The Effect of $^{131}$I Therapy on the Eradication of Helicobacter pylori in Patients with Thyroid Disorders: A Preliminary Study

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The leading cause of gastritis and its complications is Helicobacter pylori. Radioactive iodine ($^{131}$I) accumulates significantly in the stomach after consumption. On this basis, we decided to determine whether different doses of $^{131}$I in the stomach would be effective in eradicating the infection. **Methods:** All patients with hyperthyroidism or differentiated thyroid carcinoma who were referred for $^{131}$I treatment were invited to the study. A stool antigen test was conducted before consumption of $^{131}$I (0.15–5.5 GBq) and was repeated 2 mo later to detect $H.\ pylori$ infection. **Results:** $H.\ pylori$ positivity was found in 51.8% (14/27) of the patients. At 2 mo after consumption of $^{131}$I, 13 of the 14 patients with differentiated thyroid carcinoma or hyperthyroidism who had been identified as positive for $H.\ pylori$ stool antigen before $^{131}$I administration were still positive, representing a nonsignificant eradication rate of 7.1%. **Conclusion:** Administration of $^{131}$I to patients with $H.\ pylori$ did not show potential to eliminate the infection.

**Key Words:** Helicobacter pylori; $^{131}$I; differentiated thyroid carcinoma; hyperthyroidism

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A triple-therapy regimen comprising a proton pump inhibitor and 2 antimicrobial agents such as amoxicillin, clarithromycin, metronidazole, levofloxacin, and tetracycline is commonly used for eradication. However, the success rate of eradication therapy is dependent on many factors, such as smoking habits and patient compliance. The main factor in reducing therapy efficacy is antibiotic resistance (6). Antibiotic resistance is greater in developing countries than in developed countries (7). Moreover, the frequency of antibiotic use is often a factor in the rate of antibiotic resistance (8). Considering the decrease in the effectiveness of antibiotics against $H.\ pylori$ strains, the risks caused by antibiotic use, and the need to prevent complications and deaths caused by it, a new therapeutic approach is required.

Remarkably, the stomach and thyroid have a valuable ability to concentrate iodine (9). Thyroid cells phylogenetically originate from iodine-concentrating primary digestive cells. In evolution, these cells move and become specialized in absorbing and storing iodine. Whole-body scans of cancer patients who received high doses of $^{131}$I have indicated evidence of $^{131}$I uptake in malignant tissue, normal thyroid tissue, the gastric wall, and the salivary glands (10). Gholamrezanezhad et al. (11) showed that radioactive iodine ($^{131}$I) therapy in patients with differentiated thyroid carcinoma (DTC) and a positive pretreatment urea breath test (UBT) correlated with a significant decrease in the UBT-positive rate. Despite these authors’ acknowledgment that $^{131}$I would not be a reasonable therapy for the typical patient with $H.\ pylori$, these results could be applied to the use of $^{131}$I in eliminating $H.\ pylori$ in the clinical setting and the food industry. Ionizing radiation directly disturbs the structure of DNA by causing DNA breaks. Secondary effects are the production of reactive oxygen species that oxidize proteins and lipids and cause multiple DNA damages (12). Considering that our geographic region (Ardabil, Iran) has a high prevalence of $H.\ pylori$ infection, we felt prompted to determine whether different doses of $^{131}$I in the stomach are effective in eradicating this infection.

**MATERIALS AND METHODS**

**Patient Selection**

The study design was approved by the Ethics Committee of Ardabil University of Medical Sciences. Patients with...
DTC or hyperthyroidism who had been referred to the Ardabil Nuclear Medicine Center for $^{131}$I therapy were asked to participate. Informed consent was obtained from the participants before the research began.

The exclusion criteria comprised previous attempts to eradicate $H.\ pylori$ using antibiotics or antacids in the previous 1 mo or bismuth in the previous 3 mo, a history of gastrectomy, and pregnancy or lactation.

To evaluate the response to a standard treatment protocol, our research restricted data analysis to patients with DTC or hyperthyroidism who had never previously taken $^{131}$I.

**Experimental Design**

Before therapy, all patients were asked to provide stool samples for $H.\ pylori$ antigen testing. Stool samples were kept at $-20^\circ\text{C}$ until testing. Only patients who were treated with $^{131}$I and had a positive $H.\ pylori$ stool antigen test were eligible for the study. $^{131}$I in the range of 0.15–5.5 GBq was administered to patients with DTC or hyperthyroidism. Subsequently, these patients were told not to use any antibiotics, antacids, or bismuth and to return for stool sample testing 8 wk after treatment.

