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Reconstruction of Lower Eyelid in Basal Cell Carcinoma Case with Adjunctive Hyperbaric Oxygen Therapy: A Case Report

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Abstract: Basal cell carcinomas (BCCs) are the most common cancers in humans, caused by exposure to ultraviolet light and are associated with PTCH1 gene mutation. Its incidence rate significantly increases per year especially in elderly people. Several modalities are available for BCC treatment but surgery is still considered as the gold standard. Oxygen is mandatory for almost all wound healing processes, and oxygen substitution can be delivered in the form of hyperbaric oxygen (HBO) therapy. We presented a 70 years old woman with a major complaint of a tumor located in the left infrapalpebral region, below the left lower lash line with 5 years of evolution. Patient had clinical presentation of solid nodular basal cell carcinoma which was the most common clinical subtype. Patient was diagnosed as having BCC based on history taking, clinical findings, and histopathological examination. Surgical wide excision, skin flap, and HBO as the adjunctive therapy were performed on this patient. With these techniques, healing time was reduced, complications rates were low, and cosmetic outcome was much better. In conclusion, closing defects of BCC case with surgical wide excision and flap yields a remarkable outcome and an adjunctive HBO therapy after surgery optimizes the oxygenation, thus, the healing potential of tissue prior to surgery, and accelerates wound healing post operatively. A good result with short healing duration was observed.
Keywords: basal cell carcinoma; hyperbaric oxygen therapy; flap; wound healing

INTRODUCTION

Basal cell carcinomas (BCCs) are the most common cancers in humans In the US, over three million new cases arise each year and worldwide incidence is significantly increasing by 3% to 10% per year.[1-3] Incidence rates of BCC in Asians living in Singapore increased the most among persons over 60 years on sun-exposed of lighter skinned individuals.[4] Intense sun exposures increase the risk of BCC, particularly the Ultraviolet B (UVB) spectrum (290-320 nm) that induces mutations in tumor suppressor genes.[5] Moreover, most cases of BCCs are also associated with PTCH1 gene mutation.[6] The UV-induced mutations in the p53 tumor suppressor gene have been found in about 50% of BCC cases.[5] Other factors that appear to be involved in the pathogenesis of BCCs are mutations in regulatory genes,[7] exposure to ionizing radiation,[8,9] and alterations in immuno-surveillance.[10]

The BCCs outward appearance varies according to the particular subtypes, whether it is nodular BCC, pigmented, superficial, morpheaform (sclerosing), or fibroepithelioma of pinkus.[11] In general, BCC is a slow growing tumor that invades locally rather than metastasizes, even the metastasis rates varying from 0,0028% to 0,55%.[12] If left untreated, tumor will only progress to invade subcutaneous tissue, muscle, even bone.[13] Perineural invasion (PNI) is uncommon and occurs most often in histologically aggressive or recurrent lesion correlated with recurrent lesions, increased duration, size of the lesion, and orbital invasion.[11,14]

Hyperbaric oxygenation/hyperbaric oxygen (HBO) therapy is a treatment option in which tissue hypoxic condition is improved by providing high pressure oxygen to increase tissue oxygen tensions. The HBO improves oxygen supply to hypoxic tissues because dissolved oxygen can permeate via tissue fluid even if damaged tissues have poor blood circulation. The basic mechanism of HBO is very simple by just increasing dissolved oxygen, but an increase in the tissue oxygen tensions brings several beneficial effects, inter alia, providing the wound with a more favorable environment for repair and facilitates healing.[15-19]

CASE REPORT

Female patient, 70 years old, Asian race, with tumor measuring 4x5 centimeters, well delimited, asymptomatic, located in the left infrapalpebral region, below the left lower lash line, unilateral, with 5 years evolution. Patient presented herself in a good general health without palpable adenomegalies. Patient had been treated at a public health center but no improvements were observed and the lesion continued to increase in size, nodule had gradually grown from distal side of the inner canthus to the proximal side. No family history of such complaint was noted. According to clinical findings, patient was diagnosed with BCC. Routine laboratory examinations including complete blood test, blood sugar level, and clotting factors were within normal limits. Patient was subsequently planned to undergo surgical wide excision, histopathological examination, skin flap, and HBO. Wide excision and reconstruction with a musculocutaneous transposition flap from the upper eyelid with adjunctive HBO therapy were performed, and the flap completely salvaged with successful completion of the reconstruction (Figure 1 A-D).

