Demonstration of Unilateral Sialadenitis on Postradiotherapy Gallium-67-Citrate Imaging

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Intense, asymmetric uptake of ^{67}Ga-citrate in the right parotid and submandibular glands was observed in an asymptomatic patient who had undergone locoregional radiotherapy for Stage IA Hodgkin's disease 8 mo earlier. In view of the modified mini-mantle radiation field and adjunctive ^{99m}Tc salivary imaging, a unilateral radiation-induced sialadenitis best explained this unusual scintigraphic appearance.

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Gallium-67-citrate scintigraphy plays an important role in the evaluation of patients following therapy for Hodgkin's disease (*1,2*). Because false-positive findings are uncommon, a ^{67}Ga-avid focus reliably predicts residual or recurrent disease (*1,2*). Following radiotherapy to the head and neck, a pattern of symmetrically increased ^{67}Ga concentration by the salivary glands may be observed (*3,4*). As illustrated in this case, asymmetric ^{67}Ga uptake presented an interpretative dilemma; unilateral radiation-induced sialadenitis (related to a modified field) versus recurrent Hodgkin's disease involving cervical lymph nodes. Adjunctive salivary imaging with [^{99m}Tc]pertechnetate localized the ^{67}Ga activity to the parotid and submandibular glands (*5*).

CASE REPORT

A 69-yr-old man underwent conventionally fractionated locoregional radiotherapy to the right subdigastric, submandibular and cervical nodes, upper mediastinum, right supraclavicular fossa and ipsilateral axillary nodes for Stage IA nodular sclerosing Hodgkin's disease. A modified mini-mantle field (Fig. 1) was prescribed because of the history of rheumatic heart disease and mitral valve replacement 1 yr earlier. The upper border of the field consisted of a line through the mental tubercle and external auditory canal. This field border encompassed the lower half of the right parotid gland and the entirety of the ipsilateral submandibular gland. The right sublingual gland was at least partially shielded by anterior and posterior templates. Treatment was delivered using anterior and posterior parallel-opposed portals on a 4 MeV linear accelerator and consisted of a total of 4320 cGy (3420 cGy in 19 fractions with a boost dose of 900 cGy to the supraclavicular fossa).

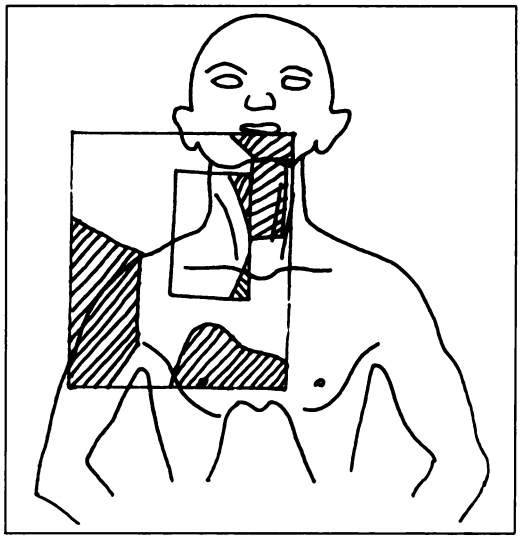

FIGURE 1. Diagram of the primary locoregional radiation portal (outer box) with boost field encompassing the right supraclavicular fossa (inner box). The lower one-third of the right parotid gland and the entire right submandibular gland were included in the irradiated zone. Shaded areas represent tissue-sparing shields.

One month prior to radiotherapy, the staging ^{67}Ga scan (Fig. 2A) showed symmetrical salivary gland uptake. Eight months following radiotherapy, the ^{67}Ga study (Figs. 2B and 2C) demonstrated two intense foci in the right face and upper neck. On physical examination, there were no palpable masses or tenderness. The differential diagnosis in this asymptomatic man included recurrent nodal disease versus an atypical unilateral sialadenitis involving the right parotid and submandibular glands.

