Aiming at new patient-centered healthcare system

AIST aims to build a training system that allows surgeons to train themselves anytime, anywhere, and as much as they want, and which gives them clear feedback on their skill level. We first worked on the basic problem, i.e., how to evaluate surgical skills from an ergonomic point of view. We have succeeded in physically capturing the differences between beginners and an expert (Fig. 1). Our next step is to set objective indices for surgical skills based on these physical differences, and to develop a feedback interface (Fig. 2) for using these indices efficiently during training. We will continue our research to allow this system to be used not only for training, but also for rehearsing surgery; Expert surgeons will be able to rehearse a surgery for each patient using our system in the near future.

*For the details of this technology, see AIST Today 2003, Vol. 3, No. 6.

**Commercialization of a precise human nasal model**

A “precise model of the human paranasal sinus for training in endoscopic sinus surgery (ESS)” (Fig. 3) was developed during our research on surgical training. To commercialize it, we founded Surg Trainer, Ltd., which has been accredited as an AIST Vencure Company. We hope the model will come into wide use in the field of otorhinolaryngology and skull-base surgery.

Collaborating organizations

- Ibaraki Prefectural University of Health Sciences
- ENT Clinic @ Tsukuba South Avenue
- University of Tsukuba
- Shinko Optical, Ltd.
- PENTAX Corporation
- KOKEN Co., Ltd.
- SurgTrainer, Ltd.

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Institute for Human Science and Biomedical Engineering

Increasing importance of training in highly advanced healthcare technology

Even though unskilled regident surgeons perform surgery under the supervision of the attending surgeons, endoscopic surgery is sometimes technically too hard for them, since they have to insert surgical tools through small holes opened on the body and manipulate them deep inside. It is also difficult for experts to intervene in case of emergency. Training in advanced Minimally Invasive Surgery (that is also called as “keyhole” surgery) is thus becoming more and more important.

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**Fig. 1** Endoscope angle data (in part) of the same surgical procedure of an expert surgon subject (red line) and a resident subject (blue line; Post Graduate Year: 3)

Apparently the resident’s data takes much longer time to finish the same procedure than the expert and varies more widely, which means an unstable endoscopic view.

**Fig. 2** An experimental design of visual feedback in surgical training

To make surgical training more efficient, we are developing interfaces that feedback real-time information on the trainee during surgery, such as endoscope direction and the applied force on the patient model measured by various sensors.

**Fig. 3** A precise human nasal model for endonasal surgery

Snapshots from Ethmoidectomy

The model’s shape as well as its haptic sensation in resection are reproduced.

LEFT: The right ethmoidal sinus is approached from the front using forceps.

RIGHT: The posterior part is being exposed.