dermatology, Venereology and Allergology, Faculty of Medicine, Medical University – Pleven, Bulgaria.
2) Sixth-year medical student, Faculty of Medicine, Medical University – Pleven, Bulgaria.
3)Department of Propedeutics of Internal Diseases, Faculty of Medicine, Medical University – Pleven, Bulgaria.
4)Surgical Oncology Department, University Hospital "Dr. Georgi Stranski", Faculty of Medicine, Medical University-Pleven, Bulgaria.

ABSTRACT:

Purpose: Basal cell carcinoma of the skin often affects the head and neck area. In elderly male patients with androgenic alopecia, the scalp is a zone of cancerization, often suffering from keratinocyte tumors. After surgical excision, extensive round and oval defects are common, and in these cases, reconstructive surgery is needed. This is a serious challenge for dermatosurgeons, surgical oncologists and reconstructive surgeons since the scalp has limited skin mobility and the skin elasticity decreases with age. Multiple graft and flap techniques have been described, and they often lead to long scars and edge necrosis.

Material/Method: We present a 74-year-old patient diagnosed with basal cell carcinoma affecting the frontal region of the middle scalp line with a diameter of 35mm. Artificial intelligence dermoscopy was performed with a 95% malignancy rate. The lesion was excised with a safety peripheral zone of 6mm from the dermatoscopically visible edges on each side, creating a defect with diameter of 50 mm, reaching in depth to the galea aponeurotica. A-T advancement flap was performed for reconstruction of the defect with a satisfactory functional outcome.

Results: In the follow-up period, there was no bleeding, necrosis, or other complications. We assessed optimal functional and cosmetic postoperative effect.

Conclusion: In the literature, a variety of procedures for scalp reconstruction have been described. In patients with extensive tissue loss, advancement flaps, like the A-T flap, are most commonly used. This advancement flap technique is practical and safe with good structural and aesthetical effect.

Keywords: Basal cell carcinoma, Skin defect, A-T advancement flap, reconstruction,

INTRODUCTION

Non-melanoma skin cancers, known as keratinocyte carcinomas, are a group of skin diseases that start developing in the epidermis. Basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) of the skin are the main representatives of the group [1]. The primary risk factor for cancer is ultraviolet radiation, and the most affected areas are the head, neck and scalp, as the most sun-exposed ones in the human body [2].

BCC is the most common cancer in countries with predominantly fair-skinned population and moderate sun exposure. People of color can still develop BCC, especially those who have accumulated significant sun exposure from occupational sources. Given the fact that sun protection was used less frequently in the past and the elderly population has less skin cancer awareness, they represent a prevalent at-risk population for different clinical scenarios of neglected skin cancer nowadays and over the next decades [3].

BCC has a tendency toward slow bone invasion and tissue destruction. The estimated risk of bone involvement is as low as 0.03%, but it must be acknowledged. If left untreated for a longer period of time, BCC can infiltrate the bone area. Early excision of cutaneous tumors of the scalp leads to optimal cosmetic and functional outcomes [4].

MATERIALS AND METHODS

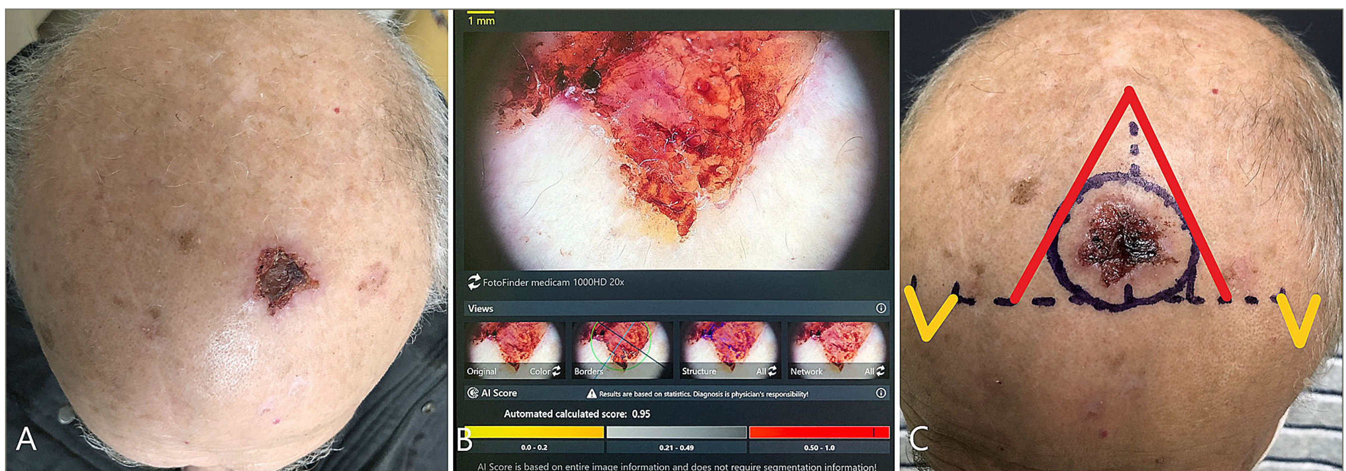
We present a 74-year-old male patient who visited the Department of Dermatology and Venereology in April 2024 with the chief complaint of a slowly growing wound on the skin of the scalp since 2020. Topical corticosteroid, antibiotic and epithelizing creams had been used in this period of time, without any effect. As for concomitant diseases, the patient suffered from arterial hypertension, benign prostatic hyperplasia, vestibular neuritis and irritable bowel syndrome. The patient did not have any allergies or a family history of skin cancer. There was no history of trauma or malignancy in the affected area.

