CASE REPORTS

TREATMENT OF A DOWN'S SYNDROME PATIENT FOR HYPERTHYROIDISM WITH RADIOACTIVE IODINE

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A Down's syndrome patient was hospitalized for evaluation of vomiting, abdominal pain, and a history of weight loss. A subsequent workup revealed that she had hyperthyroidism. The treatment of choice was radioactive iodine therapy. The patient had a history of consistent nausea and incontinence for urine and feces. Special problems posed by the patient and radiation safety are discussed.

The patient was a 27-year-old, black woman with Down's syndrome, hospitalized for evaluation of vomiting and abdominal pain persisting for one year. Her family denied melena, rectal bleeding, and hematemesis. She had a past medical history of urethral stenosis and recurrent urinary tract infection. She had a 40-pound weight loss in the past year.

The patient's physical examination demonstrated several features of this 21-trisomy disorder. Craniofacially, she had a flat occiput, epicanthic folds, slight protrusion of the tongue, and a flat nasal bridge. Her teeth were small, and her neck was short. An examination of the thorax demonstrated a holosystolic murmur of maximum intensity in the apex with a left anterior chest heave. Peripherally, she had a Simian crease of her hands, which were short and broad, and she had a gap between her first and second toes. She was incontinent of urine and feces. Chest x-ray revealed mild dextroscoliosis, and electrocardiogram showed Wolf-Parkinson-White syndrome.

PRETREATMENT HOSPITAL COURSE

An upper gastrointestinal series and small bowel follow-through were normal. Panendoscopy

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showed delayed opening of the lower esophageal sphincter, esophageal dilatation, and gastroesophageal reflux—pathophysiology frequently seen in Down's syndrome patients.

Because of the patient's weight loss history, thyroid studies were ordered and were consistent with primary hyperthyroidism with a TSH of 0.0 (2.0 to 10.0 μU/mL), T_4 of 13.9 (3.8 to 11.0 μg/dL), T_3 uptake of 42.5 percent (25 to 35 percent), and T_3 radioimmunoassay of 167 (60 to 190 ng/dL). The radioiodine uptake was 56 percent after 27 hours (10 to 35 percent). The estimated thyroid gland weight was about 30 g.

An echocardiogram demonstrated ventricular septal defect with left to right shunt. The patient's endocrinologic condition indicated that radioiodine therapy[1,2] would be the most efficacious treatment. The patient was referred for radiotherapy. Based on the information obtained from the thyroid scan, it was determined that 5.0 mCi would provide an ablative treatment dose using the following formula: 100 μCi/g × mass of the gland (in grams) × 100/% uptake × 1 mCi/1,000 μCi.

ROOM PREPARATION

Because of the uniqueness of the case and because iodine is excreted[3] by perspiration, saliva, urine, and feces, special attention was paid to the preparation of the room. The patient was admitted to a private room, even though it was not mandatory for patients given a dose of radioiodine this low.[4] The entire floor of the room and bathroom was covered with absorbent material (Chuck Pads) because of her history of frequent vomiting. The bed was also covered with plastic, because of her urinary incontinence. The phone and television were also covered with plastic.

All personnel entering the room were instructed to wear disposable shoe covers and disposable plastic gloves, which were monitored for radiation contamination after usage. Disposable tableware was used and was also monitored for radiation contamination before discarding.

PATIENT PREPARATION

Before the therapy, prochlorperazine (Compazine) was given intramuscularly to control nausea. A Foley catheter was inserted to collect urine because of the patient's history of urinary incontinence, thereby reducing the contamination potential through this route—the major excretory route for radioactive iodine not taken up by the thyroid in the first 24 hours. A Dobhoff tube was inserted to provide adequate access to the patient's gastrointestinal tract for the radioactive iodine absorption and to reduce exposure to hospital personnel from the patient coughing the liquid up during administration.

