Fiberoptic sensor for noninvasive measurement of variceal pressure

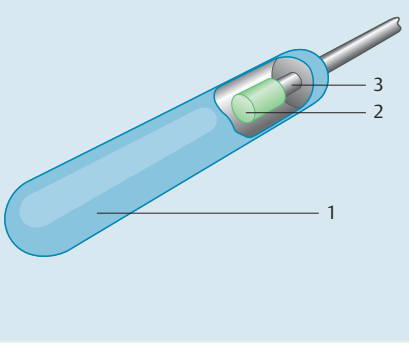

Fig. 1 Schematic of the novel pressure probe. 1: the flexible chamber with the pressure transmission medium inside it; 2: the fibreoptic sensor; and 3: the optical fiber.

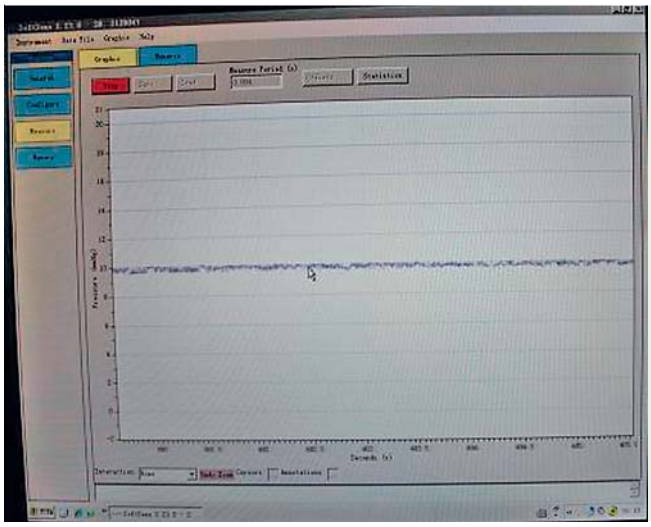

Fig. 3 The tracing on the PC monitor represents variceal pressure.

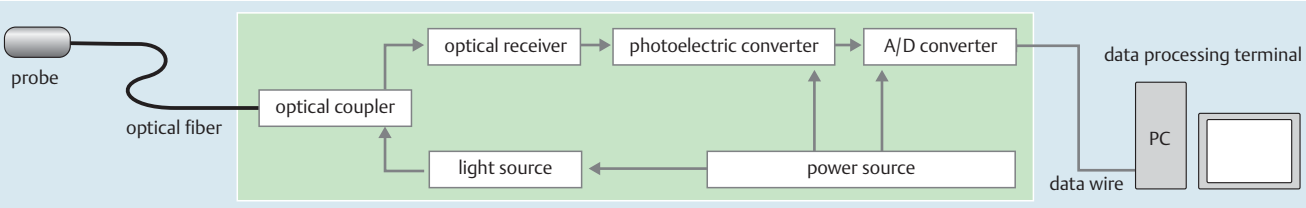

Fig. 2 Schematic of the fiberoptic variceal pressure measuring system. A/D, analog-to-digital; PC, personal computer.

We present a new measuring probe based on a miniature fiberoptic pressure sensor that can measure esophageal variceal pressure. The probe consists of an outer flexible chamber filled with a pressure transmission medium, at the center of which is positioned the fibreoptic sensor with diameter of 0.5 mm (FOP-F125, FISO Technologies Inc., Quebec, Canada) (**Fig. 1**). The single-column, flexible chamber has a 0.03-mm wall thickness and the chamber wall is made of polyurethane. The sensor within the medium is attached at one end to a connecting rod. When the membrane on the sensor chip is exposed to a rise in pressure in the surrounding medium, the light returning to the control unit is altered in accordance with the pressure deformations of the membrane and the altered interference conditions inside the cavity of the sensor [1]. The analog signals from sensor are transferred to both digital and analog values in the control unit and recorded with PC-based real-time data-acquisition hardware (**Fig. 2**, **Fig. 3**).

We used the new probe in three patients with cirrhosis after gaining approval from our institutional review board. Portal–azygous disconnection was carried out after measurement of the variceal pressure, and portal vein pressure was measured (model 90308-11-14, Space Labs Inc., Issaquah, Washington, USA) in the initial stages of surgery by directly catheterizing the right gastroepiploic vein with a PE-16 catheter. The variceal and portal vein pressure recordings in the three patients were 22 mm Hg and 22.5 mm Hg, 18.5 mm Hg and 19 mm Hg, and 20 mm Hg and 20 mm Hg, respectively. Compared with conventional technology used to measure variceal pressure [2–5], it is much easier to place the new probe (diameter 2 mm) into the correct position in relation to the varices through the endoscopic biopsy channel (**Fig. 4**). We believe the new sensor can help determine variceal pressure in routine endoscopic examinations safely and effectively.

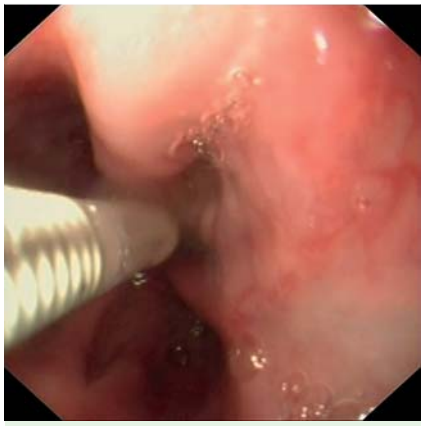

Fig. 4 The probe is gently placed onto the esophageal varix under direct visual control to measure the variceal pressure.

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Competing interests: None

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