Randomized Controlled Trial

Effect of posture on $^{13}$C-urea breath test in partial gastrectomy patients

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AIM: To investigate whether posture affects the accuracy of $^{13}$C-urea breath test ($^{13}$C-UBT) for *Helicobacter pylori* (*H. pylori*) detection in partial gastrectomy patients.

METHODS: We studied 156 consecutive residual stomach patients, including 76 with *H. pylori* infection (infection group) and 80 without *H. pylori* infection (control group). *H. pylori* infection was confirmed if both the rapid urease test and histology were positive during gastroscopy. The two groups were divided into four subgroups according to patients’ posture during the $^{13}$C-UBT: subgroup A, sitting position; subgroup B, supine position; subgroup C, right lateral recumbent position; and subgroup D, left lateral recumbent position. Each subject underwent the following modified $^{13}$C-UBT: 75 mg of $^{13}$C-urea (powder) in 100 mL of citric acid solution was administered, and a mouth wash was performed immediately; breath samples were then collected at baseline and at 5-min intervals up to 30 min while the position was maintained. Seven breath
samples were collected for each subject. The cutoff value was 2.0‰.

RESULTS: The mean delta over baseline (DOB) values in the subgroups of the infection group were similar at 5 min ($P > 0.05$) and significantly higher than those in the corresponding control subgroups at all time points ($P < 0.01$). In the infection group, the mean DOB values in subgroup A were higher than those in other subgroups within 10 min and peaked at the 10-min point (12.4‰ ± 2.4‰). The values in subgroups B and C both reached their peaks at 15 min (B, 13.9‰ ± 1.5‰; C, 12.2‰ ± 1.7‰) and then decreased gradually until the 30-min point. In subgroup D, the value peaked at 20 min (14.7‰ ± 1.7‰). Significant differences were found between the values in subgroups D and B at both 25 min ($t = 2.093, P = 0.043$) and 30 min ($t = 2.141, P = 0.039$). At 30 min, the value in subgroup D was also significantly different from those in subgroups A and C ($D$ vs $C$: $t = 6.325$, $P = 0.000$; $D$ vs $A$: $t = 5.912$, $P = 0.000$). The mean DOB values of subjects with Billroth I anastomosis were higher than those of subjects with Billroth II anastomosis irrespectively of the detection time and posture ($P > 0.05$).

CONCLUSION: Utilization of the left lateral recumbent position during the procedure and when collecting the last breath sample may improve the diagnostic accuracy of the $13^C$-UBT in partial gastrectomy patients.

Key words: *Helicobacter pylori*; $13^C$-urea breath test; Gastrectomy; Position

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Core tip: The efficiency of the $13^C$-urea breath test in the diagnosis of *Helicobacter pylori* infection in patients after gastrectomy is still controversial. Many factors may affect the diagnostic accuracy, and posture is especially important. We suggest that residual stomach patients should be kept in the horizontal position on the left side during the procedure and when collecting the last breath sample in order to improve the accuracy of detection of *H. pylori* infection.

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INTRODUCTION

*Helicobacter pylori* (*H. pylori*), a spiral gram-negative bacterium, can colonize epithelial cells of the gastric mucosa under micro-aerobic growth condition. *H. pylori* infection leads to multiple gastric disorders, including chronic active gastritis, ulcer, adenocarcinoma, and mucosa-associated lymphoid tissue lymphoma[1-3]. It has also been considered one of the factors inducing residual gastric mucosa carcinogenesis in postoperative patients with early-stage gastric carcinoma[4]. Therefore, it is crucial to accurately detect whether *H. pylori* is present in patients who underwent partial gastrectomy.