TREATMENT

With the patient sedated (the patient's mother remained in the room to reduce the patient's apprehension), gastric juices in the tube were suctioned out of the Dobhoff tube to allow the flow of liquid iodine 131 (^{131}I). Next, the plastic tubing was cut on the Dobhoff tube near its end and a three-way stopcock was inserted, producing a snug-fitting access to the Dobhoff tube. A 6-mL syringe was placed in one of the stopcock's syringe attachment sites with 4 mL of water; the valve was in the off position toward the syringe. At this point, the patient's mother was asked to step outside the room, and a clean Chuck Pad was placed beneath the stopcock.

Using a 16-gauge needle attached to a 6-mL syringe, radioactive iodine in its shielded container was drawn into the syringe. The needle was attached to the remaining stopcock port in an inverted manner. The liquid ^{131}I was pushed through the stopcock down through the Dobhoff tube, which was raised to take advantage of gravity. After the plunger was pushed to the bottom of the syringe, the stopcock access was closed to the syringe that contained the ^{131}I, and the 4 mL of water in the other syringe was used to flush the Dobhoff tubing.

Using another syringe, water was placed in the ^{131}I container to collect any remaining radioactive liquid. The syringe attached to the stopcock used for ^{131}I administration was removed in an inverted fashion, a new needle was attached, and the re-

maining radioactive ^{131}I mixed with water was drawn off. The procedure described in the above paragraph was again repeated. After the second flushing, the radioactive needle was again removed in the inverted position; another needle was attached, and water was drawn into it to rinse the syringe wall. The procedure described in the foregoing paragraph was again repeated.

The contaminated syringe was removed and placed in a plastic bag along with all materials to be discarded as radioactive waste, and the Dobhoff tube was flushed several times from both ports with noncontaminated syringes. The stopcock was left in place, with access to the Dobhoff tube closed off. All syringes were discharged into a plastic bag for radioactive waste disposal, even though there were no detectable readings of radioactivity. The patient's bed and room were also monitored for contamination; there was none. After one hour, the Dobhoff tube was removed and monitored for any residual radioactivity. It was found to have an activity of less than 0.1 mCi.

The patient remained hospitalized for four days after therapy and monitored for radiation exposure from her thyroid gland.

WASTE DISPOSAL

On the first and second day, the urine in the Foley bag showed an activity of 10 mR/h and 2 mR/h respectively. On the third day, the radiation contamination was negligible. The Foley catheter was removed on day 4. The patient had one stool on day 3 in her hospital bed, but her feces showed no radioactive contamination. The patient, no longer maintained on antiemetics at this point, vomited 50 hours after therapy, which also showed no radiation contamination.

The room and patient were monitored on a daily basis. The plastic trash bags containing contaminated material were removed daily by the radiation safety officer and kept for decay. At the end of treatment all materials used to cover room furnishings and the floor were removed and monitored; they were found to be uncontaminated. They were disposed of in the regular trash, and the room was cleared of radiation precautions.

CONCLUSION

Radioactive iodine is an efficacious method of nonsurgical ablative therapy for hyperthyroidism when the patient has failed on antithyroid drugs, methimazole and propylthiouracil (PTU), or the side effects, especially leukopenia, would require stopping the medication.

Radioactive iodine is the treatment of choice in this patient because of her Down's syndrome; compliance with PTU therapy would create oral administration problems. The same problems come into play for the one-time administration of ^{131}I because of the patient's history of emesis and fecal incontinence. At Howard University Hospital, a dose of 4 to 10 mCi of radioactive iodine is administered orally in the form of a sodium iodide capsule to avoid inhalation exposure by hospital personnel from this volatile material and to avoid spillage. However, the capsules are quite large and the potential of this patient spitting the capsule out before it was properly absorbed was quite high. This is why the treatment was delivered as described. The use of a Dobhoff tube for radioiodine therapy and a Foley catheter for urine collection prevented radiation contamination of the patient's room and hospital personnel.

Literature Cited

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