COMPOSITE-TYPE FIBERSCOPE SUPERSEDES ENDOSCOPE

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The Composite-type Optical Fiberscope (COF) integrates light illumination transmission, image transmission and irradiation laser transmission into a same axis (Oka K., 2006). The diameter of a COF is about 0.8 mm. It has about 6,000 image transmission fibers and a laser irradiation fiber as shown in the Figure 04. The optical fibers for image transmission are surrounded a single optical fiber for irradiation laser transmission, those two types are the functional laser fibers in the COF.

The physical properties of COF have direct impact with its applications. Thinner insertion tubes can be inserted into the narrow sections without any extra force as shows in Figure 06. Smaller head and the flexibility of insertion tube may increase patient comfort as well. With respect to the COFs applications the irradiation ability is one of the most important features (Oka K., 2008).

Figure 01: Tip of Conventional Endoscope, usually the diameter is 4 mm to 6 mm

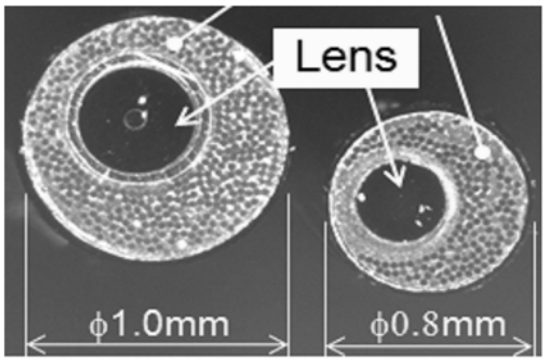

Figure 02: Tip of Composite-type of Fiberscope, usually the diameter is 0.8 mm to 1 mm

Difficulties of Conventional Endoscope

1. Two devices are required.
2. Application to a narrow part is difficult.
3. Precise positioning is difficult.
4. Due to the laser irradiation range is indefinite, unevenness occurs

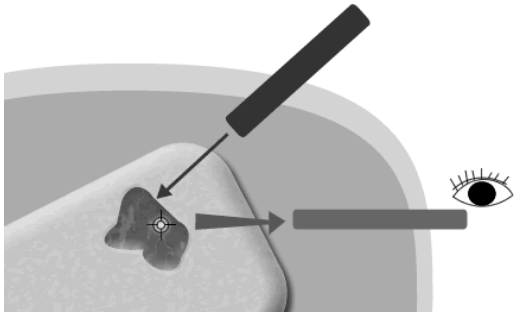

Figure 03: Positioning of Endoscope

Solution with COF

- Fibers for laser transmission and image transmission are integrated into the same axis. (Figure 04)
- Separation and integration of laser beam (1064 nm) and image(400~780 nm).
- Easy insertion to a narrow parts. (Figure 05 and Figure 06)

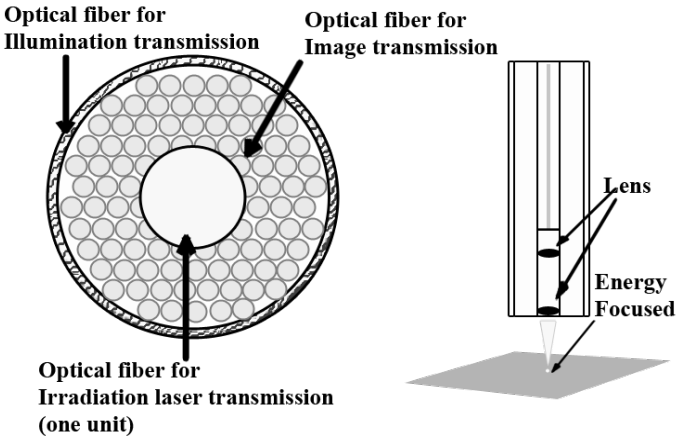

Figure-4, Arrangement of laser fibers

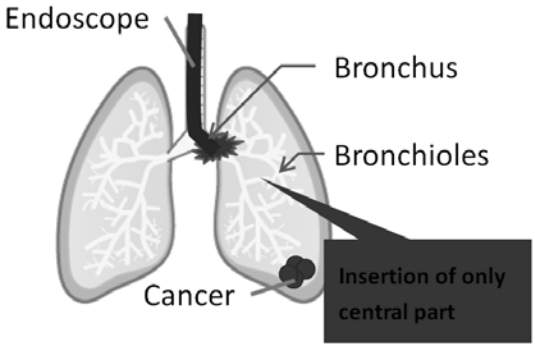

Figure 05: Issues of the conventional Endoscope

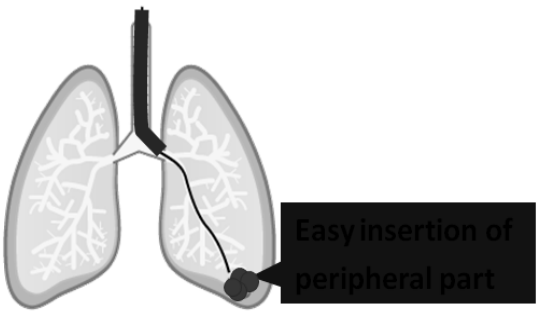

Figure 06: COF: Easy insertion, no expansion

References:

Oka, K., Naganawa A., Yamashita, H., Nakamura, T. and Chiba, T. (2008). Composite-type Optical Fiberscope for Laser Surgery for Twin-to-twin Transfusion Syndrome. Medical Imaging and Augmented Reality (Springer Berlin/Heidelberg, *Lecture Notes in Computer Science*), 5128:251-9.

Oka, K., Nakamura, T., Harada, K., Ohkawa, Y., Hidaka, T. And Chiba T. (2006). Development of laser forceps for fetal surgical treatment. *World congress on Medical Physics and Biomedical Engineering,* 2976-9.