Due to the lack of specific clinical manifestations, *H. pylori* detection in residual stomach relies on additional examinations. Although the $13^C$-urea breath test ($13^C$-UBT), a noninvasive diagnostic method for *H. pylori* infection, is inferior to bacterial culture and histological examinations[5], it represents a fast, safe, and reliable technology which is able to accurately determine *H. pylori* infection in an intact stomach. Accordingly, it has been widely used in the general population[6,7]. However, a standardized international protocol defining specific steps, detection methods, and the cutoff value for the $13^C$-UBT is currently lacking. In addition, $13^C$-UBT diagnosis is limited by some factors, such as fasting and mouth washing, dose and dosage form of $13^C$-urea (tablet, capsule, or powder), presence of test meal, time of breath sample collection and storage, and cutoff values[8,9]. Since the bacterial load is lower and emptying of the stomach is faster in residual stomach subjects, there are some disputes on the efficiency of the $13^C$-UBT in gastrectomy patients[10-12]. In particular, the influence of posture on the results of the $13^C$-UBT in detecting *H. pylori* infection in partial gastrectomy patients has been a focus of attention. In the existing reports on the $13^C$-UBT diagnosis and treatment for *H. pylori* infection in such patients, researchers from different countries utilized the conventional $13^C$-UBT protocol for the general population[7,16,17]. Gastric remnant subjects were kept in the sitting position when breath samples were collected, and they usually maintained this position between the collections[14,18]. Only a few studies included the horizontal supine position[15] or the horizontal position on the left side[11,12]. Although Togashi et al[9] have performed a preliminary study of different positions (left-lateral horizontal, sitting, or supine position), which position is more suitable for gastrectomy subjects is not yet fully addressed.

The purpose of the present study was to assess whether the position of partial gastrectomy patients during the test affects the diagnostic accuracy of $13^C$-UBT for *H. pylori* infection. We attempted to develop a convenient as well as reliable means for *H. pylori* detection and follow-up after eradication therapy in patients who underwent partial gastrectomy.

MATERIALS AND METHODS

Subjects

The infection group consisted of 76 patients with partial gastrectomy who visited Huadong Hospital Affiliated
to Fudan University from November 2012 to March 2015. *H. pylori* infection was confirmed by histopathological examination. The following inclusion criteria were used: the time interval after the subtotal gastrectomy was at least 1 year; the surgical procedure was distal gastrectomy with Billroth I or II (B-I or B-II) anastomosis; the indication for surgery included benign peptic ulcer or early gastric cancer; endoscopy, histological examination, and rapid urease test (RUT) were performed before and after the operation.

The control group contained 80 patients who underwent partial gastrectomy during the same period, met the inclusion criteria, and were *H. pylori*-negative based on histological examination. Patient characteristics such as age, sex, disease etiology, reconstruction method, and postoperative course in the control group were matched to those in the infected group.

In both groups, the patients were divided into four subgroups according to their posture after $^{13}$C-urea administration: subgroup A, sitting position; subgroup B, supine position on a bed; subgroup C, horizontal position on the right side; as well as subgroup D, horizontal position on the left side. The patients were assigned randomly to A, B, C, or D subgroup according to their reconstruction method. The following exclusion criteria were used: *H. pylori* eradication therapy prior to the present study; treatment with antibiotics, proton pump inhibitors, H$_2$-receptor antagonists, or bismuth salts within 1 mo before the study; absence of endoscopic examination, RUT, pre- and post-operative histological detection for *H. pylori*; presence of test contraindications; distal gastrectomy without B-I or B-II anastomosis; and previous gastrointestinal surgery history. The subjects were excluded if they fulfilled any of the above criteria.

The research protocol was approved by the Ethical Committee of Huadong Hospital Affiliated to Fudan University. All individuals provided written informed consent. The characteristics of the patients in the infection and control groups are shown in Table 1.

