

Gemcitabine-induced radiation recall phenomenon demonstrated by thermography

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CASE SUMMARY

A 51-year-old female was diagnosed with metastatic adenocarcinoma of the lung. She was found to have brain metastases and was treated with whole-brain irradiation to a total dose of 30 Gy in 10 fractions. The patient continued on systemic therapy and was found to have significant tumor burden in the left neck and received palliative radiation to the left upper cervical neck and submandibular area to a total dose of 30 Gy in 10 fractions (Figure 1). She eventually received single-agent gemcitabine (800 mg/m²), and after 2 days she was admitted to the hospital for respiratory failure secondary to facial and neck angioedema. She was found to have normal C4, tryptase, and

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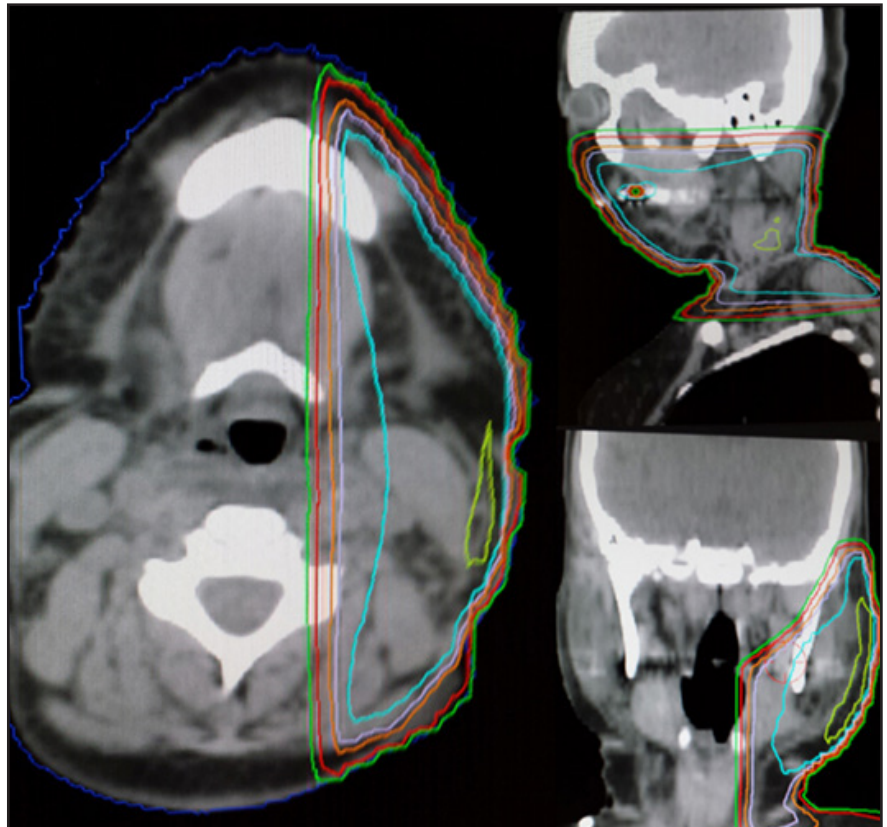


FIGURE 1. The image shows axial, coronal, and sagittal plan reconstructions for the palliative left upper neck and submandibular area. 31.5 Gy, 30 Gy, 28.5 Gy, 27 Gy, 21 Gy, and 15 Gy isodose lines in yellow-green, sky blue, purple, orange, red, and dark green, respectively.

RADIATION ONCOLOGY CASE

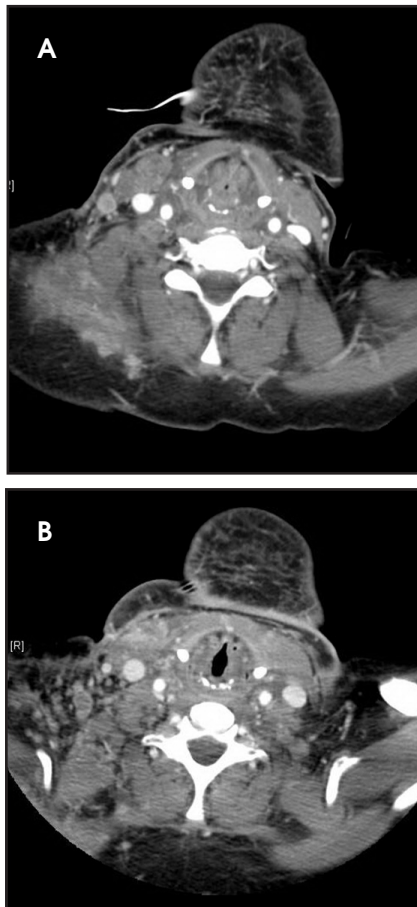


FIGURE 2. A CT scan with contrast (A) showing a patent airway prior to the administration of gemcitabine. Approximately 3 weeks later, (B) a scan shows near obstruction of the airway due to edema.

C1 esterase inhibitor. A thermogram was taken to assist with the diagnosis. She was eventually seen by an oncologist after her airway was stabilized and diagnosed with gemcitabine induced radiation recall.