The pathological changes affected the skin in the fronto-occipital region of the scalp. They were presented by an ulcero-infiltrative lesion with an irregular shape, covered with hemorrhagic crusts, with infiltrated edges raised above the surrounding skin and a diameter of 35 mm (Fig 1 A). The surrounding skin was atrophic with actinic changes. There were no enlarged periauricular or neck lymph nodes. Artificial intelligence dermoscopy with ATBM master, Fotofinder Systems GmbH (The latest version of a convolutional neural network (CNN), which has been approved as a medical device for the European market) with Moleanalyzer pro artificial intelligence was performed showing 95% malignancy rate of the lesion (Fig 1 B).

The results of complete blood count and biochemistry were within the reference ranges, except for low hemoglobin level – first stage anemia. Chest X-ray showed no evidence of metastatic lesions or any pathological changes.

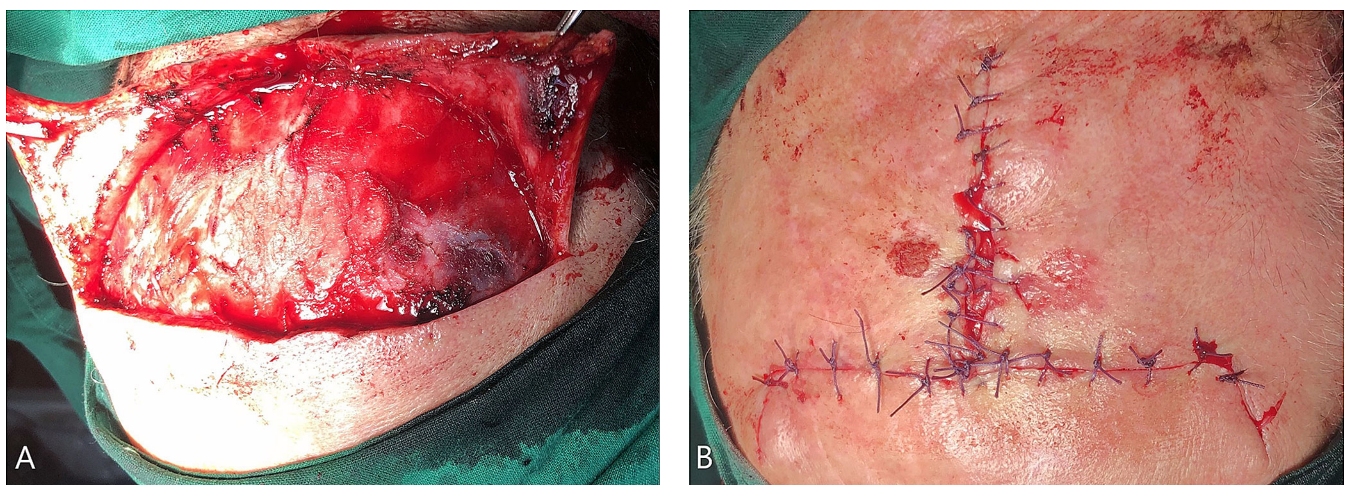
The tumor formation was preoperatively marked with a safety peripheral zone of 6mm from the dermoscopically visible edges on each side, creating a round tissue defect with a diameter of 50 mm. Such a defect could not be primarily surgically sutured, and we designed an A-T advancement flap (Fig. 1 C).