**$H.\ pylori$ Antigen Test**

We used a qualitative and immunochromatographic assay to detect $H.\ pylori$ antigens in stool samples. Each sample was placed into a well and allowed to react with particles coated with anti–$H.\ pylori$ antibodies. The mixture then moved toward the membrane by capillary action. If $H.\ pylori$ antigens were present at detectable levels in the sample, a visible colored signal was produced. The appearance of a colored band at the result line and at the control line was considered positive. Complete absence of the control band was considered invalid, regardless of the appearance of the result line (13).

**Statistical Analysis**

Because of the dichotomous nature of all dependent variables (positive/negative), the McNemar test with the exact method was used to determine any differences before and after the interventions. A $P$ value of 0.05 indicated a statistically significant difference for all compared variables. Statistical analysis was done using SPSS software version 26.0 (IBM).

**RESULTS**

The ratio of desired changes to undesired changes was 1 to 13 ($P = 1$). All 14 patients positive for $H.\ pylori$ antigen had a repeat stool antigen test for the presence of $H.\ pylori$ 8 wk after $^{131}$I therapy. None of the patients had used antibiotics, antacids, or bismuth during the intervention period. $H.\ pylori$ positivity was seen in 92.8% (13/14) of the patients (Table 1). Different doses (0.15–5.5 GBq) had no significant effect on $H.\ pylori$ eradication. Of the 14 subjects studied, one (a 41-y-old woman with DTC who received a dose of 5.5 GBq) became negative 2 mo after treatment (Table 1).

**DISCUSSION**

The prevalence of $H.\ pylori$ in eastern and southern Europe, South America, and Asia is often higher than 50%, and most infected people are asymptomatic. Currently, a proton pump inhibitor combined with antibiotic therapy is suggested for patients with active $H.\ pylori$ infection. In the study of Gholamrezanezhad et al. (11), on 71 patients with DTC and a positive pretreatment UBT result, $^{131}$I therapy at a dose of 3.7–7.4 GBq was related to a significant decrease in UBT positivity: 32.4% of UBT-positive patients became negative after 2 mo of treatment. These findings provide indirect evidence of $H.\ pylori$ susceptibility to $^{131}$I treatment. In another study, by Xu et al., the mean amount of

**TABLE 1**

Clinical and Therapeutic Details of 18 Patients with DTC or Hyperthyroidism and $H.\ pylori$ Infection Treated with $^{131}$I

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Age (y)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Treatment dose (GBq)</th>
<th>Hp stool Ag before $^{131}$I</th>
<th>Hp stool Ag after $^{131}$I</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>58</td>
<td>M</td>
<td>HT</td>
<td>0.74</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>2</td>
<td>44</td>
<td>F</td>
<td>PTC</td>
<td>0.15</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>3</td>
<td>60</td>
<td>F</td>
<td>PTC</td>
<td>0.2</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>4</td>
<td>36</td>
<td>F</td>
<td>PTC</td>
<td>0.2</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>5</td>
<td>61</td>
<td>M</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>6</td>
<td>50</td>
<td>F</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>7</td>
<td>38</td>
<td>F</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>8</td>
<td>43</td>
<td>F</td>
<td>PTC</td>
<td>3.7</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>9</td>
<td>43</td>
<td>M</td>
<td>HT</td>
<td>1.1</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>10</td>
<td>43</td>
<td>F</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>11</td>
<td>31</td>
<td>F</td>
<td>PTC</td>
<td>0.2</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>12</td>
<td>33</td>
<td>F</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>13</td>
<td>50</td>
<td>F</td>
<td>PTC</td>
<td>3.7</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>14</td>
<td>41</td>
<td>F</td>
<td>PTC</td>
<td>5.5</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

$Hp = H.\ pylori$; $Ag =$ antigen; HT = hyperthyroidism; PTC = papillary thyroid carcinoma.
**CONCLUSION**

In the current study, the effect of different doses of 131I radiation on *H. pylori* in our local population of DTC or hyperthyroidism patients was investigated. Contrary to previous reports, 131I failed to eradicate *H. pylori* infection, possibly because of the severe degree of *H. pylori* colonization in the gastric mucosa. Therefore, further investigation in different populations is needed.

**DISCLOSURE**

The study was supported and funded by the Deputy of Research and Technology, Ardabil University of Medical Sciences (IR.ARUMS.REC.1399.070). No other potential conflict of interest relevant to this article was reported.

**KEY POINTS**

**QUESTION:** Does 131I prescribed in different doses (0.15–5.5 GBq) for DTC or hyperthyroid patients eliminate *H. pylori* infection?

**PERTINENT FINDINGS:** Different doses of 131I radiation had no effect on *H. pylori* in our local population of patients with DTC or hyperthyroidism.

**IMPLICATIONS FOR PATIENT CARE:** 131I radiation cannot be a rational treatment for the eradication of *H. pylori* in the people of our geographic region (Ardabil, Iran).

**REFERENCES**