

Airway Edema after Keloid Resection and Superficial Radiation: Unexpected Event in an Unusual Location

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Summary: Postoperative radiation therapy has been shown to significantly reduce recurrence rates of keloids after surgical excision. Adverse effects of radiation therapy in this setting are generally minimal because the radiation utilized quickly dissipates below the skin, and the radiation effects on the internal organs are usually negligible. This case report describes a patient who underwent excision of a wide anterior neck keloid and received postoperative external beam radiation therapy of the incision. She presented with extensive upper airway edema, dyspnea, and dysphagia requiring readmission and steroids. Re-evaluation of the radiation protocol revealed an inadvertent intersection of the multiple abutting radiation fields at the supraglottic region, resulting in tripling of the dose in the area, and likely leading to her complication. She did well with conservative management with IV steroids, and did not require intubation. She has had no long-term sequelae and no recurrence at 6 months postoperative. (*Plast Reconstr Surg Glob Open* 2023; 11:e4823; doi: [10.1097/GOX.0000000000004823](https://doi.org/10.1097/GOX.0000000000004823); Published online 17 February 2023.)

Keloids are abnormal overgrowths of dermal fibrous tissue that expand beyond the boundaries of the original injury and represent major treatment challenges for dermatologists and plastic surgeons.¹ Keloids are cosmetically disfiguring and often painful and pruritic, negatively affecting quality of life.² The standard of care for keloids differs geographically, with steroid tape being the first-line treatment modality in Japan, and steroid (triamcinolone acetonide) injections the treatment of choice in the USA.¹ Other common treatments include silicone sheets, compression, intralesional 5-fluorouracil administration, and excision. Radiotherapy was proposed for the treatment of keloids in the early 20th century, and since the 1940s, dermatologists, plastic surgeons, and radiation oncologists have collaborated in the treatment of keloids. A combination of surgical excision and early postoperative radiotherapy allows for effective and encouraging

results.³ Shen et al showed a 9.59% recurrence rate with electron-beam radiation therapy, with the most effective results seen when radiotherapy treatment was delivered within 24 hours of excision.^{4,5}

The adverse effects of postoperative radiation are generally mild and transitory swelling, erythema, and desquamation. We describe a patient who presented with upper airway edema after surgical excision and radiation of an extensive anterior neck keloid.

CASE REPORT

A 44-year-old woman presented to the dermatology clinic in April 2021 with a 10-year history of a 24×3 cm keloid of the anterior neck (Fig. 1). She reported that the keloid developed after using a hair removal product, but also reported a history of acne in the area. The keloid had not been treated before, but she had undergone treatment for keloids on her ears, chest, and abdomen, with multiple recurrences. She had previously received postoperative radiation therapy for a keloid on her left earlobe. She had pain and pruritis in the neck keloid, and psychological distress due to its highly visible location. Her history was significant for asthma, requiring multiple hospitalizations as a child with PO and IV steroids, and she continues with daily Albuterol (90 mcg inhaler, 2 puffs daily). She denied a personal history of connective tissue disorders. She had no allergies.

She was initially treated with intralesional Kenalog injections without significant improvement, and was

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Received for publication July 11, 2022; accepted December 20, 2022.

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DOI: [10.1097/GOX.0000000000004823](https://doi.org/10.1097/GOX.0000000000004823)

Disclosure: The authors have no financial interests to declare in relation to the content of this article.



Fig. 1. Preoperative photograph of the patient's neck keloid.

referred to plastic surgery and radiation oncology. Keloid excision with immediate postoperative radiation treatment using superficial orthovoltage radiation was planned.

She underwent keloid resection and primary closure under general anesthesia by plastic surgery and was discharged home on a course of Tramadol 50 mg and Keflex 500 mg. Pathology confirmed keloid. This was followed by three fractions of radiation (one on the day of excision and two the following day) for a total of 18 Gy radiation therapy.^{6,7} On the evening of postoperative day 1, after completion of all three fractions of radiation, she called with complaints of a hoarse voice, dysphagia, dyspnea, and odynophagia and was advised to present to our emergency department immediately for evaluation.

On presentation, she was hemodynamically stable with normal vital signs and hemoglobin oxygen saturation. Computed tomography of the neck showed extensive circumferential mucosal soft tissue thickening and inflammatory changes extending from the nasopharynx to the supraglottic trachea with severe luminal narrowing (Fig. 2). She did not have a seroma or hematoma. She was evaluated by the otolaryngology service (ENT), who admitted her to the intensive care unit for airway watch, with radiation oncology team consulting. She was not intubated, but kept on a nothing by mouth diet.

Over the subsequent 24 hours she was given a short course of IV Decadron 8 mg q8 hours. She underwent bedside laryngoscopy with ENT. No video was captured, but the ENT physician documented that the “epiglottis is compressed laterally by supraglottic edema... and the vocal cords difficult to visualize.” After 1 day, she reported improvement in her dysphagia and dyspnea. She underwent a swallow study, and was subsequently started on an oral diet. She was discharged home on hospital day 2 with magic mouthwash (viscous diphenhydramine, lidocaine 2% and aluminum-magnesium hydroxide), liquid Tylenol, soft diet for 1 week, and close follow-up with radiation oncology and plastic surgery. She did well subsequently, and at her 6 months follow-up in the plastic surgery clinic, the patient has complete resolution of dyspnea and dysphagia, and no recurrence of the keloid (Fig. 3).