Fig. 1. A) BCC - ulcero-infiltrative lesion with an irregular shape, covered with hemorrhagic crusts, with infiltrated edges raised above the surrounding skin and a diameter of 35 mm; B) Margin control – 6mm from the dermatoscopically visible edges; C) Full A-T advancement flap design.



Under local anaesthesia, the tumor was excised. The excision was extended in depth to galea aponeurotica in order to remove every tumor cell in the subcutaneous fat tissue. The oval skin defect was converted to a triangular form with its base aligned along the scalp hairline. Two incisions were extended bilaterally from the base of the triangular defect to create both sides of the A-T flap. To relieve the tension in the edges, we made two burow triangles at the ends of the incisions. After undermining, the two opposite flaps were approximated to the center on the base of the triangular defect and sutured in an inverted "T" shaped fashion. The A-T flap was sutured with insoluble polypropylene surgical thread 3/0 (Fig. 2 A, B).

Fig. 2. A) Undermining the two opposite flaps in depth to galea aponeurotica; B) Flaps are approximated to the center of the triangular defect and sutured in an inverted "T" shaped fashion.



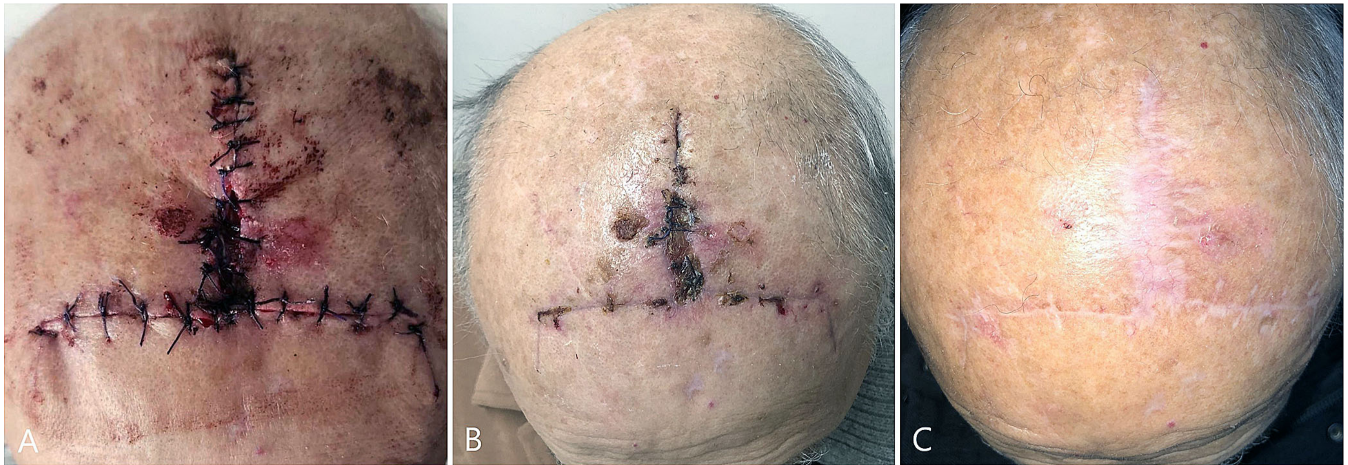
RESULTS

We registered a smooth postoperative period with good primary wound healing on the second day (Fig. 3 A).

No subsequent complications occurred, and we removed the sutures on day 14 (Fig. 3 B). Six months after surgical treatment, we present the patient, reaching an optimal cosmetic and functional outcome (Fig. 3 C).

The postoperative histopathological report showed an ulcero-infiltrative type of BCC with a maximum size of 35mm and maximum thickness of 5mm. The side resection lines were without tumor infiltration and a high grade actinic keratosis. The patient was staged as Stage 2 [T2N0M0] and is being followed up annually.

Fig. 3. A) Two days after operation; B) Suture removal on day 14; C) Six months after surgery - optimal cosmetic and functional outcome.



DISCUSSION:

Basal cell carcinoma is a slowly growing, locally aggressive skin cancer that rarely metastasizes and accounts for approximately 70-75% of all non-melanoma skin cancers. Its incidence is increasing at an exponential rate, especially in regions with fair-skinned people, such as North America, Europe and Australia [3]. The main risk factors for BCC development are chronic sun exposure, immunosuppression, fair skin and genetic disorders such as Gorlin Goltz syndrome, Albinism and Xeroderma Pigmentosum [5]. Other risk factors which can contribute to higher incidence are the advancing age and increased life expectancy, use of ultraviolet tanning beds, depletion of ozone level. People develop BCC mostly in anatomical sites often exposed to sun light – the head and neck region, as in our case, and the superior portions of the upper limbs [6, 7].