**Table 1 Characteristics of the patients in the infection and control groups**

|                | Infection group | Statistic | Control group | Statistic | P value |
|----------------|-----------------|-----------|---------------|-----------|---------|
|                | A               | B         | C             | D         | A       | B         | C             | D         | P value |
|                | (n = 19)        | (n = 19)  | (n = 19)      | (n = 19)  |         | (n = 20)  | (n = 20)      | (n = 20)  |         |
| Age (yr)       | 59.9 ± 11.2     | 63.1 ± 9.2| 66.1 ± 10.9   | 66.0 ± 12.5| $\chi^2$ = 1.341| 58.7 ± 12.1| 62.0 ± 8.5 | 65.2 ± 10.7 | 61.7 ± 14.1| $\chi^2$ = 1.081| 0.362 |
| Sex (M:F)      | 12/7            | 14/5      | 14/5          | 13/6      | $\chi^2$ = 0.468| 15.5      | 14.5       | 15.5         | 13.7      | $\chi^2$ = 0.671| 0.880 |
| Indication for gastrectomy | $\chi^2 = 0.452$ | 0.929 | $\chi^2 = 0.251$ | 0.969 |         |          |           |             |           |         |
| Peptic ulcer   | 5               | 6         | 7             | -         | -       | 5         | 6           | 5            | 6         | -       | -       |
| Early-stage gastric cancer | 12            | 11        | 13            | 12        | -       | 15        | 14          | 15           | 14        | -       | -       |
| Reconstructive procedure | B-I           | 11        | 11            | 11        | -       | -         | 10          | 10           | 10        | -       | -       |
|               | B-II            | 8         | 8             | 8         | -       | -         | 10          | 10           | 10        | -       | -       |
| Interval (yr)  | 8.9 ± 5.9       | 7.4 ± 5.1 | 7.3 ± 3.9     | 7.9 ± 4.9 | $\chi^2$ = 0.429| 8.6 ± 6.0 | 7.6 ± 5.8 | 7.8 ± 5.0    | 8.4 ± 4.6 | $\chi^2$ = 0.150| 0.929 |

$^{13}$C-UBT procedure

Modified $^{13}$C-UBT test was conducted in each participant within a week after the endoscopy. Overnight fasting was required before the test. In the following morning, breath samples were taken at baseline ($T_0$) and at 5-min intervals up to 30 min ($T_5$, $T_{10}$, $T_{15}$, $T_{20}$, $T_{25}$, and $T_{30}$) after an oral administration of $^{13}$C-labelled urea powder (75 mg/100 mL citric acid solution; AltaChem Pharma Ltd., Canada) and an immediate mouth wash to remove the residual compound. The first breath sample was taken in the sitting position. The patients were then placed in the positions according to their subgroups and maintained them for 30 min while the rest of the breath samples were collected. These gas samples were collected separately for analysis of the $^{13}$CO$_2$/CO$_2$ ratio ($\Delta$13CO$_2$, ‰) with an isotope mass spectrometer (IRIS 3, Frankfurt, Germany), which was normalized using a standard gas sample. The analysis was performed by Wagner Analysen Technik GmbH (Bremen, Germany). Differences between the values at $T_5$, $T_{10}$, $T_{15}$, $T_{20}$, $T_{25}$, and $T_{30}$ and those at $T_0$ were presented as delta over baseline (DOB, $\Delta\delta$, ‰). Based on the related reports[5,11,12] and our previous study of 194 samples[19], the cutoff value for this diagnostic test was defined as 2.0‰. Subjects with a DOB > 2.0‰ were considered *H. pylori*-positive,
whereas those with a DOB < 2.0‰ were considered H. pylori-negative.

Reference standard for H. pylori infection diagnosis
Four gastric mucosa biopsy samples were collected separately from the greater curvature of the mid-to-high body as well as the gastric side of the anastomotic stoma, in that order (2 samples from each position), during endoscopy for RUT and histological examination. A positive RUT result was defined as a color alteration from yellow to red during a 24-h period. In most patients, this color change occurred within 120 min. For histological examinations such as hematoxylin and eosin (HE) or Giemsa staining, curved rods were used to identify H. pylori in a sectioned specimen. The result of the histological examination was considered positive if H. pylori was detected at any site. Only patients with positive RUT and positive histological test were defined as the ones with H. pylori infection[13]. Conversely, a patient was considered uninfected when both tests were negative. If inconsistent results were obtained between the RUT and histological test, the corresponding patients were excluded. All biopsy specimens were assessed by a single pathologist who was blinded to the results of endoscopic examinations and UBT for H. pylori.

