

## Percutaneous local therapies for hepatocellular carcinoma impair gastric function

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### TO THE EDITOR

Percutaneous local therapies, such as percutaneous ethanol injection (PEI), microwave coagulation and radiofrequency ablation (RFA), are frequently used worldwide for the treatment of hepatocellular carcinoma (HCC) because of their high effectiveness. Although these treatment modalities can induce effectively coagulated tumor necrosis in the liver, they may cause adverse effects on extrahepatic abdominal organs. There are, however, no published reports on the influence of percutaneous local therapies on the gastric myenteric activity. Therefore, it is unclear whether or not gastric function is affected by percutaneous local therapies. In this study, to make clear the effect of PEI and RFA on the gastric function, we continuously recorded the gastric myoelectric activity by electrogastrography (EGG) and estimated the effect of percutaneous local therapies for HCC on gastric function.

Five patients with HCC (3 males and 2 females; age

ranging from 66 to 81 years) were enrolled in the present study. Written informed consent was obtained from each patient. We have developed several novel percutaneous local therapies for HCC. The first is the combination of PEI and RFA (PEI-RFA). In this treatment modality, RFA is performed immediately after PEI. The second is percutaneous ethanol-lipiodol injection (PELI). In this modality, mixture of pure ethanol and lipiodol, a lipid-based contrast medium, at a ratio of 10:1, is injected percutaneously into HCC. The last is the combination of PELI and RFA (PELI-RFA). Usefulness of these new treatment modalities has been reported elsewhere<sup>[1-7]</sup>. In the present study, two patients with HCC underwent PELI and three underwent PELI-RFA.

We recorded EGG before and 3 d after therapy, and the results were compared. EGG was recorded with a portable electrogastrographic recorder (NIPRO; Tokyo, Japan). Five electrodes were affixed to the abdomen as shown in Figure 1, and EGG was recorded for 30 min during a fasting period and again during a postprandial period. We evaluated the percentages of bradygastria (<2.4 c/min), normogastria (2.4 - 3.6 c/min), and tachygastria (>3.6 c/min), as well as the dominant frequency (DF) and the postprandial-to-fasting power ratio (PR). We also examined clinical abdominal symptoms, using the questionnaire reported by Svedlund *et al.* (Gastrointestinal Symptom Rating Scale, GSRS)<sup>[8]</sup> which was translated into Japanese. The translated form was provided by Astra Zeneca (Tokyo, Japan). Measured values were expressed as mean ± SE. Comparisons before and after therapy were performed by the paired Student's *t* test, and *P* < 0.05 was accepted as a significant difference.

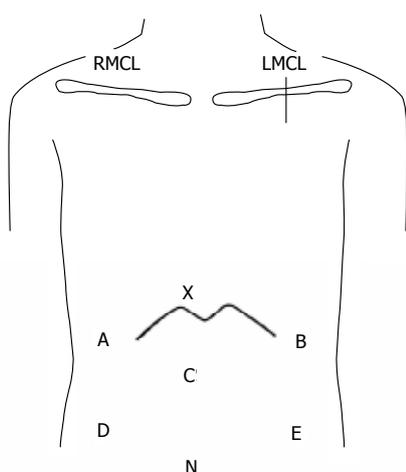
The results are summarized in Table 1. Because the similar EGG patterns were obtained from all the channels, the data of channel 1 are shown in Table 1. After percutaneous local therapies for HCC, the percentages of bradygastria in the fasting period were significantly increased, while the percentages of normogastria in the same period were significantly decreased. The PR of normogastria and bradygastria was significantly decreased after therapy. Conversely, no significant differences were found in the calculated GSRS scores obtained from the questionnaire before and after therapy. This study is the first report to estimate the effect of percutaneous local therapies for HCC on the gastric myenteric activity. The present results indicate that percutaneous therapies for HCC may impair gastric function even when clinical symptoms are not apparent.

The first EGG measurement in humans was performed by Alvarez<sup>[9]</sup>. This method can be used to noninvasively assess the electrical activity generated by gastric smooth

**Table 1 Comparisons between before and after therapy (mean ± SE)**

	Before	After
Bradygastria (%)	54.0 ± 7.4	77.4 ± 5.6 <sup>a</sup>
Normogastria (%)	42.4 ± 7.5	18.6 ± 5.2 <sup>a</sup>
Tachygastria (%)	3.2 ± 1.8	4.0 ± 4.0
PR of bradygastria (%)	1.3 ± 0.1	0.8 ± 0.1 <sup>a</sup>
PR of normogastria (%)	2.5 ± 0.5	1.8 ± 0.5 <sup>a</sup>
PR of tachygastria (%)	2.1 ± 0.5	1.7 ± 0.5
DF (c/min)	2.3 ± 0.1	1.9 ± 0.1
Gastrointestinal symptoms	1.8 ± 0.2	2.2 ± 0.5
Total score		

<sup>a</sup>*p* < 0.05 vs before therapy



**Figure 1** The positions of electrodes for EGG recording. X, xiphoid process; N, navel; RMCL, right mid-clavicular line; LMCL, left mid-clavicular line; C, central terminal electrode placed on the patient's ventral midline about halfway between the umbilicus and the xiphoid process; A, channel 1 placed on an intersecting point between RMCL and a vertical bisectrix of the line XC; B, channel 2 placed on intersecting point between LMCL and a vertical bisectrix of the line XC; D, channel 3 placed on intersecting point between RMCL and a vertical bisectrix of the line NC; E, channel 4 placed on intersecting point between LMCL and a vertical bisectrix of the line NC.

muscles. EGG is believed to reflect the electrical control activity and gastric motility regulated by pacemakers. In humans, these EGG waves originated from the pacemaker area along the major curvature of the stomach and propagated aborally with increasing velocity, at intervals of approximately 20 s<sup>[10]</sup>. EGG has been shown to provide useful information for clinical diagnoses<sup>[10]</sup>. EGG abnormalities have been observed in disorders of gastric emptying, nausea and vomiting<sup>[10]</sup>.

Percutaneous local therapies is of great significance in the treatment of HCC and metastatic liver tumors. PELI, PEI-RFA and PELI-RFA are new therapeutic methods for HCC, which we have developed. We have confirmed the usefulness of these novel percutaneous local therapies in the treatment of HCC<sup>[1-7]</sup>. It has been shown that transcatheter arterial chemoembolization affected the gastric myenteric activity and that overproduction of endogenous prostaglandin was related to dysrhythmia of the gastric myenteric activity<sup>[11]</sup>. In this pilot study,

we demonstrated that the gastric myenteric activity was affected by percutaneous local therapies for HCC, although abdominal symptoms were not apparent and GSRS scores obtained from the questionnaire did not change significantly after therapy. It is a significant clinical matter that delayed gastric transit may occur after percutaneous therapy for HCC. Because it has been reported that patients with HCC tend to have gastrointestinal dysfunction<sup>[12]</sup>, we have to pay attention to gastric dysfunction after percutaneous local therapies for HCC even when there are no clinical symptoms. The mechanisms underlying the effect of percutaneous local therapies for HCC on extrahepatic abdominal organs need further exploration.

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