IMAGING FINDINGS

A computed tomography (CT) scan of the neck on 3 days prior to gemcitabine administration shows no evidence of subcutaneous or laryngeal edema. Three weeks later, a CT scan of the neck found diffuse subcutaneous edema with associated laryngeal

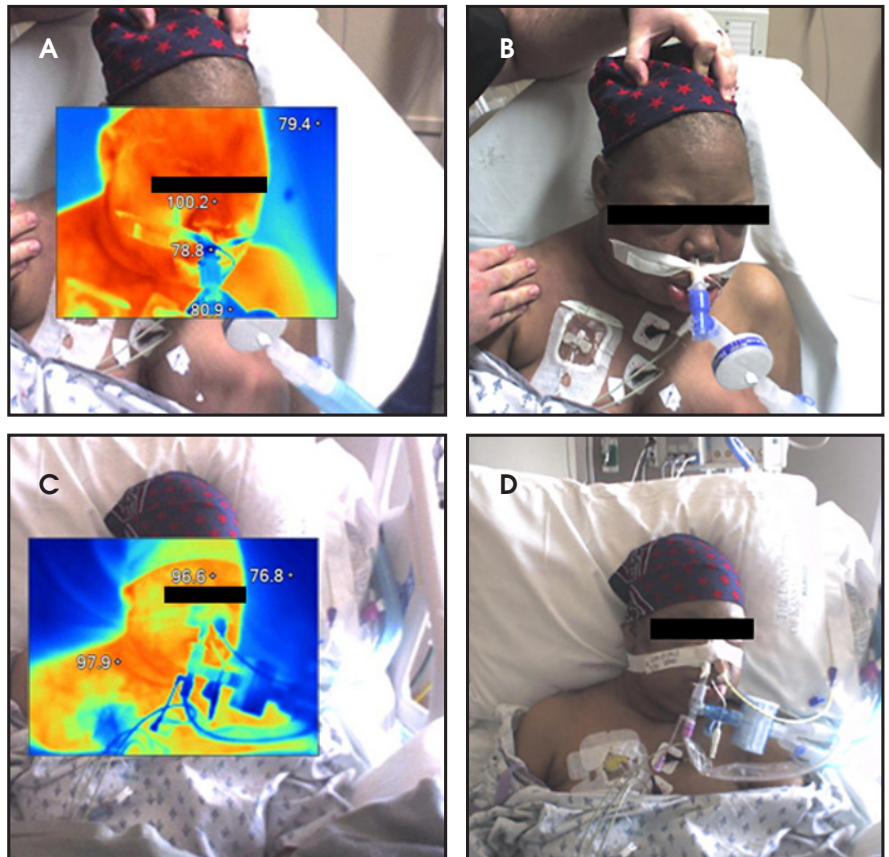


FIGURE 3. (A) Thermography on the admission showing an elevated temperature of 100.2°F. (B) Associated visible light image. (C) Thermography showing normalization of the patient's hyperthermia 2 days later. (D) An associated visible light image.

edema (Figure 2). Thermography, on the day of admission, shows a symmetric hyperthermic response with temperatures up to 100.2°F that subsided 2 days later (Figure 3).

DIAGNOSIS

Gemcitabine-induced radiation recall with a differential diagnosis of drug reaction, lymphedema secondary to tumor burden, and SVC syndrome.

DISCUSSION

Radiation recall is a phenomenon thought to be related to an inflammatory reaction in a previously irradiated area.¹ It was first recognized in the 1950's after the administration of

actinomycin-D.² It is most recognized in conjunction with older chemotherapeutic agents, such as Adriamycin and even hormonal therapies, such as tamoxifen.^{3,4} Gemcitabine-induced recall is rare and can easily be missed in the differential diagnosis of clinicians. A series of 6 patients was reported from the Dana-Farber institution that found gemcitabine-induced recall in the central nervous system, skin, gastrointestinal tract, and in the lymphatic and musculoskeletal systems. Our patient presented with diffuse angioedema of the face and neck, after approximately one year from her whole-brain radiation therapy and 4 months from irradiation to the left neck and mandibular

area. Thermography has been used to assess radiation injury⁵ and in a case of a fluoroscopic burn,⁶ but this is the first known case where thermography was used in the setting of radiation recall. There was an initial hyperthermic reaction that subsided after 2 days, which is in contradistinction to a typical allergic reaction. In the case of idiopathic angioedema, a case report from Japan showed that thermography decreased heat emission in the area of edema, whereas our patient showed homogeneous hyperthermia.⁷ There is a case of angioedema secondary to gemcitabine reported in 2010; however, in this case the reaction was only 7 minutes after the infusion and angioedema limited just to the right eyelid.⁸ In addition, the patient had a complete work up with multiple specialists, including allergy, pulmonology, and anesthesia, and none of the

typically elevated lab levels were associated with our patient, so the likelihood of this representing an allergic reaction is low. Furthermore, radiation recall presents with dermatitis 63% of the time, while gemcitabine-related events preferentially involve internal tissues and organs.⁹

CONCLUSION

Radiation recall is a rare event and is believed to be related to an inflammatory reaction in a previously irradiated field after the administration of systemic therapy. Thermography may prove to be a useful tool, especially in the setting of gemcitabine-induced radiation recall with angioedema, where an initial hyperthermic reaction is followed by a decrease in temperature in 2 days. This may be another diagnostic tool to help physicians diagnose this disease.

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