

## Department of Surgery

### Division of Pediatric Surgery and Vascular Surgery

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#### General Summary

##### *Pediatric surgery*

The Division of Pediatric Surgery at The Jikei University Hospital is dedicated to providing expert surgical care for fetuses, infants, children, and adolescents with congenital and acquired conditions. Our surgeons remain committed to the ongoing development of new surgical techniques for treating diseases in children, particularly minimally invasive approaches to replace more invasive open procedures that require large incisions.

##### *Vascular surgery*

Research projects of our department have focused on the development of the endovascular repair of aneurysms, the treatment of peripheral arterial disease with drug-eluting stents, and the clinical study of specific antibodies for heparin-platelet factor 4 (PF4) complexes.

#### Research Activities

##### *Education*

Education for medical students: Children undergoing surgery often have congenital anomalies. Therefore, lectures on pediatric surgery for students are based on embryology.

Education for trainees: Three objectives for trainee physicians in pediatric surgery are: 1) how to obtain blood samples from pediatric patients, 2) understanding fluid therapy for pediatric patients, and 3) learning how to bury sutures.

Education for surgical residents: Residents are able to act as lead surgeons or assistants during pediatric surgery.

##### *Clinical studies*

1. Endoscopic treatment for vesicoureteral reflux using Deflux

There are 3 options for treating vesicoureteral reflux. We select endoscopic treatment with a dextranomer/hyaluronic acid gel (Deflux, Q-Med, Uppsala, Sweden). We have treated 3 cases, 2 of which completely resolved.

2. Electrolyte and acid-base balances in laparoscopic surgery

Carbon oxide alters electrolyte and acid-base balances in laparoscopic surgery.

3. In severe cases of gastroesophageal reflux, a surgical procedure called fundoplication

is performed. This procedure is performed laparoscopically at our hospital. With minimally invasive laparoscopic surgery, pain is minimized, and postoperative recovery is faster. The number of neurologically handicapped children with gastroesophageal reflux has been increasing at our hospital.

4. The Nuss procedure aims to force the sternum forward and hold it there with an implanted steel bar, but without a large incision to resect the abnormal cartilage. In this procedure, the curved steel bar is placed under the sternum through 2 small incisions on the sides of the chest. The number of patients with pectus excavatum treated surgically at our hospital is the third highest in Japan.

#### *Basic studies*

1. Laparoscopic surgery contributes to global warming

Carbon dioxide, the most important greenhouse gas, is indispensable for laparoscopic surgery. To assess CO<sub>2</sub> emissions, we first determined the number of laparoscopic operations performed in Japan. Next, we measured the quantity of CO<sub>2</sub> used in our hospital.

2. Inhibitory effects of an antiangiogenesis drug on the metastasis of human neuroblastoma

Many antiangiogenesis factors have been discovered. We evaluated the effects of several potent antiangiogenesis drugs on the metastasis of neuroblastoma in a mouse model of liver metastasis.

3. Plasmapheresis in severe sepsis or septic shock

During sepsis, microorganisms release various endotoxins that activate, to a greater or lesser extent, cascade systems, including the release of cytokines, such as tumor necrosis factor alpha and interleukin 6, and complement components. Plasmapheresis is used to remove these factors. We created a rat model of sepsis and evaluated the effect of plasmapheresis.

#### *Vascular surgery*

1) Development of endovascular repair of thoracoabdominal aneurysms

Although stent grafts for the treatment of abdominal aortic aneurysms (AAAs) have been established and are commercially available, no such stent grafts are available for the treatment of thoracoabdominal aortic aneurysms (TAAAs). Although the surgical death rate following open surgery for the treatment of AAAs is satisfactory, that for TAAAs remains unacceptably high at 15% to 20%, and further improvement is desperately needed. Because TAAA involves one or more visceral arteries, maintenance of visceral perfusion is mandatory while excluding the aneurysm with stent grafts. We have used a custom-made branched stent graft in combination with covered stents (for visceral reconstruction) for the treatment of TAAAs that were deemed to be inoperable because of co-morbid conditions or a hostile thorax/abdomen. Although stent graft repair for TAAAs requires long operative and fluoroscopic times, this treatment is feasible and safe.

