It has been over 35 years since we published our first article on rat blood vessel surgery. During this time many outstanding scholars have contributed knowledge of the surgical physiology, transplantation immunology, and techniques of rat organ transplantation. On behalf of all, I am highly indebted to three outstanding men: Drs. Bernard Fisher, Frank Dixon, and Marshall Orloff, who "pulled and pushed" to develop these techniques.

My own animal research started in 1953 when I was a junior resident in surgery at St. Francis Hospital in Pittsburgh. I received permission to use dogs at the hospital pathology laboratory. Dr. Park, anesthesia resident at Mercy Hospital, was the principal anesthesiologist. There I performed operations to constrict the suprahepatic inferior vena cava in the canine thorax to 75% of its original diameter in order to create ascites. These ascitic dogs were then treated with a rectus-wick operation which consisted of transpositioning the peritoneum and rectus muscle position so that the muscle fibers wicked the abdominal fluid. This operation worked as long as the muscle fibers were not covered by peritoneum. I presented this paper at the Greater Pittsburgh Resident’s Science Fair, and subsequently was invited to join Dr. Fisher's laboratory upon completion of my residency.

The University of Pittsburgh was equipped with dog laboratory facilities where vascular surgeries were tested to develop open-heart surgery and kidney transplantation techniques. Back then our laboratory's emphasis was on surgical physiological observation of hypothermia, portacaval shunt, and vascular reconstruction using dogs and rats as research models. At the time rats were seldom used in surgical laboratories despite a long history of using rat in allied biological research.

While actively engaged in kidney transplantation research, we had many occasions to employ neonatal puppies as research subjects. Using these small animals, we practiced vascular anastomoses and perfected micromanipulations such as thymectomy and thyroid and parathyroid transplantations in dogs. In 1957 Dr. Fisher urged me to try a portacaval end-to-side procedure in the rat, and I made an extensive 6-month search for suitable microsurgical instruments. I tried various shapes and sizes of women's hairpins on the rat blood vessels, but they were soon discarded, being either too loose or too sharp for such delicate blood vessels. By 1958 a miniature Satinsky clamp was designed. Next a vascular clamp was invented that was covered with rubber tubing (air passage tubing for an endotracheal tubal cuff). After many attempts and failures due to
misalignment of the two blood vessels, blood loss from needle holes and gaps, constriction of the stoma, and anesthesia problems, end-to-side portacaval shunt was finally perfected in the rat in 1958. Dr. Fisher revised the 1959 edition of Blood Vessel Surgery and its application written by Dr. Guthrie, and in it he stated, “Do you know what you have done just now? You have opened an avenue to conduct allied physiological research, transplantation investigation, and it may well replace dog surgery in the years to come.” He further stated, “we fully expect that vascular surgery will be applied to smaller and smaller vessels, for such is possible and will be utilized by those who are willing to master the technical skill. Of course, the smaller the blood vessel operated upon, the narrower becomes the permissible technical error that is comparable with success.”

By the end of 1958 a paper entitled “Portacaval Shunt in the Rat” was sent to Surgery, and the paper appeared in 1961 [18]. In the meantime the techniques for side-to-side portacaval shunt, arteriovenous fistula, liver arterialization, and kidney transplantation in the rat were completed. These techniques were developed and finalized from the knowledge gained from surgery in the dog [7, 18].

While we were busy investigating fundamental liver physiology using the portacaval shunt model in the rat, the Cincinnati group headed by Miller et al. [27] reported a model of rat kidney transplantation using the neck blood vessels. Because it is a nonphysiological model, this technique has not been popular among immunological investigators. In the meantime we reinforced the technical feasibility of rat blood vessel surgery at the 1961 Annual American College of Surgeons Congress at the scientific exhibit section by exhibiting portacaval shunt, arteriovenous fistula, liver arterialization, and kidney transplantation in the abdominal cavity. In 1964 Abbott et al. [1] reported a heterotopic rat heart transplantation utilizing end-to-end anastomoses between the donor aorta and pulmonary artery and the recipient’s abdominal aorta and inferior vena cava, respectively. In 1963 Dr. Sakai from Japan joined our research group, and we tackled many projects utilizing dogs and rats. In 1964 I accepted an invitation to join Dr. Frank Dixon’s institution in La Jolla, California, for a period of 3 years. At that time I used my technical skill to investigate allied transplantation immunology and to acquire a transplantation immunology background.

Two major events occurred early in 1964 in La Jolla. The first was that Dr. Sakai was no longer with Dr. Fisher and wished to learn kidney transplantation in the rat. He spent several weeks in La Jolla to master the transplantation technique. Second, I was invited to Harvard University’s Peter Brigham Hospital twice to teach scholars of Professor Merrill, where I met Dr. Rowinski and others. I taught several surgeons for one week and then returned to La Jolla. Within a few weeks Dr. Merrill called me to Boston to teach another group of physicians, where I had the pleasure of meeting a young scholar, Dr. Guttmann. He wanted to learn the delicate renal transplantation technique. After a 1-week course at Harvard we exchanged letters and telephone calls, and I sent several hand drawings to him. Dr. Guttmann and his associates started to report their results on rat renal transplantation in Transplantation and other leading journals [9–11].