Cancer staging system
We used the cancer staging system from the American Joint Committee on Cancer (AJCC) Cancer Staging Manual (version 7th)[20].

Statistical analysis
Statistical Product and Service Solutions (SPSS) software (version 16.0) was used in this study for all statistical analyses. Continuous variables are expressed as mean ± SD and analyzed by Student’s t test, one-way analysis of variance or Wilcoxon’s rank-sum test. Classified variables were analyzed by χ² test or Fisher’s exact test. P values < 0.05 were defined as statistical significance.

RESULTS
The patients in the infection group (76 subjects) and control group (80 subjects) were divided into four subgroups: A, B, C, and D. As a result, there were 19 infected patients (B- I , 11 subjects; B-II , 8 subjects) and 20 uninfected patients (B- I , 10 subjects; B- II , 10 subjects) in each subgroup. No statistically significant differences were found in age, sex, indications for gastrectomy, or postoperative course between the subgroups within the infection group and the control group (P > 0.05). The subjects in the infection and control groups were placed in the sitting position, supine position, and right or left lateral recumbent position according to their subgroups. Significantly higher DOB values for each subgroup in the infection group were detected compared with the control group at T5 and thereafter regardless of the patients’ posture (P < 0.01). No borderline or false-negative results were found in any position and at any time point in the infection group. In the control group, no borderline or false-positive results were found in any position at T10, T15, T20, T25, or T30. The mean DOB values for the four subgroups of each group are plotted in Figures 1 and 2.

According to the DOB value curves in the infection group (Figure 3), the mean DOB values in the subgroups were similar at T5 (F = 0.421, P = 0.738). The mean values in subgroup A were higher than in other subgroups within the first 10 min. At T10, the mean DOB value was 12.4% ± 2.4‰, exceeding the mean DOB value in subgroup D (11.2% ± 2.1‰, t = 1.617, P = 0.115) and being significantly higher than those in subgroups B (10.4% ± 2.4‰, t = 2.634, P = 0.012) and C (9.9% ± 1.6‰, t = 3.811, P = 0.001). The values in subgroups B and C both reached their peaks (B: 13.9% ± 1.5‰, C: 12.2% ± 1.7‰) at T15 and then both decreased gradually until 30 min. In subgroup D, the value peaked (14.7% ± 1.7‰) at T10 and was significantly higher than those at T5, T10, and T15 (F = 30.628, P = 0.000) but did not differ
DISCUSSION

The $^{13}$C-UBT is an internationally recognized gold standard for *H. pylori* infection detection and anti-*H. pylori* drug efficacy monitoring\[9,12\]. It has been widely recommended, even for children, gravidas, and the elderly\[7\]. However, the application of $^{13}$C-UBT in diagnosing *H. pylori* infection in partial gastrectomy patients remains controversial. In spite of the fact that the gastric remnant is not suitable for colonization by *H. pylori* and its survival, the bacteria can still be transmitted via fecal-oral, gastric-oral, oral-oral, and other ways. Gisbert et al\[11\] concluded that the $^{13}$C-UBT was not suitable for gastric remnant patients who underwent Billroth gastrectomy as the ingested $^{13}$C-urea passed through the stomach faster and entered the duodenum (B-I) and small intestine (B-II) more easily, which would definitely impact the diagnostic accuracy. However, other reports\[6,11,12\] showed that, with a proper procedure and an appropriate cutoff value, the $^{13}$C-UBT was a reliable detection method in patients after gastrectomy.