DISCUSSION

Diagnosis of BCC in this patient was based on history taking, clinical findings, and histopathological examination. Patient of 70 years old is in line with the literature that BCC is more common in elderly individuals (most among individuals over 60 years old).[4,11,20] Dermatological examination showed superficial nodules with hyperpigmented base, irregular margins, raised edges in the region of lower left eye; all of them were consistent with clinical manifestations of BCC. Patient was continuously exposed to sunlight during the day. Some researchers stated that risks for BCC included UV light exposure (particularly UVB), skin type, and other predisposing factors.[4,5,11] Moreover, the vast majority of BCCs were located on the head and neck[11,20] The UVB radiation damages DNA and effects the immune system resulting in a progressive genetic alterations and neoplasms.[5]

Figure 1: A, Basal cell carcinoma: nodular basal cell carcinoma; B, Intraoperative stage; C, Flap positioned and direct closure of upper palpebral region; D, Postoperative-three-week follow up after eight sessions of HBO. Palpebral function and aesthetics were preserved, without complaints or ophthalmological changes.

Patient complained about non-healing pruritic wounds under her left eye five years before admission. Clinical symptoms of BCC may vary according to its clinical subtypes. In this case, patient had clinical presentation of nodular basal cell carcinoma which was the most common clinical subtypes, characterized by translucent nodule with telangiectasia and cut edges. Histopathological findings of BCC differ according to its subtype; most BCCs share similar histological characteristics.[11] In this patient we found basaloid cell proliferation with hyperchromatic nucleus, poorly defined cytoplasm forming nest in the dermis, typical of solid nodular BCC.

Wide excision surgery on this patient was followed by Tripier flap, and eight times of HBO sessions. The patient presented an excess of skin in the upper left palpebral region, enabling mucocutaneous transposition of a local lobe to the surgical defect. There are two techniques exist to reconstruct lower eyelid deformities. The first technique involves direct closure with either a semicircular Tenzel flap or lateral cantholysis for tiny defects up to 30%. The second one is for moderate-sized defects up to 5% of the eyelid length, divided into the posterior and anterior lamella. Hughes's (modified) tarsoconjunctival flap is a part of the posterior lamella. Full-thickness skin grafts, Tripier flap unipedicles, and cheek skin advancement are examples of anterior lamella.[21] Several modalities are available for BCC treatment including standard surgical excision, destruction by various modalities, Mohs Micrographic Surgery (MMS), and topical chemotherapy. Overall complete excision surgery technique is still considered as the gold standard management for BCC.[11,22,23]

Wounds need oxygen to heal properly, therefore, exposing a wound to (near) 100% oxygen may speed the healing.[24] The HBO acts through both direct and indirect effects. Both hyperoxia and increased pressure are primary impacts. Antimicrobial effects, a reduction in ischemia-reperfusion injury, and wound healing are secondary consequences of regulated oxidative stress. Thus, wound healing is the result of both systemic and local effects.[15-19] In this patient, HBO is shown to aid the healing of surgical wounds, results in better outcome for flap survival, limits tissue death, and demonstrates to reduce the risk of poor outcome by up-regulation of angiogenesis and collagen synthesis.

Stitch removal was performed on the 5th days. Wound healing time was three weeks. In the third months of ambulatory follow-up, patient remained with no recurrence or any relapse, as well as satisfying functional and aesthetic palpebral outcomes. The prognosis of this patient was *quo ad vitam bonam, quo ad functionam, dubia ad bonam,* and *quo ad sanationam*. Closing defects with these techniques yielded remarkable outcomes with shorter duration of healing.

CONCLUSION

Reconstruction of soft tissue and skin defect in eyelid area remains a challenge for surgeon. Flap is a suitable option of surgical procedure to close a wide defect in the eyelid area after skin cancer removal as seen in this patient with basal cell carcinoma added with adjunctive hyperbaric oxygen therapy after surgery optimizes the oxygenation that promotes the healing potential of tissue prior to surgery and accelerates wound healing post operatively. A good result with short healing duration was observed.

Conflict of Interest

The authors affirm no conflict of interest in this study.

