A New Fiberintestinoscope Type FIS–T₁ Patterned after Intestinal Biopsy Tube

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MITA, M., WONG, T.-f., YAMAGATA, R., MATSUMOTO, K., TACHIKAWA, H., SUGAWARA, T., GOMI, T., YAMAGISHI, G., UENO, K., OSHIBA, S., MIURA, K. and YAMAGATA, S. A New Fiberintestinoscope, Type FIS–T₁ Patterned after Intestinal Biopsy Tube. Tohoku J. exp. Med., 1976, 118 (Suppl.), 111–116 — A new type of fiberintestinoscope (FIS–T₁) patterned after an intestinal biopsy tube was developed for observing the small intestine beyond the ligament of Treitz. The flexible part of the new FIS has been made as pliable as the Cantor tube or the Miller-Abbott tube so that the tip of the new FIS is carried on into the small intestine by peristaltic activity along its natural configuration. A balloon attached near the tip of the new FIS acted as a bolus, enabling peristaltic activity to carry the fiberscope to the distal portion. In order to facilitate the passage of the fiberscope, it was also advisable to keep changing the posture and position of the body with a minimum of fluoroscopic exposure. Inflation of the balloon as well as air feeding through the air channel of the fiberscope made possible satisfactory observation. In a patient suffering from protein-losing gastroenteropathy, multiple white spots on the diffuse rough surface of the mucosa were visualized by using the new FIS. Histological finding of the biopsy specimen taken from near the ligament of Treitz by using the fiberduodenoscope showed dilated lymph vessels in the villi.

fiberintestinoscope; intestinal biopsy tube; protein-losing gastroenteropathy

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Fig. 1. General appearance of our intestinal suction biopsy instrument.

MATERIALS AND METHODS

A new type of fiberintestinoscope (FIS-T₁) was made tentatively by the Machida Co., Ltd. as shown in Fig. 2. A balloon was attached near the tip of the new FIS. Fig. 3

Fig. 2. General appearance of new FIS.

Fig. 3. Inflated balloon and tip of new FIS.
TABLE 1. Specifications of new FIS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Whole length</td>
<td>2,050 mm</td>
</tr>
<tr>
<td>Effective length</td>
<td>1,910 mm</td>
</tr>
<tr>
<td>Apical rigid part:</td>
<td>Length: 15 mm</td>
</tr>
<tr>
<td></td>
<td>Diameter: 10 mm</td>
</tr>
<tr>
<td>Flexible part:</td>
<td>Diameter: 5 mm</td>
</tr>
<tr>
<td>Angle of vision</td>
<td>Direct: 40°</td>
</tr>
<tr>
<td>Depth of focus</td>
<td>Fixed: 4~∞</td>
</tr>
<tr>
<td>Angle deflection</td>
<td>(~)</td>
</tr>
<tr>
<td>Biopsy channel</td>
<td>(~)</td>
</tr>
<tr>
<td>Light guide, length:</td>
<td>1,500 mm</td>
</tr>
<tr>
<td>Balloon:</td>
<td>Length: 35 mm</td>
</tr>
<tr>
<td></td>
<td>Diameter: 32 mm</td>
</tr>
</tbody>
</table>

(Unit of length: mm)

shows the inflated balloon and the tip of the fiberscope. The main specifications of the new FIS are shown in Table 1. The new FIS is approximately 2000 mm in length, and is of anterior direct vision and fixed focus type. The maximal outside diameter of the apical rigid part is 10 mm, and the diameter of the flexible part is 5 mm. The size of the balloon when inflated is 35×32 mm. This fiberscope is not equipped with an angle deflection mechanism or a biopsy instrument. Introduction of the new FIS into the small intestine was achieved by manipulation under fluoroscopic guidance with a minimum of fluoroscopic exposure or under direct visual control through the fiberscope.

RESULTS

In 15 cases the endoscopic examinations with the new FIS were performed. It was possible to insert the tube into the deeper portion of the jejunum or the upper ileum in 4 cases, into the middle portion of the jejunum in 6 cases, and into the upper jejunum in 3 cases. In 2 out of 15 cases the tip of the fiberscope was not inserted into the duodenum through the pylorus. One of the special features of the new FIS is that its flexible part has been made as flexible as the Cantor tube or the Miller-Abbott tube so that the tip of the new FIS was carried on into the small intestine by peristaltic activity along the natural configuration of the small intestine without distorting it. A balloon attached near the tip of the fiberscope acted as a bolus, enabling peristaltic activity to carry the fiberscope to the distal portion. In order to facilitate the passage of the tip of fiberscope, it was advisable to keep changing the posture and position of the body. Repeated inflation and deflation of the balloon also contributed to easy passage of the fiberscope. By applying these procedures, it was possible to insert the fiberscope into the deeper portion of the small intestine about 3 hr after the beginning of examination as shown in Fig. 4. As shown in Fig. 5, inflation of the balloon as well as air feeding through the air channel of the fiberscope made possible satisfactory observation. In a 33-year-old female patient suffering from protein-losing gastroenteropathy, endoscopic examination was performed by using the new FIS. The tip of the fiberscope reached almost the middle of the jejunum after 2 hr as shown in Fig. 6. Fig. 7 is an endoscopic picture of this patient.
Fig. 4. X-ray of new FIS in deeper portion of small intestine.
Fig. 5. Fiberscopic picture of the middle of jejunum in a normal subject.

Fig. 6. X-ray of new FIS in the middle of jejunum in a patient suffering from protein-losing gastroenteropathy.
Fig. 7. Fiberscopic picture of the patient showing multiple white spots on diffuse rough surface of jejunum.
Multiple white spots on the diffuse rough surface of the mucosa were visualized from the distal duodenum to the observed jejunum.

Histological finding of the biopsy specimen taken from near the ligament of Treitz by using the fiberduodenoscope showed remarkably dilated lymph vessels in the villi as shown in Fig. 8. Therefore, we feel that it is noteworthy to have obtained the endoscopic finding indicating intestinal lymphangiectasia with the new FIS. One of the disadvantages of the new FIS was that the image came in and out of the visual field with the action of the small intestine and that it was difficult to keep the lumen continually distended with air or the inflated balloon.

**DISCUSSION**

Up to date, two methods have been attempted in order to examine the small intestine with the fiberscope. One is the active insertion method (push method) currently used in routine gastroduodenal fiberoscopic examinations. The other one is the rope way method which was successfully achieved by Hiratsuka (1973). However, these methods have still some limitations for observing the entire small intestine without fail. Then, as a new attempt we have developed a new type of fiberintestinoscope patterned after an intestinal biopsy tube. It was reported by Rider (1967) that a similar type of fiberduodenoscope with a mercury bag attached to the tip was utilized. Although Rider’s instrument was long enough (2670 mm) to pass through the jejunum, he mentioned only the observation of the duodenum. The effective length of our fiberscope is approximately 2000 mm. It is too short to observe the ileum. Then, we intend to lengthen the present model further in the next trial.

This fiberscope is not equipped with a biopsy instrument. We are further developing the new FIS by attaching a suction biopsy instrument, with which we can get multiple specimens during one endoscopic examination. It will be difficult technically to equip a forceps biopsy channel. It was also difficult to keep the lumen continually distended with air or the inflated balloon because of the action
of the small intestine. However, we believe that the difficulties can be overcome by using various shapes of balloons or by the administration of a relaxant to the small intestine.

References


