

DEPARTMENT OF PEDIATRIC SURGERY

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OVERVIEW

The key research project of the Dep. of Ped. Surgery is the invention and development of innovative techniques that make the daily pediatric surgical work less invasive, more efficient, and safer. Besides the establishment of the single-incision pediatric endosurgery (SIPES) for a variety of new indiciations, new combined endoscopic-endosurgical techniques were developed as well. Google Glass, as a type of wearable technology with on optical head-mounted display, could successfully be tested in clinical work in 2014 by members of our team. Various projects on the use of telemedicine in the field of pediatric surgery have been launched. Our translational research focuses on the examination of tissue samples from tumors in childhood and in Hirschsprung's disease using multiphoton microscopy.

HIGHLIGHTS

SINGLE-INCISION PEDIATRIC ENDOSURGERY (SIPES)

SIPES is accomplished through only a single small incision in the navel, minimizing the visible scar and potentially reducing incisional pain associated with the multiple points of entry used during traditional laparoscopic surgery. Within our department, a variety of novel laparoscopic procedures were first described early childhood, and are now routinely and safely performed with this method. The aim of a new research project is to establish this method for minimal invasive tumor surgery in comparison to standard laparoscopy.

GOOGLE GLASS

Personal portable information technology is advancing at a breathtaking speed. Last year, Google introduced Glass, a device that is worn like conventional glasses, but that combines a computerized central processing unit, touchpad, display screen, high-definition camera, microphone, bone-conduction transducer, and wireless connectivity. We have obtained a Glass device through Google's Explorer program and have tested its applicability in our daily pediatric surgical practice and in relevant experimental settings. Glass has some clear utility in the clinical setting. At this time, we are using it for photo- and videodocumentation, and are working on overcoming specific drawbacks such as the lack of specialized medical applications, or issues of patient data protection.

TELEMEDICINE

Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance. Telemedicine can be broken into three main categories: store-and-forward, remote monitoring and (real-time) interactive services. Real-time interactive service using the Adobe Connect Software is evaluated for routine outpatient care with great success. Trauma projects and telemedical cooperation with outpatient physicians are goals of further research work. We currently are evaluating a telemedical tool for pediatric surgical outpatient follow-up in a randomized, controlled study.

MULTIPHOTON MICROSCOPY (MPM)

Multiphoton Microscopy is investigated as an alternative to intraoperative frozen section biopsies for pediatric surgical oncology and Hirschsprungs' disease. Multiphoton Microscopy has been proposed as a real-time microscopic imaging modality that may be a useful adjunct for the surgeon in the operating room. We documented the ability to accurately determine the distribution of ganglion cells in mice with Hirschsprung's disease. In pediatric surgical oncology three-dimensional real time imaging of tissue could provide immediate feedback to the surgeon on resection margins. We are currently evaluating its applicability for these indications.

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FUTURE DIRECTIONS

Our future goal is the expansion of already initiated projects. For the design of subprojects, we are in communication with the IZKS (Interdisciplinary Centre for Clinical Trials). At the initiative of our clinic, an interdisciplinary telemedical working group was established at the University Medical Center Mainz. Together with the IZKS, we anticipate the implementation of further telemedical projects, and grant submission in this field. For multiphoton microscopy, we are currently creating a tissue bank covering a variety of childhood solid tumors and gastrointestinal pathology. In the long term tissue multiphoton microscopical examination at different stages of diseases and at different ages during childhood is planned. A longterm goal is the development of a laparoscopic MPM device to improve accurate determination of resection margins in Hirschsprung disease and a variety of pediatric neoplasias.



<u>FIG. 1:</u> The team of the Department of Pediatric Surgery <u>FIG. 2:</u> Visualization of ganglion cells in biopsies of the intestinal wall by MPM and conventional light microscopy

MPM Examination of tissue of different origin in comparison to conventional histopathology in childhood PROJECT MANAGER: Prof. O Muensterer, Dr. J Gödeke FUNDING: Else-Kröner-Fresenius Foundation PROJECT DURATION: 2014 - 2019 Multiphoton Microscopy as an alternative to intraoperative frozen section biopsies for pediatric surgical oncologic diseases PROJECT MANAGER: Dr. J Gödeke, Dr. S Waldron FUNDING: Else-Kröner-Fresenius Foundation FUNDING: IPEG Research Fund PROJECT DURATION: 2014 - 2019 Telemedicine in the diagnosis and treatment of pediatric surgical patients PROJECT MANAGER: Dr. J Gödeke, Dr. M Schwind FUNDING: University Medical Center of Mainz SUM: € 5,000 PROJECT DURATION: 2014 - 2019