To resolve this interpretative dilemma, a ^{99m}Tc salivary study (Fig. 2D) was performed at the conclusion of routine ^{67}Ga imaging. Following intravenous administrating of ^{99m}Tc, dual-tracer views of the head and neck were acquired sequentially using a large-field-of-view gamma camera equipped with a medium-energy, parallel-hole collimator. Gallium-67 was imaged first, using only the 297 keV photopeak (20% window) to eliminate contribution from ^{99m}Tc into the two lower photopeaks of ^{67}Ga (Fig. 2C). Without patient motion and after resetting for ^{99m}Tc (140 keV, 20% window), images of the salivary glands were obtained for the same number of counts (Fig. 2D). The ^{67}Ga-avid foci corre-

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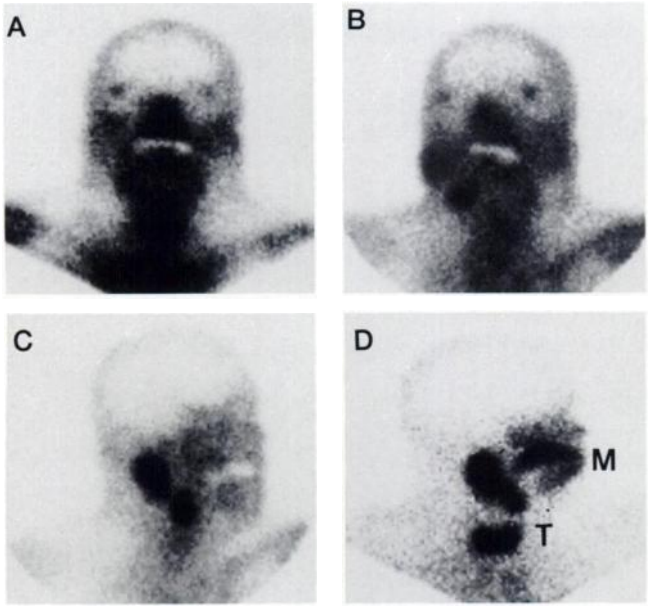

FIGURE 2. (A) Anterior view from the pre-therapy ^{67}Ga scan demonstrates the usual pattern of symmetric salivary gland uptake. Anterior (B) and right lateral (C) views from the post-therapy ^{67}Ga study show generalized decreased tracer uptake throughout the soft tissues and bones, e.g., clavicle, of the right upper thorax and neck due to radiotherapy. The two distinct ^{67}Ga-avid foci in the right face and neck correspond exactly to the parotid and submandibular glands, as confirmed by the lateral ^{99m}Tc salivary image (D). T = thyroid and M = mouth.

sponded to the right parotid and submandibular glands which appeared to function relatively normally as compared to the opposite side.

Based on clinical follow-up, the patient remained disease-free at 2 yr. Serial contrast-enhanced computed tomography of the neck showed interval atrophic change in the right parotid gland and a smaller right submandibular gland as compared to the left side.

DISCUSSION

The serous acini of the major salivary glands are exquisitely sensitive to ionizing radiation (*6–8*). Radiation portals are designed to spare as much of the parotid glands as possible to preserve salivary function (*7,8*). Clinically significant xerostomia can occur acutely and may persist following high-dose radiotherapy to both parotid glands (*7,8*).

Gallium-67 normally localizes to varying degrees in the lacrimal and salivary glands. Bilaterally symmetric increased ^{67}Ga uptake ("panda sign") may be seen in conditions such as sarcoidosis and Sjogren's syndrome and following radiotherapy (*3,4*). This scintigraphic pattern is most striking during the acute phase when radiation-induced vascular and cellular inflammatory changes are most pronounced, but may persist into the subacute phase (6–12 mo post-therapy) when chronic inflammation and interstitial fibrosis predominate (*3,7,8*).

Dual-radiopharmaceutical imaging can be performed with any isotopes of significantly different energies. Serial ^{99m}Tc and ^{67}Ga studies have been used in the preoperative evaluation of patients with benign and malignant tumors or inflammatory disease involving the salivary glands (*5*). Diseased salivary glands usually accumulate ^{99m}Tc to a lesser degree than normal and, depending on the underlying pathology, may show either increased or decreased ^{67}Ga uptake (*5*). In the asymptomatic patient presented here, the relatively preserved ability of the parotid and submandibular glands to concentrate ^{99m}Tc suggested that, given the locoregional portal, the abnormal ^{67}Ga findings simply reflected a unilateral radiation-induced sialadenitis. Together, the scans mitigated against recurrent Hodgkin's disease in the nodes or in the salivary glands themselves.

Recognition of this atypical phenomenon impacted on patient management as it did not evoke failure of primary radiotherapy or the need for immediate biopsy or adjunctive chemotherapy. It also underscored the occasional nonspecificity of ^{67}Ga citrate scintigraphy in the evaluation of the head and neck following radiotherapy.

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