The golden standard for diagnosing Basal cell carcinoma of the skin before surgical excision and histopathology is the dermoscopy examination. Through the dermascope, many lesional characteristics are seen: shape, size, distribution and color of tumor structures, stroma, distribution and shape of blood vessels (specific for different types of skin cancer), presence or absence of pigment [8]. In order to discover better and faster diagnostic methods, videodermoscopes with artificial intelligence have been developed based on dermatoscopic analysis, which automatically makes the diagnosis. Cases have been described in which the videodermoscope with artificial intelligence has managed to diagnose tiny tumor formations missed by dermatologists during regular dermatoscopic examinations. Cases in which artificial intelligence fails to make a correct diagnosis, not distinguishing a benign from a malignant lesion, have also been described [9]. In our case, artificial intelligence dermoscopy (ATBM master, Moleanalyzer Pro, Fotofinder Systems GmbH) showed a correct malignancy rate of 95%.

The treatment of wide-diameter BCC in the head and neck area is a challenge. It requires teamwork and an interdisciplinary and individual approach for every patient. The treatment method is determined by the currently available therapeutic options (surgery/radiotherapy/target therapy) and by the willingness of the patient to undergo invasive treatment. Most of the oncologists refer the patients for radiotherapy and target therapy in BCC cases, as the one presented by us, after histopathological evaluation of the disease [10]. On the other hand, dermatosurgical units rely on invasive options for the removal of the tumor and subsequent tissue reconstruction using rotational, transpositional or advancement flaps [4]. The operability of the tumor depends on the general condition of the patient, the concomi-

tant diseases and the experience of the dermatosurgical team. Excision of large tumors leads to wide tissue defects, excessive tension and unacceptable functional and cosmetic results, requiring tissue-movement procedures – flaps and grafts. An advancement flap is a technique with tissue sliding from an adjacent area into the defect. In these cases, the wound edge acts as the free margin of the flap [11]. Dermatosurgeons widely use advancement flaps because they are basic, versatile and simply involve the linear advancement of tissue in one direction. There is a wide range of flap designs: H-flap, crescentic flap, A-T flap and others. Lee et al. compared the results of free skin graft plastic procedure and the A-T flap technique according to skin regeneration, oncological and cosmetic final results. Their research included 153 cases and concluded that the satisfaction of patients is much higher after local flaps. They show excellent outcome in functional and cosmetic aspect rather than skin grafts with worse touch and tone compared to the surrounding normal skin [12].

In A-T advancement flap, the original round or oval defect is converted to a triangular shape, followed by bilateral tension releasing incisions on the inferior or superior edge of the circular defect. The burrow's triangle is created on one or both ends of the tensions, releasing incisions, depending on the defect size and the elasticity of the adjacent skin. In this flap technique the incisions are made in a linear repair axis in order to stay in a single anatomical region and to avoid interrupting the cosmetic unit border. A-T advancement flap is mostly used for the reconstruction of forehead, nose and scalp defects, as in our case [13]. The National Comprehensive Cancer Network (NCCN) guidelines recommend standard excision with a 4 mm margin of uninvolved skin around the tumor to a depth of the mid-subcutaneous tissue in tumors with a diameter <20 mm and a 6 mm margin of uninvolved skin to a depth of superficial muscle fascia for tumors with macroscopic diameter >20mm [14]. Early detection of non-melanocytic skin tumors during dermatological screening programs in combination with direct aggressive surgical eradication, followed by long-term follow-up, can lead to a better prognosis of the disease.

CONCLUSION:

In conclusion, we presented a case of a large basal cell carcinoma of the scalp and a successful surgical approach. The A-T advancement flap technique, used by our team, lead to the complete eradication of the tumor without any complications in the postoperative period and the achievement of optimal cosmetic and functional outcome.

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Address for correspondence:
Preslav Vasilev
Department of Dermatology, Venereology and Allergology, Faculty of Medicine, Medical University – Pleven;
1, Sv. Kliment Ohridski Str., 5800 Pleven, Bulgaria.
E-mail: preslav.vasilev@abv.bg,