

Next generation of world-leading microsurgery: Basic research and clinical practice of supermicrosurgery

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After the technique of blood vessel suture was developed by Alexis Carrel in 1912, small vessel microanastomosis has been adopted in the various field of surgery. Currently, blood vessels that are about 2 to 3 mm in diameter can be anastomosed without difficulty. Recently, a technique called "Supermicrosurgery" was developed for plastic surgery, which enables anastomosis of quite tiny blood vessels (about 0.3-0.4 mm in diameter). Supermicrosurgery is clinically used for fingertip replantation and lymphaticovenous anastomosis. In our study, we used this technique in animal experiments and succeeded in organ/tissue transplantation, which is considered clinically impossible.

First, we conducted uterus transplant research, which was intended for patients who wish to get pregnant but have a congenital anomaly or cancer resection. We developed a uterus transplantation model using cynomolgus macaque. We performed anastomoses of uterine arteries and ovarian veins by supermicrosurgery. After performing autotransplantation, we succeeded in achieving natural pregnancy and cesarean operation. In addition, we tried allotransplantation using immunosuppressants.

Further, we conducted anal transplant research for patients with anal dysfunction in order to improve defecation function. We succeeded in anal autotransplantation in a beagle dog model. Pudendal arteries, veins, and pudendal nerves of both the sides were anastomosed by supermicrosurgery, and currently, the dogs are followed up for functional outcome.

Thus, basic research and clinical practice using supermicrosurgery were successfully advanced in the department of plastic surgery at the University of Tokyo. This technique may spread in the field of all over the world.

Biography

Jun Araki has completed his plastic surgical residency at the age of 29 years from University of Tokyo. He works on clinical practice and research of plastic surgery, transplant medicine, and the regenerative medicine in cooperation with Keio University, Kyoto University, Harvard University, and Columbia University.

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