

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 experience 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 an important 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 collapsed completely under forced inspiration owing to weak cartilagenous support. Other than narrowing of both nostrils, no nasal deformity was present. Preoperative computed tomography 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 septal 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.

Use of unsintered hydroxyapatite and poly-L-lactic acid composite sheets for management of orbital wall fracture

Although unsintered hydroxyapatite and poly-L-lactic acid (u-HA/PLLA) composite sheets have various applications, including in craniomaxillofacial fractures, orthognathic surgery, and orthopedic surgery, and have been proven to be safe and effective, no studies have reported the use of u-HA/PLLA composite sheets for orbital wall reconstruction with long-term follow-up. This study reports our preliminary results using the u-HA/PLLA composite sheet for orbital wall fractures. The SuperFIXSORB[®] MX sheet (u-HA/PLLA composite sheet, Takiron, Japan), measuring 30 × 50 mm and 0.5 mm thick, was used for hard reconstruction of orbital bone defects. Seventy-two patients with acute orbital wall fractures (within 2 weeks after sustaining the injury) treated at The Jikei University from January 2014 through August 2016 were included. We evaluated postoperative complications and the operability of the material. With the use of the u-HA/PLLA composite sheet, we observed no postoperative complications, such as infection, postoperative diplopia, or enophthalmos. In pure type orbital fractures (orbital fractures only), the operation time was significantly longer with combined inferior and medial wall fractures (n = 11; mean = 201.1 minutes; standard deviation [SD] = 36.6) than with inferior wall or medial wall fractures only (n = 51; mean = 135.0 minutes; SD = 54.4) (Mann-Whitney U test, P < 0.001). The u-HA/PLLA composite sheet is safe and can be used for reconstructing orbital wall fractures. We believe that further long-term functional and aesthetic assessments are necessary for infection, ocular movement disorder, enophthalmos, and any other complication.

Augmented external fixation of ulnar carpometacarpal joint fracture dislocations

Fracture dislocations of the ulnar-sided carpometacarpal (CMC) joint are uncommon, are frequently associated with fractures of the metacarpal base or hamate or both, and are often sustained by young men who have struck a hard object. Because such fracture dislocations are complex, anatomic alignment and joint congruency must be carefully restituted for mobility and stability. Miniaturization has allowed external fixation devices to be applied to the hand. Spanning external fixation utilizes the principles of “ligamentotaxis,” in which capsule-ligamentous structures are indirectly reduced through distraction forces. Treatment options for ulnar-sided CMC fracture dislocations are varied. We reviewed 10 patients with ulnar-sided CMC fracture dislocations who had most recently undergone acute surgical repair and intra-articular comminution with external fixation devices. The surgical technique included percutaneous Kirschner wire fixation and spanning with a miniature external fixation device. The follow-up period was at least 1 year. Radiographs from the patient’s most recent appointments were evaluated by 2 independent reviewers. Patients rated their level of pain and assessed functions using a subjective

outcome instrument. Mean total active motion, when comparing a traumatized digit to the same digit in the contralateral hand, was 100%. All fractures healed primarily with maintenance of the congruent joint space and without radiographic displacement or arthrosis. Patients had high satisfaction and all returned to their preinjury level of function. Our study demonstrates that in the management of ulnar-sided CMC fracture dislocations the use of an external fixation device is effective in reestablishing and maintaining normal hand anatomy, reducing pain, increasing function, and preserving motion.

Pharyngoesophageal reconstruction with the anterolateral thigh free flap

In Japan, pharyngoesophageal defects traditionally have been reconstructed with a jejunal flap. However, because of its advantages over the jejunal flap for reconstructing head and neck defects, the anterolateral thigh flap is often used. We recently introduced the anterolateral thigh flap for pharyngoesophageal reconstruction. The purpose of this retrospective study was to analyze the clinical and functional outcomes achieved with the anterolateral thigh flap. The medical records of 50 patients who had undergone pharyngoesophageal reconstruction with an anterolateral thigh flap were reviewed. Outcomes analyzed were perioperative mortality, morbidity, fistula, neck abscess, and other complications, swallowing, and tracheoesophageal speech function. Before reconstruction, 9 patients had undergone radiotherapy and 11 had undergone open abdominal surgery. The donor site of the anterolateral thigh flap was closed primarily in 1 patient, skin grafted in 42 patients, and closed with a local flap in 7 patients. Flap necrosis was partial in 1 patient and total in 1 patient. Pharyngocutaneous fistula occurred in 1 patient, and strictures occurred in 2 patients. This study demonstrates that with the anterolateral thigh flap, excellent clinical and functional outcomes can be achieved. The anterolateral thigh flap offers many advantages for pharyngoesophageal reconstruction and is as good as the free jejunal flap. We should further investigate which reconstructive method is superior.

Analysis of postoperative speech function after oropharyngeal cancer reconstruction

Speech and swallowing are the important postoperative functions of oropharyngeal cancer surgery. However, speech function after reconstruction in patients with lateral wall oropharyngeal cancer has rarely been reported. We analyzed speech function in 10 patients in whom lateral wall oropharyngeal cancer was resected and free flap reconstruction was performed at our institution from 2011 through 2015. The best evaluation scores were for Hirose's 10-point scoring system and Taguchi's method. The average score of the 100 monosyllable list was 82% (range, 70% to 95%). The most frequent incorrect answer was for plosive sounds. The resected area, speech function, and nasopharyngeal closure function were not significantly correlated. The score of 100 monosyllable list was found to be significantly correlated with nasal leakage during soft blowing ($r = 0.82$, $p < 0.01$). Although patients with lateral wall oropharyngeal cancer who had undergone reconstruction could generally obtain good speech intelligibility, a decrease in syllable articulation centered on plosive sounds was observed. These findings suggest that a cause is nasopharyngeal closure dysfunction.

Publications

Iimura J, Miyawaki T, Kikuchi S, Tsumiyama S, Mori E, Nakajima T, Kojima H, Otori N. A new “J sep-toplasty” technique for correction of mild caudal septal deviation. *Auris Nasus Larynx*. 2020 Feb; **47**(1): 79-83. doi: 10.1016/j.anl.2019.04.009. Epub 2019 May 9. PubMed PMID: 31078357.

Nishimura R, Wright L, Seitz WH Jr. Augmented External Fixation of Ulnar Carpometacarpal Joint Fracture Dislocations. *Tech Hand Up Extrem Surg*. 2019 Jun; **23**(2): 84-87. doi: 10.1097/BTH.0000000000000223. PubMed PMID: 30507722.