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 mmHg and 22.5 mmHg, 18.5 mmHg and 19 mmHg, and 20 mmHg and 20 mmHg, 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.

Endoscopy_UCTN_Code_TTT_1AO_2AM

Competing interests: None

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Acknowledgments

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This work was supported in part by grants 81271736 and 81070337 from the General Program of National Natural Science Foundation of China.

References

- 1 Xiao Z. Application of artificial microcavities in wafer bonded silicon. Technical Report No. 285 Gothenburg, Sweden: Department of Solid State Electronics, Chalmers University of Technology; 1996: 1–41
- 2 Gertsch PH, Meister JJ. Pressure measurement in oesophageal varices: preliminary report on a new non-invasive method. Gut 1987; 28: 1162–1165
- 3 Bosch J, Bordas JM, Rigau J et al. Non-invasive measurement of the pressure of esophageal varices using an endoscopic gauge: comparison with measurements by variceal puncture in patients undergoing endoscopic sclerotherapy. Hepatology 1986; 6: 667–662
- 4 Vegesna AK, Chung CY, Bajaj A et al. Minimally invasive measurement of esophageal variceal pressure and wall tension (with video). Gastrointest Endosc 2009; 70: 407–413
- 5 Miller LS, Dai Q, Thomas A et al. A new ultrasound-guided esophageal variceal pressure measuring device. Am J Gastroenterol 2004; 99: 1267–1273

Bibliography

DOI <http://dx.doi.org/10.1055/s-0032-1325972>
Endoscopy 2013; 45: E55–E56
© Georg Thieme Verlag KG
Stuttgart · New York
ISSN 0013-726X

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