Oral Administration of ^{131}I by Semiautomatic Pipette to a Patient with Severe Swallowing Difficulties: A Case Report

Maroun Karam, MD[1]; Raymond N. Dansereau, PhD[2]; and Howard S. Smith, MD[1]

[1]Nuclear Medicine Section, Radiology Department, Albany Medical College, Albany, New York; and [2]Pharmacy Department, Albany Medical College, Albany, New York

As an alternative method of oral administration of ^{131}I to a patient with quadriplegia and severe swallowing difficulties, we introduced, into the back of the patient's mouth, a 200-μL laboratory pipette containing 74 MBq (2 mCi) of ^{131}I-sodium iodide in a 76-μL aqueous solution and delivered its contents. The procedure was repeated a few days later with a 1,000-μL laboratory pipette to administer 1.48 GBq (40 mCi) of ^{131}I-sodium iodide in a 270-μL aqueous solution. The patient tolerated both procedures well. The pipette permitted accurate measurement of both dosages and complete (greater than 99.9%) delivery of the tracer in a small volume to the back of the patient's mouth, as documented by assay of the empty pipette after use. In patients with swallowing difficulties, use of the pipette constitutes a safe and efficient means to deliver ^{131}I-sodium iodide by the oral route.

Key Words: ^{131}I; oral administration; swallowing difficulty; tracer delivery

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Because only a narrow selection of dosage forms is commercially available for ^{131}I-sodium iodide, administration to patients who have severe difficulty with swallowing can represent a challenge. We present an innovative approach that safely and efficiently administered ^{131}I to such a patient.

CASE REPORT

The patient was a 44-y-old woman who was referred to our institution for radioiodine evaluation and treatment of thyroid carcinoma.

The patient had a history of Hodgkin's disease, which had been treated with radiation to the neck when she was 13 y old. After the radiation therapy, quadriplegia had developed secondary to a stroke, probably related to estrogen therapy for menorrhagia. A lump was noted on the side of her neck in July 2001. There was no pain in the neck or ear. She was referred to a local surgeon for evaluation. On August 3, the patient underwent contrast-enhanced CT of the neck. The scan showed right cervical lymphadenopathy. On August 13, she underwent a right lymph node biopsy. Pathologic examination showed that papillary carcinoma of the thyroid involved a lymph node. On August 22, she underwent a total thyroidectomy and a right-sided lymph node dissection. There were no intraoperative complications. Pathologic examination showed a 0.8-cm papillary carcinoma of the right lobe of the thyroid, with metastases in 8 of 8 lymph nodes. Arrangements were then made for her to undergo ^{131}I whole-body scanning at our institution after withdrawal of thyroid hormone.

On the day she was scheduled to receive 74 MBq (2 mCi) of ^{131}I for the pretherapy whole-body scan, she was interviewed by a nuclear physician with the family's help (the patient was unable to speak). It was determined, from speaking to the family, that she could not take liquids and could take capsules by mouth only if the capsule was placed on a spoon with a soft substance such as ice cream or fruit jelly. This posed a therapeutic dilemma, which was resolved in the following way.

The two commercially available dosage forms for ^{131}I-sodium iodide include an aqueous solution and a hard gelatin capsule. The usual approach for the oral administration of solution requires the ability to drink from a straw approximately 60 mL of solution (the drug solution and tap water to rinse the bottle containing the drug). This was impossible for the patient to do without some coughing, and it would result in significant radioactive contamination. The capsule dosage form was not a safe option either, because if a patient cannot take water, the probability of adhesion of the capsule to the esophagus is increased. This phenomenon

For correspondence or reprints contact: Maroun Karam, MD, Albany Medical College, MC 113,43 New Scotland Ave., Albany, NY 12208.
E-mail: karamm@mail.amc.edu

has been described (*1*,*2*). If a capsule adheres to the esophagus it may slowly release its contents over several hours (*3*), leading to an unacceptable absorbed dose at the point of adhesion. There is no commercially available parenteral dosage form and, because of time constraints, the extemporaneous preparation of an injectable form was not possible.

One approach that we considered was to have a nasogastric tube placed and to subsequently administer the aqueous solution through the tube. This process would have to be repeated for the therapeutic dose several days later. Because the patient was able to swallow her own saliva, we came upon a method that took advantage of this fact and would spare her the risk and discomfort of a nasogastric tube. We decided to use a 200-μL semiautomatic laboratory pipette (Pippetman-200; Gilson Medical Electronics, SA; Fig. 1) to deliver 74 MBq (2 mCi) of ^{131}I-sodium iodide in a 76-μL aqueous solution (Mallinckrodt Medical). The pipette permitted accurate measurement of the diagnostic dose and complete (greater than 99.9%) delivery of the tracer in a small volume to the back of the patient's mouth, as documented by assay of the empty pipette after use. Several days later, a 1,000-μL semiautomatic laboratory pipette (Pippetman-1000; Gilson Medical Electronics, SA) was used to administer 1.48 GBq (40 mCi) of ^{131}I-sodium iodide in a 270-μL aqueous solution (CIS-US, Inc.) with similar success. The patient tolerated both procedures well and did not have any problems swallowing the small amounts of liquid administered. No imaging was performed immediately after administration of the diagnostic or therapeutic dose. However, satisfactory whole-body scans were obtained 3 d after the diagnostic dose and 7 d after ablation.

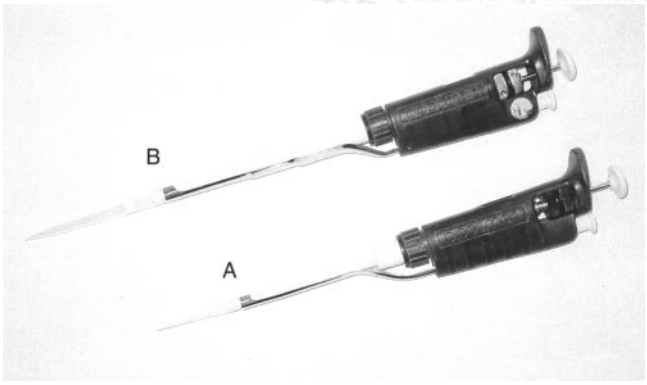

FIGURE 1. (A) Photograph of 200-μL semiautomatic pipette used to administer diagnostic dose. (B) Photograph of 1,000-μL semiautomatic pipette used to administer therapeutic dose.

DISCUSSION

This case illustrates various possibilities that may be considered when patients with severe dysphagia require enteric medication. In this patient, swallowing of capsules, and liquids in particular, may have led to intense coughing and resulted in significant radioactive contamination of the room and of the health care professionals attending her. After considering alternative administration routes in general (*4*), we decided to attempt enteric administration. Other investigators have studied ways to change the formulation of nonradioactive medications for patients who have difficulty with swallowing (e.g., changing the formulation to a liquid suspension (*5*) or soft gelatin capsule (*6*)), but none to our knowledge has attempted to do the same with radiopharmaceuticals. A coated-bead dosage form for ^{131}I-sodium iodide has been reported (*7*) but has not been commercialized and would not likely have resolved the problem in this case. Given the narrow selection of commercially available dosage forms of ^{131}I-sodium iodide, we believe that our innovative approach provides a safe and efficient way of administering ^{131}I to patients such as ours.

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