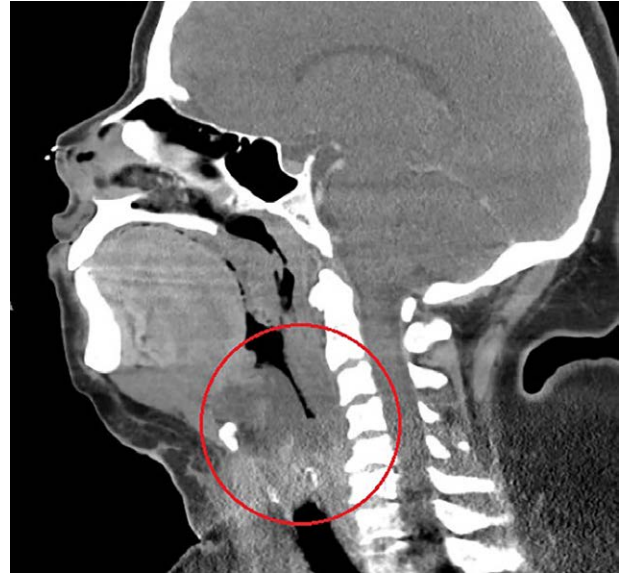


Fig. 2. Neck computed tomography scan at the time of admission for dyspnea/dysphagia. Circled area demonstrates circumferential mucosal soft tissue thickening and inflammatory changes of the upper airway.



Fig. 3. Postoperative photograph of the patient's neck at 6 months.

DISCUSSION

Adjuvant radiation therapy for keloids includes superficial and orthovoltage X-rays, external beam radiotherapy, and brachytherapy.⁸ Brachytherapy is divided into low dose rate, high dose rate, and surface modalities, with the radioactive source placed into or onto the surgical incision. It has been reported that high dose rate and surface brachytherapy are better for keloid treatment compared with external beam radiotherapy, as they result in less exposure to adjacent tissue.⁹ However, regardless of the treatment modality, complications such as wound dehiscence, alteration of normal skin pigmentation, and telangiectasia are possible.¹⁰

Typically, radiation after keloid excision is performed on superficial areas of the body but not in the vicinity of

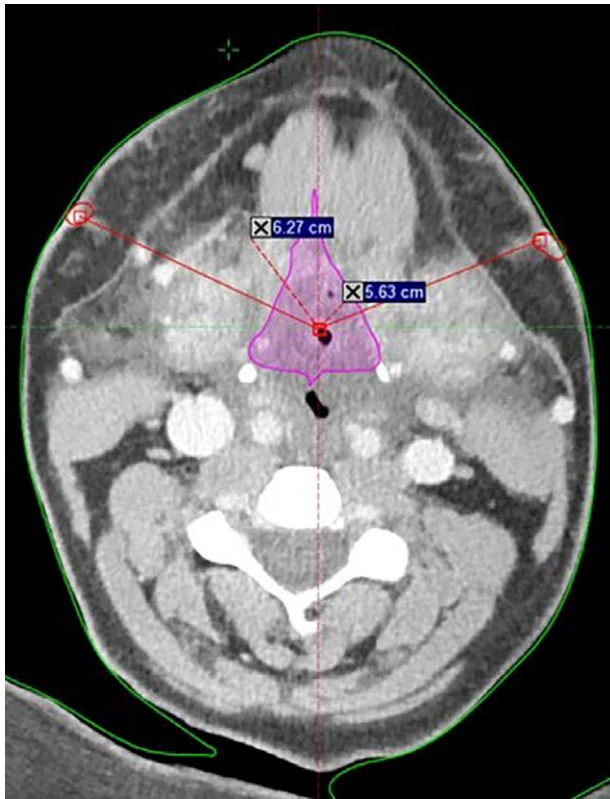


Fig. 4. Simulation showing radiation beams inadvertently converging and tripling the dose at depth in the supraglottic area.

internal organs. Because superficial radiation utilized is quickly dissipated below the skin, and the common site of keloids is away from most visceral organs, it is thought that the radiation effects are generally inconsequential.⁸ This, however, was not the case with our patient.

In this situation, because of the extensive and wide nature of the keloid, the radiation was given with three angled abutting fields (one anterior and two lateral), with the supraglottic region inadvertently at the intersection of the three beams (Fig. 4). The normally low doses at depth were therefore tripled in the supraglottic region, likely contributing to her postoperative swelling and respiratory distress.

When irradiating the neck after excision of large keloids, physicians must be cognizant of short-term inflammation of surrounding healthy tissues, which can compromise the airway. Although this patient had no long-term adverse effects, a different method of radiation delivery

with a more conformal dose—like brachytherapy—would have likely avoided the inadvertent high radiation dose to the supraglottic area and the subsequent respiratory compromise. The possibility of airway edema should be discussed with the patient when radiation to the jaw area or neck is undertaken, and overnight observation should be considered.

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ACKNOWLEDGMENT

Due to the nature of the study IRB approval was not required, and all research and investigation conformed to the Helsinki Declaration.

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