dentures, titanium abutments, porcelain fused to metal and all-ceramic crowns were soaked in 100 ml of distilled water containing 250 µCi $^{131}$I for 24 hours, to simulate the amount of $^{131}$I in the saliva of patients receiving a 1-mCi diagnostic scan. After air-drying for 2 hours and rinsing in water, the dental models underwent the same imaging procedures.

Results
Planar scans from 123 of 216 patients were judged to be positive or equivocal for oral cavity uptake: bilateral foci were present in 85%. Twelve patients were excluded because the scans did not include the complete oral cavity; in the remaining 111 patients, uptake that co-localized with high-density dental material was found in 86%. A total of 323 foci were observed (up to 12 foci in a single patient). Some regions with high-density dental material were not associated with $^{131}$I uptake, possibly indicating that they were resin or amalgam fillings or ceramic crowns containing no metal. Scans from 16 patients showed uptake within the oral cavity: in 4 it appeared to be associated with dental material, while in 12 it was localized in the floor of the mouth, in the soft palate, or in teeth that did not contain dental materials. In all cases with focal uptake on the diagnostic scan, uptake was also observed on the therapeutic scans. The phantom tooth studies showed intense uptake in the porcelain fused-to-metal crown and the gold partial denture, less uptake in the titanium abutment, and no focal uptake in the all-ceramic crown or in the resin or amalgam fillings.

continued on next page
Some Dental Materials Cause Hot Spots in the Oral Region When Whole Body 131I Scans Are Done after Thyroidectomy

Stephen W. Spaulding

Conclusions
The authors postulate that the negatively charged $^{131}$I ion can form a permanent or semipermanent bond with positively charged ions on dental materials containing gold, silver, palladium, or mercury. The bond formed with titanium seems weaker. Most of the uptake detected in the mouth on postthyroidectomy scans appears to be due to this benign cause.

ANALYSIS AND COMMENTARY

The authors had no information about the actual dental materials that they found to be correlated with the SPECT/CT foci, and the patients did not undergo dental examination to look for evidence of subclinical gingivitis or dental abscess associated with the dental materials. The phantom model study showed clear-cut interactions of a tracer dose of $^{131}$I with several virgin dental metals, but the results might have been somewhat different if saliva had been used to soak the dental phantoms instead of distilled water. (Saliva contains substantial amounts of nonradioactive iodide, and the iodine level does not differ between euthyroid and hypothyroid subjects [1]). Interestingly, no uptake was found on the dental phantom containing a mercury/silver amalgam filling, although iodides of mercury and silver have been well characterized. A prospective study is now needed to correlate such oral foci of $^{131}$I with the specific dental materials present in each patient, the length of time those materials have been in place, plus other clinical (and metallurgical) parameters. Nonetheless, previous clinical studies concerning the kinetics of radioiodine in the salivary glands, and on salivary-gland function in patients treated with $^{131}$I may need to be reinterpreted.

REFERENCES