

Department of Plastic and Reconstructive Surgery

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General Summary

Research in the Department of Plastic and Reconstructive Surgery is focused on 4 basic areas: (1) the causes and treatment of craniofacial anomalies, (2) the causes and treatment of hand and foot anomalies, (3) the mechanism of wound healing and the grafting of skin and bone, and (4) microsurgical transplantation. The faculty of our department consists of surgeons representing virtually all areas of plastic surgery and clinicians from related disciplines. This diversity provides the stimulating atmosphere necessary for productive research. The participation of plastic surgery residents and postresidency fellows in research studies provides them with important experiences and expands their understanding of anatomical and physiological factors involved in these special areas of surgery.

Research Activities

Introducing the techniques of aesthetic surgery in open septorhinoplasty

Rhinoplasty plays a great role in the treatment of nasal obstruction, because the anterior nasal airway is responsible for 70% of airway resistance. Caudal septal deviation was known to cause nasal obstruction but had rarely been treated in Japan because the caudal septum is a key structure to be preserved in conventional intranasal septoplasty. Damage to the caudal septum may compromise the shape of the nasal pyramid. We have recently collaborated with otorhinolaryngological surgeons in performing functional rhinoplasty and have introduced open septorhinoplasty techniques that are widely used in aesthetic surgery. The open approach allows the deviated L-strut to be corrected under direct vision and is best indicated for treating caudal septal deviation and internal/external nasal valve obstruction.

Treatment of nasal valve obstruction

The nasal valve region plays a key role in nasal breathing. Although a variety of techniques for treating nasal valve compromise have been described in the international literature, they are rarely used in Japan. Both nostrils collapse completely under forced inspiration owing to weak cartilagenous support. Other than narrowing of both nostrils, no nasal deformity was present. Preoperative computed tomography (CT) revealed that the nasal septum was straight and that the inferior turbinate was not swollen. Anterior nasomanometry showed that nasal resistance in the sitting position was increased. Open septorhinoplasty was performed, and a 10-mm-wide L-strut was left intact. The internal nasal valve was widened with a pair of spreader grafts. The external nasal valve was reinforced with a columellar strut and an alar batten graft. The spreader graft was given the role of a sep-

tal extension graft to support the tip of the nose. Postoperative nasal resistance was less than the standard for adults, and the nostrils never collapsed under forced inspiration. Nasal valve compromise can cause nasal obstruction, even when the septum is straight, but can easily be treated with techniques well known in aesthetic surgery.

A new “J septoplasty” technique for correction of mild caudal septal deviation

A major drawback of the Killian incision is the inability to access the caudal septum and correct caudal septal deviation. Open and hemitransfixion septorhinoplasty are considered necessary in such cases. We developed a new septoplasty method named “J septoplasty” after Dr. Jiro Imura, which can be successfully used for patients with mild caudal septal deviation. In this study, we evaluated the outcome of this technique.

Methods: We prospectively collected data of 16 patients with mild caudal septal deviation who had undergone endoscopic septoplasty from November 2015 through October 2017. A modified Killian incision was made on the concave side of the septum. The central part of the cartilage was preserved, and excess cartilage was resected; the central part of the cartilage was sutured to the caudal cartilage.

Results: Postoperatively, the ratio of the area of the convex side to that of the concave side in the anterior portion of the nasal cavity was significantly improved, as revealed with CT analysis ($p < 0.001$). Nasal obstruction was significantly reduced or eliminated in all patients ($p < 0.001$).

Conclusion: The J septoplasty method for the correction of mild caudal septal deviation is easy to perform through a modified Killian incision and seems to be useful in selected cases.

Ilizarov minifixator

The Ilizarov minifixator is a useful device in various areas of hand surgery. Its clinical usefulness was demonstrated in the treatment of fractures (open and comminuted fractures and fractures adjacent to the joint), malunion of fractures, and pathological fractures caused by enchondroma and joint contractures. This device has also been used with good results in bone lengthening and the temporary traction of joints. Use of the Ilizarov minifixator is an effective and noninvasive method and is highly recommended for selected cases.

Surgical strategy for Apert syndrome: Retrospective study of developmental quotient and 3-dimensional CT

Many surgical techniques have been used to treat craniosynostosis. However, the indications for and timing of surgery remain unclarified. Most of the skull growth in children with craniosynostosis is completed in the first year of life, and the bone is strong enough to undergo distraction osteogenesis. This study aimed to consider the best timing for cranial expansion and surgical strategy for Apert syndrome. From January 2002 through December 2011, 13 patients with Apert syndrome underwent surgery and were followed up for more than 5 years. The primary surgery was fronto-orbital advancement. We evaluated the postoperative developmental quotient every year and evaluated cosmetic change with 3-dimensional CT when the patient was older than 5 years. Eleven of 13 patients had

improved developmental quotient scores, with no significant intergroup differences. Three-dimensional CT evaluation showed cases with remnant brachycephalic deformity in both groups. Two patients with remnant plagiocephalic deformities tended to have primary surgery earlier in life than did other patients. Thus, primary surgery had little effect on psychological development when delayed and can be delayed unless the intracranial pressure must be controlled. We conclude that fronto-orbital advancement cannot sufficiently improve the brachycephalic appearance; other procedures, such as posterior vault distraction, might be better alternatives.

A simple way to measure glucose and lactate values during free flap head and neck reconstruction surgery

Evaluation of flap blood flow is necessary to detect abnormalities and perform salvage surgery. This study determined whether intraflap blood glucose and lactate values measured with a simple instrument can detect impaired blood flow during head and neck reconstruction. We prospectively analyzed 82 cases of head and neck cancer; blood flow was impeded after reconstruction in 74 cases. Levels of glucose and lactate were regularly measured over a period of 48 hours, from the time of flap elevation, as predictor variables. Blood flow obstruction was the outcome variable. Other study variables included primary site, flap type, sex, age at operation, height, weight, body mass index, the presence or absence of diabetes, ischemia time, and operative time. Logistic analysis, using glucose and lactate values at the time of blood flow failure, was performed. Cutoff values were calculated with a receiver operating characteristic analysis. The choice of the flaps was as follows: 20 free jejunum flaps, 19 anterolateral thigh flaps, 12 fibular flaps, 11 radial forearm flaps, 8 rectus abdominis myocutaneous flaps, and 4 other flaps. Congestion was observed in 8 of 82 flaps, including 3 anterolateral thigh flaps, 3 radial forearm flaps, 1 free jejunum flap, and 1 rectus abdominis myocutaneous flap. The intraflap blood glucose values in the normally progressing cases gradually decreased until 16 hours postoperatively and thereafter recovered to normal levels. Intraflap blood lactate values were increased until 8 hours postoperatively and subsequently decreased. The odds ratio during congestion was significantly different for only lactate (odds ratio, 2.55; $P = .014$), and the cutoff values were 4.2 mmol/L for sensitivity and 6.7 mmol/L for specificity. Intraflap blood glucose and lactate values might reflect the transition of the postoperative circulation of free flaps. During congestion, lactate values change more sensitively than do blood glucose values.

Publications

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