2) Research on drug-eluting stents in the superficial femoral artery

The Zilver PTX Drug-Eluting Peripheral Stent is specifically designed and approved to

treat peripheral arterial disease affecting the superficial femoral artery, which is the main blood vessel in the thigh. It is a self-expanding stent made of nitinol, a space-age, shape memory metal that offers unique mechanical advantages for a stent in the superficial femoral artery.

Both the global registry and the randomized controlled trial, which enrolled patients predominantly in the United States, but also in Germany and Japan, is awaiting its 1-year primary endpoint, which should be complete in August 2009. We are participating in this randomized controlled trial.

### 3) Clinical study of specific antibodies for heparin-PF4 complexes

Heparin is commonly used for anticoagulation in vascular surgery. Heparin-induced thrombocytopenia is a rare but life-threatening complication that causes thrombosis of veins and arteries. Even if heparin use is limited, it occasionally induces the production of specific antibodies against heparin-PF4 complexes. Patients with such antibodies are at increased risk for heparin-induced thrombocytopenia. The prevalence of these antibodies in patients receiving heparin is presumably underestimated. Accordingly, we prospectively measured antibodies against heparin-PF4 complexes and the activity of PF4 and investigated whether they are related to symptoms of heparin-induced thrombocytopenia, particularly in patients undergoing major vascular surgery. We measured these variables in about 300 patients for 2 years.

Antibodies against heparin-PF4 complexes were found in approximately 13% of patients, a percentage higher than expected. Moreover, the antibody-positive patients tended to have higher PF4 activity than did antibody-negative patients. The results of this study are being statistically analyzed and will be published in 2009.

### 4) Research on hemostatic fleece and closure devices in endovascular aortic aneurysm repair

We have found that collagen patches coated with components of fibrin glue significantly reduce blood loss and the time required for hemostasis at the operation site in endovascular aortic aneurysm repair. Moreover, percutaneous aortic aneurysm repair with closure devices has been shown to be technically feasible and to be associated with a low morbidity rate. However, complications from percutaneous arterial closure are not insignificant and can be life-threatening. We have evaluated our experiences with this technique, compared them with previously published results, and identified factors associated with complications and conversion to open repair.

## Publications

**Ohki T.** Regarding endoleaks after endovascular aneurysm repair lead to nonuniform intra-aneurysm sac pressure. *J Vasc Surg* 2008; **47**: 899.

**Ohki T.** Popliteal artery interventions. *Endovascular Today* 2008 May p. 4.

**Ohki T.** Evaluating thoracic aortic therapy. *Endovascular today* 2008 September p. 4.

**Ohki T.** Pros and Cons of IVUS imaging for endovascular procedures. *Endovascular Today* 2008 March p. 80-2.

**Toya N, Fujita T, Kanaoka Y, Ohki T.** Endotension following endovascular aneurysm repair. *Vasc Med* 2008; **13**: 305-11.

**Kanaoka Y, Kubo H.** The six-year results of a combined surgical and endovascular repair for thoracoabdominal aortic aneurysm involving the visceral arteries. *Minerva Chir* 2008; **63**: 229-35.

**Kurobe M, Ashizuka S, Yoshizawa J, Yoshida K, Ohki T.** Concomitant laparoscopic splenectomy and cholecystectomy in children:

outcomes and lessons learned from our cases. 11<sup>th</sup> world congress of endoscopic surgery. Yokohama Japan 2008, September.

**Kurobe M, Ohashi S, Ashizuka S, Yoshizawa J, Yoshida K, Yanaga K.** Laparoscopic Nissen Fundoplication in neurologically impaired patients. American College of Surgeons. San Francisco. USA. 2008, October.

**Yamagata T, Yoshizawa J, Ohashi S, Yanaga K, Ohki T.** Expression patterns of MicroRNAs are

altered in hypoxic human neuroblastoma cells. American Academy of Pediatrics 2008, National conference & exhibition, Boston, 2008.

**Tanaka K, Hashimoto H, Tachibana T, Ishikawa H, Ohki T.** Apoptosis in the small intestine of neonatal rat using blue light-emitting diode devices and conventional halogen-quartz devices in phototherapy. *Pediatr Surg Int* 2008; **24**: 837-42.