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ORIGINAL CONTRIBUTION

The effect of radioiodine on eradication of *Helicobacter pylori* infection in patients with thyroid cancer—A pilot study

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Recently, 32% of *Helicobacter pylori* (*H pylori*) infected patients who were treated for differentiated thyroid carcinoma (DTC) were found to have a negative urease breath test at 2 months posttreatment. Our objectives were to eradication of clarify equivocal findings, and determine whether radioiodine eradicates this chronic bacterial infection. Twenty-eight patients (25 DTC patients and 3 with hyperthyroidism) positive for *H pylori* stool antigen were treated with oral radioiodine (^{131}I) at a dose of 100 to 200 mCi in 18 patients with thyroid carcinoma; 30 mCi in 1 patient with a significant residual mass in the thyroid bed after surgery; and 4 mCi in 6 patients who had been treated with 100 to 150 mCi over the last 5 years. The hyperthyroid patients received 10 to 20 mCi. To standardize the results, and better compare with a previous study, only those patients who received a dose of 100 to 200 mCi were included for analysis. All 18 DTC patients who tested positive for *H pylori* stool antigen before radioiodine treatment remained positive 3 months post-treatment, indicating an eradication rate of 0% with an upper 95% confidence limit of 18.53%. Radioiodine administered to *H pylori* infected patients did not eradicate infection in Israeli patients.
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Helicobacter pylori (*H pylori*) infection is among the most common bacterial infections in humans, resulting in significant morbidity and mortality. It is estimated that half of the world's population are infected with the organism. Moreover, >50% of ulcers and gastric malignancies are attributable to chronic *H pylori* infection.[1] The mainstay of current therapy consists of a combination of antibiotics and

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proton pump inhibitors (PPIs). However, over the past few years, the efficacy of these regimens has decreased. In fact, several studies have reported some intention-to-treat eradication rates of 75%[2] and occasionally <50%.[3] Antibiotic resistances have been identified as one of the major factors affecting the ability to cure *H pylori* infection. As a result, the rate of resistance is increasing in many geographical areas.[4] Given the declining effect of antibiotics against the current strains of *H pylori*, the risks associated with antibiotic therapy and the need to prevent associated morbidity and mortality, a new approach to treatment is needed.

Interestingly, the stomach and thyroid share an important iodide-concentrating ability.[5] Thyroid cells are phylogenetically derived from primitive iodide-concentrating gastroenteric cells. During evolution, these cells migrate and specialize in uptake and storage of iodine. In patients treated with high doses of ^{131}I for malignancy, whole-body scanning showed evidence of ^{131}I uptake throughout the malignant tissues as well as within the remaining normal thyroid tissue, stomach wall, gastric mucosa, and salivary glands.[6]

Over the past 100 years, research relating to food irradiation has demonstrated that radiation eradicates typical food spoilage organisms and bacterial pathogens. *Salmonella*, *Campylobacter*, and *Lysteria* are sensitive to irradiation, and their destruction significantly increases the acceptable shelf life of foods. In addition, recent reports from the Centers for Disease Control and Prevention show that food irradiation is associated with a significant drop in the number of foodborne illnesses.[4] This, combined with iodine-concentrating ability of gastric mucosa, leads to the question of whether radioactive iodine may be useful in the treatment of *H pylori.*

Recently, Gholamrezanezhad et al[7] reported that radioiodine therapy, in the range of 100 to 200 mCi (3.7-7.4 GBq), administered to 71 patients with differentiated thyroid carcinoma (DTC) and a positive pretreatment urease breath test (UBT), was associated with a significant reduction in the rate of UBT positivity: 32.4% of the UBT-positive patients became UBT-negative within 2 months of treatment. Although these authors acknowledge that radioiodine (RAI) therapy would not be a logical treatment for the typical patient suffering from *H pylori*, they do suggest that these results can be used to direct research studies as to the use of radiation in eradicating *H pylori* both in the clinical and food industry setting.

Recently, our institution undertook a similar study in which 18 patients, with DTC and a concurrent diagnosis of *H pylori* infection, were given therapeutic doses of ^{131}I and then again tested at 3 months for the presence of *H pylori*. The aim of this retrospective case review was to again assess the clinical value of radioiodine in eradicating *H pylori*. We also hope to clarify equivocal findings and determine whether radioiodine eradicates this chronic bacterial infection. Our hypothesis was that given the iodine-concentrating ability of the gastric mucosa, our results would mirror those of the previous study.

Patients and methods

Patient selection

The design of this study was approved by the Ethics Committee of the Rabin Medical Center. Written informed consent was obtained from the patients before entry into the study. Between January 1, 2009 and August 31, 2009, all consecutive patients with DTC or hyperthyroidism, aged >18 years, who had been referred to the Department of Nuclear Medicine, Rabin Medical Center for radioiodine treatment or evaluation, were asked to participate in the study.

Exclusion criteria included previous attempts to eradicate *H pylori* by means of antibiotics and/or antigastric acid therapy within the previous 30 days and/or bismuth therapy within the previous 90 days. Patients with a history of gastric resection and patients who were pregnant or breast-feeding were also excluded.

Results were collected on all patients admitted to the study; however, to assess response to a standardized treatment protocol, our study limited data analysis to patients with DTC who had never received previous RAI treatment.

Experimental design

Before treatment, all patients were asked to provide serum and stool samples for serology/enzyme-linked immunosorbent assay and antigen testing for the presence of *H pylori*. Serum and stool specimens were stored at −20°C until tested. Only patients undergoing radioiodine therapy and who tested positive in both serology and *H pylori* stool antigen tests were eligible for the study.

^{131}I was administered at a dose of 100 to 200 mCi to patients with DTC. Patients were then scheduled for a whole-body scan 1 week later, and were followed up by an endocrinologist. After treatment, these patients were instructed not to take any antibiotics and/or antigastric acid therapy or bismuth and to return 12 weeks after treatment for repeat stool sample testing.

Determination of *H pylori* status

H pylori-positive status was defined as a positive result in both serology and *H pylori* stool antigen tests. *H pylori* eradication was defined as a negative *H pylori* stool antigen test at 12 weeks after RAI treatment in patients with a positive pretreatment *H pylori* stool and serum antigen test.

Serum samples were tested for immunoglobulin G antibodies against *H pylori* infection by enzyme-linked immunosorbent assay (Orion Diagnostica; Espoo, Finland). This method was validated in our laboratory by a pilot study of patients who had undergone an endoscopy procedure at our hospital, yielding a sensitivity of 94%, specificity of 90%, and positive predictive value (PPV) and negative predictive value (NPV) of 100 and 90%, respectively.[8]

Stool specimens were tested for the *H pylori* antigen by the FemtoLab *H pylori* sandwich enzyme immunoassay

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