Department of Plastic and Reconstructive Surgery

Kunihiro Kurihara, *Professor*
Meisei Takeishi, *Associate Professor*
Takeshi Miyawaki, *Associate Professor*
Mitsuru Uchida, *Professor*
Kunitoshi Ninomiya, *Associate Professor*
Kimihiro Nojima, *Lecturer*

General Summary

The main research topics of our department are congenital hand and foot anomalies, craniomaxillafacial surgery, hand surgery, reconstructive surgery after excision of malignant tumor and severe trauma, malignant skin tumors, laser treatment, and burns. These topics were investigated both experimentally and clinically. These treatments require knowledge of nervous, vascular, and integumentary systems, the physiological mechanisms of metabolic change, and skills for the atraumatic and microsurgical techniques. Basic research and clinical technique is require taking authorization of the plastic surgeons medical specialist during first 6 years.

Research Activities

Clinical research

1. Cleft lip and palate

A long-term follow-up study revealed satisfactory results after rotation-advancement lip repair for unilateral cleft lip. A long-term follow-up study of the push-back method for cleft palate also revealed satisfactory results for speech. A long-term follow-up study of early-stage bone grafting for alveolar cleft revealed good results for maxillary growth. These results were analyzed with dental models and cephalograms and by speech therapists.

2. Congenital hand and foot malformations

Because hands are often said to serve as a second pair of eyes, repair of congenital hand and foot malformations requires good functional results in terms of both sensation and motion. The purpose of our clinical research was to analyze the morphological and functional conditions of abnormal hands and feet and to analyze the long-term results after treatment. Long-term follow-up after repair of malformations with triangular flaps, a method we developed to separate the digits in syndactyly, revealed excellent functional and cosmetic results.

3. Distraction osteogenesis

Distraction osteogenesis has been used to treat several hand anomalies and syndromic craniosynostosis and has shown great potential for the reconstruction of deformities of the hand and cranial vault.

Open reduction and fixation using a bioabsorbable system were used to treat 41 cases of facial bone fracture. The mean follow-up period was 8.1 months (range, 3 to 21 months). Malar bone fractures were present in 31 patients with a mean age of 32.7 years (range, 10 to 72 years). We have encountered no severe complications with this system, and the fixation force was sufficient. After this analysis, we have continued to use this

method and have obtained good results.

4. Breast reconstruction

Autologous tissue transfer was used for breast reconstruction in more than 100 patients and yielded satisfactory results. A long-term follow-up study of breast reconstruction with free flaps in 210 patients revealed excellent results. Transplanted soft tissues were harvested from the abdominal wall and back wall with vascular pedicles and were anastomosed to the thoracodorsal or internal thoracic vessels.

5. Head and neck reconstruction

Microsurgical free flap reconstruction was performed in more than 40 patients after resection of head and neck tumors and achieved satisfactory results. Reconstructive surgery increases a patient's quality of life. The flap survival rate was greater than 90%.

6. Laser treatment

Cooling jelly is used with dye lasers to decrease skin damage when port wine stain is treated with high-density irradiation. This technique achieves good results and shortens the period of treatment.

Basic research

1. Tissue engineering

Cultured autogenous mucous cell transplantation on the fascia lata is used to restore the bladder, the full thickness of the cheek wall, and the pharyngeal wall. The goal of this research was restoration of these areas after the excision of malignant tumors.

2. Mechanism of extremity formation using gene induction in mouse embryos

The whole-embryo culture system, which can completely reproduce development, is an established method of inducing genes of the mouse embryo bud. Twelve-day-old embryos of the Std-ddt mouse were dissected out of the yolk sac, amnion, and chorioallantoic placenta. A plasmid (cytomegalovirus enhancer+β-actin promoter) with 0.1 μl of green fluorescent protein (GFP) was injected via a microcapillary tube into the yolk sac. Immediately after injection of the material, the embryo was pinched with the pincette-type element. In Tyrode's solution, an electric shock (30, 40, or 50 V, 50 milliseconds, 3 pulses) was applied to the embryo. The rotating bottles were incubated at 37°C, with fresh 95% O_2 and 5% N_2 supplied to the bottle twice a day. The bottles were rotated at 30 rpm. After 48 hours the frozen sample was resected. With electric shocks of 40 V or 50 V, GFP was detected throughout the body, but with shocks of 30 V, GFP was observed only in the bud portion.

3. Repair of calvarial defects with artificial bone

The repair of calvarial defects with artificial bone (α- or β-tricalcium phosphate) was studied. Healing of bone defects was observed.

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