CLINICAL VIGNETTE

Single-session Laser with Concomitant Photodynamic Therapy and Adjuvant Topical Imiquimod for Basal Cell Skin Cancer

Ekra Rai, MD[1], Deeti J. Pithadia, MD[2], Teo Soleymani, MD[2] and Carol Cheng, MD[2]

[1]Department of Pediatrics, David Geffen School of Medicine at University of California Los Angeles, Los Angeles, CA
[2]Division of Dermatology, David Geffen School of Medicine at University of California Los Angeles, Los Angeles, CA

Introduction

Non-melanoma skin cancers in the pediatric population are challenging to treat due to the need for anesthesia and functional and cosmetic constraints for tumor extirpation. We present a novel alternative therapeutic approach for the treatment of facial basal cell carcinomas (BCCs) in young patients.

Cases

Case 1: A 4-year-old girl presented with a slowly enlarging left nasal sidewall growth over one year. She had no personal history of radiation, chemotherapy, severe sunburns and no family history of skin cancer. Physical exam revealed a 0.2 x 0.3 cm pink papule with overlying telangiectasias on the left nasal sidewall. A shave biopsy confirmed a diagnosis of nodular basal cell carcinoma.

She tested negative for cutaneous tumor syndromes including *PTCH1*, *PTCH2*, and *SUFU* and referred for consultation with Mohs micrographic surgery (MMS). Treatment options were discussed including topical chemotherapies, immunotherapies, standard excision, and MMS. Given the tumor's histopathologic subtype, there was concern for poor efficacy with topical chemotherapy alone to achieve a sustained cure. Given her age, we discussed the need for general sedation for tumor excision and facial reconstruction. An alternative option was proposed, using laser and photodynamic therapy (PDT) combined with topical immunotherapy to avoid the need for general anesthesia and minimize scarring, which the family opted to pursue.

Aminolevulinic acid (ALA) 20% was applied to the tumor with a 1 cm radial margin and incubated for 60 minutes. The tumor was then treated with pulsed dye laser (PDL) (Vbeam Perfecta), 595 nm, 5 mm spot, 10.5 J/cm2, 3 ms, DCD = 30/20, pulse stacked for two passes. The tumor area was subsequently treated with 5% imiquimod cream for 12 weeks, applied in a graduated fashion. At her 6-month follow-up visit there was no clinical evidence of recurrence.

Case 2: A 7-year-old girl with a history of cognitive delay and severe blistering sunburns presented with several months of enlarging forehead papule. She had no family history of skin cancer or photosensitivity disorders and no personal history of radiation or chemotherapy. Physical exam revealed multiple nevi, lentigines, and a pink pearly papule with grey blue dots on the left forehead measuring 0.2 x 0.2 cm. Shave biopsy of the forehead papule demonstrated nodular BCC. Genetic testing revealed a homozygous mutation in XPA c.390-1G>C, compatible with xeroderma pigmentosum (XP).

Treatment options including topical therapies, light-based therapies, standard excision, and Mohs micrographic surgery were discussed. The patient's family opted to pursue laser with concomitant PDT followed by 5% topical imiquimod. ALA 20% was applied for 60 minutes, followed by treatment first with PDL (Vbeam Perfecta) 595 nm laser, 5 mm spot, 9.25 J/cm2, 20 ms DCD = 30/20, then with neodymium-doped yttrium aluminum garnet (Nd:YAG) laser (GentleMax Pro) 1064 nm, 3x10mm spot, 130 J/cm2, 10ms DCD 30/20. After one week of healing, she started 5% imiquimod cream for 12 weeks, applied in a graduated fashion. At her 3-month follow-up visit, no evidence of tumor was noted.

Discussion

Mohs micrographic surgery is the current gold-standard for the treatment of non-melanoma skin cancers arising on the head and neck, as it provides the highest tumor cure rate (> 99% for BCCs) while maintaining the greatest tissue conservation amongst surgical options. While we strongly considered Mohs micrographic surgery for our two patients, concerns regarding unpredictable duration of anesthesia required for surgical tumor extirpation and reconstruction, coupled with aesthetic and functional concerns of surgical tumor removal on the face limited the feasibility of Mohs micrographic surgery. Furthermore, in patients with tumor syndromes, such as the 7-year-old patient with XP, with known predisposition to developing future malignancies points toward the utility of a nonsurgical approach. Because complete histologic tumor clearance may not be possible in patients with underlying tumor syndromes, tumor burden reduction and long-term maintenance of their BCCs with the goal of minimizing functional destruction should be emphasized.

To our knowledge, this is the first report demonstrating efficacy of laser and concomitant PDT with adjuvant topical immunotherapy for the treatment of non-melanoma skin cancers in pediatric patients. The two lasers played the primary role in treating the BCCs, while PDT and imiquimod immunotherapy were added to increase the efficacy of treatment. PDL and Nd:YAG lasers are hypothesized to destroy a tumor by selectively targeting its vascularity.[1] Nd:YAG lasers have the ability to penetrate 50-75% deeper than PDL,[1-3] increasing efficacy when used together. Lasers are also time efficient and have a shorter recovery period and fewer potential adverse effects in comparison to surgical excision. PDT involves applying a photosensitive agent followed by irradiation of the site at a specific wavelength to activate the photosensitizing agent that becomes intercalated in the keratinocytes, resulting in reactive oxygen species that destroy neoplastic cells.[4] Imiquimod serves as an immunomodulator with antineoplastic and antiviral abilities[5] and has been reported to have cure rate of 84% for low-risk superficial and nodular subtypes of BCCs when used alone.[6]

In children, there is a paucity of available data investigating the efficacy of PDT, laser, and topical imiquimod for the treatment of BCC. There are few patients with cutaneous tumors, no developed treatment protocols, and limitations in patient and provider comfort in use for children. Several smaller studies have shown PDT to be effective in children above 6 years of age and demonstrated a 78% to 98% overall clearance rate after 1-3 treatments.[7-10]

There are several disadvantages to PDT and laser therapy, including potentially lower tumor cure rates compared to MMS, cost, device availability, and physician experience and comfort. Use is also limited by tumor depth, size and patient skin type. In our patients, biopsy prior to treatment may have decreased tumor mass and led to more effective penetration by the laser and topical therapies.

The treatment outcomes in these patients suggest that combined conservative measures in a single procedural session may be an effective alternative to surgery in individuals who are poor surgical candidates. Both patients will be followed with serial clinical surveillance to evaluate for recurrence.

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