Miwa et al\[11\] investigated the effect of different positions (supine position and sitting position) and of changing the position by rolling during the period after $^{13}$C-urea injection on the diagnostic performance of the $^{13}$C-UBT for *H. pylori* infection in infected patients with intact stomach. The study revealed that posture affected the DOB values at T5 and T10 but did not affect the results at the 15-min, 20-min, and later time points. Compared with the intact stomach, the anatomy, pH, motility, and distribution of *H. pylori* in the residual stomach are considerably altered, which makes the posture during the $^{13}$C-UBT an important clinical factor. Therefore, we conducted this study to determine the optimal posture for residual stomach subjects.

Our study showed that the DOB values in the control group were lower compared with the infection group at all time points, and the first positive results appeared at T5, which might be due to the presence of urease-positive organisms in the oral cavity early in the procedure. The study by Lee et al\[9\] proved that the effect of oral bacteria was most remarkable at T5 and T10, decreased at T15, and was weakest at T30.
However, Togashi et al.\textsuperscript{[9]} found that oral organisms could affect the final results in residual stomach subjects. Therefore, we suggest that a thorough cleaning of the oral cavity with a mouth wash is important in residual stomach patients after \textsuperscript{13}C-urea administration, especially if the powder form is used.

Based on comparing the different subgroups of the infection group, we found that the posture in the period after the first measurement affected the results to some degree. The DOB values peaked at a different point in each subgroup, with those in the sitting position subgroup reaching the maximum at the earliest point (T\textsubscript{10}) and those in the left lateral recumbent position peaking at the latest point (T\textsubscript{20}). Although the DOB values in all subgroups were similar at T\textsubscript{5}, they differed substantially thereafter. Thus, the DOB values in the subgroups diverged at T\textsubscript{10}, suggesting that they may be affected by the posture early in the test, except for the component caused by the presence of residual organisms in the oral cavity. Furthermore, during the late stage (especially at T\textsubscript{20} and thereafter), the DOB values were mainly affected by the posture. As the gastric antrum, the most common site of colonization by \textit{H. pylori}, is removed during the operation, the \textit{H. pylori} infection rate in patients after B-I or B-II gastrectomy is reduced by about 50\%\textsuperscript{[21]}. Park et al.\textsuperscript{[23]} reported \textit{H. pylori} infection rates of 70.8\% (B-I) and 45.9\% (B-II). From the viewpoint of pathophysiology, gastric emptying is faster in the absence of the gastric antrum, and the clearance of \textsuperscript{13}C-urea is further accelerated in the sitting position by the gravity force. Together, these factors reduce the time of exposure of the gastric mucosa to \textsuperscript{13}C-urea, leading to a significant decrease in DOB values during the late stage of the test. This is the main reason of the low diagnostic accuracy of the \textsuperscript{13}C-UBT in residual stomach patients. A test meal, such as citric acid solution, commonly used in the routine \textsuperscript{13}C-UBT to prolong gastric emptying and improve the diagnostic accuracy for \textit{H. pylori} infection is ineffective in partial gastrectomy subjects\textsuperscript{[15]}. The time dependence of the DOB values in the right lateral recumbent position group, which was also affected by gastric anatomy and motility, was similar to that in the sitting position group. In the left lateral recumbent position, \textsuperscript{13}C-urea clearance was delayed, which allowed better access of the substrate to \textit{H. pylori} urease, resulting in the DOB values peaking at a later time point (T\textsubscript{20}) and remaining relatively stable during the late stage of the test. The DOB values in subgroup D at T\textsubscript{20} and T\textsubscript{30} were higher than those in the remaining three subgroups. For clinical convenience\textsuperscript{[16,24]} and to avoid the influence of intestinal bacteria during the late stage, we did not collect breath samples beyond 30 min. Urita et al.\textsuperscript{[24]} suggested that the routine \textsuperscript{13}C-UBT should be conducted for at least 20 min to diagnose \textit{H. pylori} infection. Combined with our findings, the duration of 30 or 25 min with the subject positioned horizontally on the left side during the procedure might be optimal for residual stomach patients.