REFERENCES

1. Roewert-Huber J, Lange-Asschenfeldt B, Stockfleth E, Kerl H. Epidemiology and aetiology of basal cell carcinoma. Br J Dermatol. 2007;157(Suppl2):47-51. Doi: 10.1111/j.1365-2133.2007.08273.x
2. 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):1081-6. Doi: 10.1001/jamadermatol.2015.1187
3. Our New Approach to a Challenging Skin Cancer Statistic. The Skin Cancer Foundation. 2023. Available from: https://www.skincancer.org/blog/our-new-approach-to-a-challenging-skin-cancer-statistic/
4. Oh CC, Jin A, Koh WP. Trends of cutaneous basal cell carcinoma, squamous cell carcinoma, and melanoma among the Chinese, Malays, and Indians in Singapore from 1968-2016. JAAD Int. 2021;30(4):39–45. Doi: 10.1016/j.jdin.2021.05.006
5. Situm M, Buljan M, Bulat V, Mihic LL, Bolanca Z, Simic D. The role of UV radiation in the development of basal cell carcinoma. Coll Antropol. 2008:32(Suppl2):167-70. Available from: https:// pubmed.ncbi.nlm.nih.gov/19138022/
6. Martinez MF, Romano MV, Martinez AP, Gonzalez A, Muchnik C, Stengel FM, et al. nevoid basal cell carcinoma syndrome: PTCH1 mutation profile and expression of genes involved in the Hedgehog pathway in Argentinian patients. Cells. 2019;8(2):144. Doi: 10.3390/cells8020144
7. Pellegrini C, Maturo MG, Di Nardo L, Ciciarelli V, Garcia-Rodrigo CG, Fargnoli MC. Understanding the molecular genetics of basal cell carcinoma. Int J Mol Sci. 2017;18(11):2485. Doi: 10.3390/ijms18112485
8. Karagas MR, McDonald JA, Greenberg ER, Stukel TA, Weiss JE, Baron JA, et al. Risk of basal cell and squamous cell skin cancers after ionizing radiation therapy. For the Skin Cancer Prevention Study Group. J Natl Cancer Inst. 1996;88(24):1848-53. Doi: 10.1093/jnci/88.24.1848
9. Li C, Athar M. Ionizing radiation exposure and basal cell carcinoma pathogenesis. Radiat Res. 2016;185(3): 217-28. Doi: 10.1667/RR4284.S1
10. Bartos V. Development of multiple-lesion basal cell carcinoma of the skin: a comprehensive review. Med Bull Sisli Etfal Hosp. 2019;53(4):323-8. Doi: 10.14744/SEMB.2019.08058
11. Carucci JA, Leffell DJ, Pettersen JS. Basal cell carcinoma chapter 115 section 21. Epidermal and Appendageal Tumors. In: Fitzpatrick's Dermatology in General Medicine (8th ed). New York: McGraw-Hill; 2012. p. 1294.
12. Johannessen JT, Møller MP. Metastatic basal cell carcinoma. Ugeskr Laeger. 2021;183(37):V01210110. Available from: https:// pubmed.ncbi.nlm.nih.gov/34596527/
13. Sharquie KE, Noaimi AA. Basal cell carcinoma: topical therapy versus surgical treatment. Journal of the Saudi Society of Dermatology & Dermatologic Surgery. 2012;16(2):41-51. Doi: https://doi.org/ 10.1016/j.jssdds.2012.06.002
14. Leibovitch I, Huilgol SC, Selva D, Richards S, Paver R. Basal cell carcinoma treated with Mohs surgery in Australia III. Perineural invasion. J Am Acad Dermatol. 2005;53(3):458-63. Doi: 10.1016/j.jaad.2005.04.089
15. Zamboni WA, Browder LK, Martinez J. Hyperbaric oxygen and wound healing. Clin Plast Surg. 2003;30(1):67-75. Doi: 10.1016/s0094-1298(02)00068-8
16. Undersea and Hyperbaric Medical Society. Indications for Hyperbaric Oxygen Therapy. 2023. [cited 2021 Jan 17]. Available from: https://www.uhms.org/resources/hbo-indications.html

17. Shinomiya N, Asai Y. Hyperbaric Oxygenation Therapy Molecular Mechanisms and Clinical Applications: Molecular Mechanism and Clinical Applications. Singapore: Springer Nature Pte. 2020. Doi: 10.1007/978-981-13-7836-2
18. Neuman TS, Thom SR. Physiology and Medicine of Hyperbaric Oxygen Therapy. Philadelphia: Saunders Elsevier; 2008. Doi: https://doi.org/10.1016/B978-1-4160-3406-3.X5001-X
19. Bhutani S, Vishwanath G. Hyperbaric oxygen and wound healing. Indian J Plast Surg. 2012;45(2):316-24. Doi: 10.4103/0970-0358.101309
20. Nakayama M, Tabuchi K, Nakamura Y, Hara A. Basal cell carcinoma of the head and neck. J Skin Cancer. 2011;2011(ID 496910):1-9. Doi: 10.1155/2011/496910
21. Codner MA, McCord CD, Mejia JD. Lalonde D. Upper and lower eyelid reconstruction. Plast Reconstr Surg. 2010;126(5):231e–245e. Doi: 10.1097/PRS.0b013e3181eff70e
22. Puig S, Cecilia N, Malvehy J. Dermoscopic criteria and basal cell carcinoma. G Ital Dermatol Venereol 2012;147(2):135-40. Available from: https://pubmed.ncbi.nlm.nih.gov/22481576/
23. Kim KP, Sim HS, Choi JH, Lee SY, Lee DH, Kim SH, et al. The versality of cheek rotation flaps. Arch Craniofac Surg. 2016;17(4):190-7. Doi: 10.7181/acfs.2016.17.4.190
24. Castilla DM, Liu ZJ, Velazquez OC. Oxygen: implications for wound healing. Adv Wound Care (New Rochelle). 2012;1(6):225-30. Doi: 10.1089/wound.2011.0319