Based on the effect of posture on DOB values, we conclude that the patients’ posture during breath samples collection could also influence final results. To balance the accuracy and convenience, we recommend that residual stomach patients are placed in the sitting position when collecting the first sample and in the left lateral recumbent position thereafter, including when collecting the last sample.

We found no significant differences in DOB values between the groups with different reconstruction methods (B-I and B-II), indicating that the anastomosis type does not affect the diagnostic value of \textsuperscript{13}C-UBT, which is consistent with the study of Togashi et al.\textsuperscript{[9]}. The differences in DOB values in the subjects with B-I and B-II anastomoses at T\textsubscript{5}, T\textsubscript{10}, and T\textsubscript{15} in infection subgroup D suggest that the late stage of the test (T\textsubscript{20} and thereafter) may be optimal for avoiding the effect of the operation type. Moreover, the left lateral recumbent position during the \textsuperscript{13}C-UBT procedure was most suitable for the B-I and B-II subjects. In this study, we selected subjects with B-I and B-II gastrectomy to simplify the analysis and to avoid the influence of intestinal bacteria during the late stage, we did not collect breath samples beyond 30 min. Urita et al.\textsuperscript{[24]} suggested that the routine \textsuperscript{13}C-UBT should be conducted for at least 20 min to diagnose \textit{H. pylori} infection. Combined with our findings, the duration of 30 or 25 min with the subject positioned horizontally on the left side during the procedure might be optimal for residual stomach patients.

As the \textit{H. pylori} load is lower and gastric emptying is faster after the operation, the CO\textsubscript{2} concentration in breath samples may be insufficient to detect positive results, and the cutoff value for the \textsuperscript{13}C-UBT in residual stomach subjects should be lower than that in the

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**Table 2** The reconstructive procedure and mean delta over baseline values (%) for the subjects in the infection group

| Subgroup | Time | DOB (B-I) | DOB (B-II) | t value | P value |
|----------|------|-----------|------------|---------|---------|
| A        |      |           |            |         |         |
|          | T\textsubscript{5} | 9.67 ± 1.79 | 9.30 ± 3.00 | 0.314   | 0.760   |
|          | T\textsubscript{10} | 12.57 ± 1.92 | 12.18 ± 3.06 | 0.324   | 0.752   |
|          | T\textsubscript{15} | 12.28 ± 1.95 | 11.89 ± 3.08 | 0.319   | 0.756   |
|          | T\textsubscript{20} | 11.50 ± 1.93 | 10.80 ± 2.94 | 0.588   | 0.568   |
|          | T\textsubscript{25} | 10.91 ± 1.90 | 10.20 ± 2.98 | 0.592   | 0.566   |
|          | T\textsubscript{30} | 10.58 ± 1.88 | 9.86 ± 2.93  | 0.609   | 0.555   |
|          | T\textsubscript{35} | 9.74 ± 1.77  | 8.74 ± 2.85  | 0.841   | 0.412   |
|          | T\textsubscript{40} | 10.69 ± 2.11 | 10.11 ± 2.60 | 0.628   | 0.538   |
| B        |      |           |            |         |         |
|          | T\textsubscript{5} | 14.20 ± 1.56 | 13.56 ± 1.56 | 0.880   | 0.391   |
|          | T\textsubscript{10} | 13.99 ± 1.59 | 13.35 ± 1.62 | 0.861   | 0.401   |
|          | T\textsubscript{15} | 13.57 ± 1.60 | 12.91 ± 1.62 | 0.885   | 0.389   |
|          | T\textsubscript{20} | 13.34 ± 1.56 | 12.69 ± 1.59 | 0.890   | 0.386   |
| C        |      |           |            |         |         |
|          | T\textsubscript{5} | 8.96 ± 1.69  | 8.69 ± 1.71  | 0.344   | 0.735   |
|          | T\textsubscript{10} | 10.03 ± 1.53 | 9.81 ± 1.67  | 0.288   | 0.777   |
|          | T\textsubscript{15} | 12.33 ± 1.74 | 12.05 ± 1.73 | 0.347   | 0.733   |
|          | T\textsubscript{20} | 11.79 ± 1.69 | 11.50 ± 1.72 | 0.364   | 0.700   |
|          | T\textsubscript{25} | 11.26 ± 1.62 | 10.99 ± 1.69 | 0.352   | 0.729   |
|          | T\textsubscript{30} | 10.95 ± 1.62 | 10.72 ± 1.62 | 0.295   | 0.771   |
|          | T\textsubscript{35} | 10.21 ± 1.54 | 8.39 ± 2.18  | 2.136   | 0.048   |
|          | T\textsubscript{40} | 12.12 ± 1.57 | 9.98 ± 2.56  | 2.446   | 0.026   |
| D        |      |           |            |         |         |
|          | T\textsubscript{5} | 12.12 ± 1.57 | 9.98 ± 2.56  | 2.446   | 0.026   |
|          | T\textsubscript{10} | 14.51 ± 1.39 | 12.91 ± 1.76 | 2.213   | 0.041   |
|          | T\textsubscript{15} | 15.32 ± 1.37 | 13.93 ± 1.82 | 2.049   | 0.046   |
|          | T\textsubscript{20} | 15.04 ± 1.38 | 13.56 ± 1.77 | 2.057   | 0.055   |
|          | T\textsubscript{25} | 14.84 ± 1.37 | 13.33 ± 1.82 | 2.068   | 0.054   |

DOB: Delta over baseline.
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C-UBT in partial gastrectomy patients.

Applications

The modified 13C-UBT may be a simple, safe, and effective method for diagnosing H. pylori infection and for long-term follow-up after eradication therapy in residual stomach subjects.

Peer-review

This manuscript is interesting to me. Authors meticulously designed four subgroups in H. pylori infection and control patients with different postures for demonstrating the significance of outcome of 13C-urea breath test. The data analysis is confident and exact. I think authors need amend some information of outcome of 13C-urea breath test in the same patient with four different postures, which can provide more true results.

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Background

Accurate detection of the presence of Helicobacter pylori (H. pylori) in patients with partial gastrectomy is of crucial importance. The efficiency of the 13C-UBT in the diagnosis of H. pylori infection in patients after gastrectomy is still controversial.

Research frontiers

Many factors may affect the diagnostic accuracy, and posture is especially important.

Innovations and breakthroughs

Unlike in the general population, posture may affect the diagnostic accuracy of the 13C-UBT in residual stomach subjects, especially during the late stage of the test (20 min and thereafter). Utilization of the left lateral recumbent position during the procedure and when collecting the last breath sample may improve the diagnostic accuracy of the 13C-UBT in partial gastrectomy patients.

Therefore, the cutoff value in this study was reduced from 3.5‰ to 2‰. According to the literature[9], the sensitivity of the 13C-UBT for gastric mucosa H. pylori detection is 82.2%-96.3%, and the specificity is 94.6%-100%. Based on the comparison with the results of histological examinations, Kubota et al[11] found that the most appropriate cutoff value in residual stomach subjects was 2.0% as determined using a receiver operating characteristic curve. Under these conditions, high sensitivity (96.3%), specificity (100%), and accuracy (97.1%) were achieved. Our previous study[19] found that, when the cutoff value was 2.0‰, the 13C-UBT had a high sensitivity (88.6%) and specificity (94.9%), and its accuracy (92.6%) was similar to that of the invasive test method (histological examination, 93.5%), with good consistency between the two approaches (Kappa = 0.84). Accordingly, the 2.0‰ cutoff value is more suitable for residual stomach subjects than the conventional value of 3.5‰.

Unlike in the general population, posture may affect the diagnostic accuracy of the 13C-UBT in residual stomach subjects, especially during the late stage of the test (20 min and thereafter). Utilization of the left lateral recumbent position during the procedure and when collecting the last breath sample may improve
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