Department of Otorhinolaryngology

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General Summary

Our basic and clinical studies have examined: the pathogenesis of cholesteatoma and adhesive otitis media, surgery of the middle ear, navigation medicine, space motion sickness, nasal allergy, endoscopic endonasal sinus surgery, sleep apnea syndrome, phonosurgery, deglutition, and reconstructive surgery for head and neck tumors.

Research Activities

Otology

Our research projects span experiments on the fundamental aspects of middle ear mucosa regeneration and its clinical application, research on gene therapy targeting epithelium with residual cholesteatoma, and the development of a navigation system utilizing virtual-reality technology to improve the safety of surgery. In addition, we recorded cases of cholesteatoma surgery conducted at our hospital in our database, which is used to analyze the clinical condition of patients, consider operative methods, and review postoperative outcomes. In regard to research on hearing loss, we are studying the physiology of the inner ear in metabolic disorders using experimental animal models and collaborating with Shinshu University in the gene analysis of deaf patients.

Approximately 200 middle ear surgeries are performed annually at our hospital. The several cochlear implantations performed every year have also yielded favorable results. We conduct skull base surgery, including surgery for cholesteatoma in the petrous part, in conjunction with the department of neurosurgery, and have found that hearing and facial nerve function can be preserved in many cases. We also conduct acoustic tumor surgery via the posterior cranial fossa approach, middle cranial fossa approach, or translabyrinthine approach.

For secretory otitis media, we select the treatment method on the basis of the degree of development of the mastoid air cells. We determine the timing of the removal of indwelling ventilatory tubes in each patient by measuring changes in middle ear total pressure caused by transmucosal gas exchange.

In the field of neuro-otology, we have introduced vestibular evoked myogenic potential (VEMP) testing for the evaluation of saccular function in patients with such conditions as vestibular neuritis, Meniere's disease, and dizziness of unknown cause, to facilitate detailed diagnosis and treatment. Moreover, we are examining the prevalence of abnormal saccules, as measured with VEMP testing, in the ictal and nonictal phase of

Meniere's disease and the incidence of VEMP abnormalities according to disease stage. We also perform furosemide-loading VEMP in patients with suspected delayed endolymphatic hydrops as a putative test for endolymphatic hydrops. In addition, we are advancing research on the localization of the vestibular cortex and the projection from the vestibular system to the cerebral cortex by analyzing cerebral blood flow using single photon emission computed tomography in conjunction with the department of neurology.

In the selection of astronauts for the Japan Aerospace Exploration Agency, our neuro-otology team conducted the third-stage examination at the Tsukuba Space Center. In this examination, the aptitude for space flight was tested by applying "Coriolis stimulation" using a rotating chair to provoke motion sickness.

Rhinology

We have been analyzing data from patients undergoing endoscopic sinus surgery (ESS) for rhinosinusitis and from prospective studies of the postoperative course to identify factors related to refractory disease. In an attempt to expand the indications of ESS from paranasal sinus tumors to skull base surgery, including for spinal fluid leakage, skull base tumors, and pituitary gland tumors, and to improve the safety of ESS, we have conducted high-tech navigation surgery in which 3-dimensional endoscopic images and stereonavigation images are displayed in a superimposed manner, and we have identified problems and improvements relevant to this operative method. At present, we are making alterations to the device to improve accuracy and performance. We have examined the involvement of aspartate protease derived from fungi, especially from *Alternaria,* and the superantigen of *Staphylococcus aureus,* in the pathogenesis of refractory eosinophilic paranasal sinusitis. Through comprehensive gene expression analysis to clarify factors contributing to intractable chronic sinusitis, we have found that the expression profiles of genes related to virus infections differ between fibroblasts derived from cell cultures of nasal polyps and those derived from normal tissue cultures. At present, we are studying the regulatory mechanisms of gene expression to clarify the mechanisms underlying the differential gene expression.

Head and neck tumors

We perform radical surgery for common advanced cancers (*e.g.,* total pharyngolaryngectomy combined with reconstruction by free intestinal transplantation for hypopharyngeal cancer and total laryngectomy for laryngeal cancer); however, we actively undertake laryngeal conservation surgery (partial hypopharyngectomy combined with reconstruction by free flap and partial laryngectomy) as functional preservation treatments, especially to preserve vocal functions to the greatest extent possible, which has yielded favorable outcomes, from the aspects of both laryngeal preservation and survival. As conservative therapy and postoperative treatment for advanced cancer, concurrent chemoradiotherapy with cisplatin and fluoruracil or radiotherapy or both are performed and have yielded favorable results. We use narrow-band imaging endoscopy for diagnosis in routine practice and make good use of this technology for the diagnosis and treatment of early-stage mesopharyngeal and hypopharyngeal superficial cancers.

In research on cancer, we are performing fundamental studies to apply basic findings to future studies or clinical practice, and such fundamental studies include extraction of DNA from surgical specimens and evaluation of epidermal growth factor receptor expression, a target for molecularly targeted agents. We are planning clinical studies of human papilloma virus expression, which is thought to be involved in the development of mesopharyngeal cancer and oral cancer, and are planning to investigate treatments for various cancers, including vaccine therapy.

Vocal and swallowing functions

1. Phonosurgery: We are conducting outpatient day surgery using a flexible fiberoptic scope and laryngomicrosurgery using the microflap method under general anesthesia for vocal fold polyps, vocal cord nodules, and vocal cord cysts. To determine the optimal surgical indications and operative methods, we compare potential operative methods by means of fiberoptic laryngoscopy, stroboscopy, acoustic analysis, aerodynamic testing, and assessment using the Voice Handicap Index before and after surgery.
We have been performing outpatient day surgery for unilateral recurrent nerve paralysis by intravocal fold injection of atelocollagen for many years; however, we are also performing laryngeal framework surgery for patients who are not considered candidates for intravocal fold injection of atelocollagen.
2. Diagnosis and treatment for spasmodic dysphonia: We have been performing botulinum toxin treatment as first-line therapy for spasmodic dysphonia with the approval of the ethics committee of the university since December 2004. The prevalence of this disorder is increasing; therefore, evaluating methods of diagnosis and treatment is important, and an important future task is the development of surgical treatment methods for patients who do not respond to botulinum toxin treatment.
3. Evaluation and treatment of dysphagia: We collaborate with other departments, such as the departments of neurology and rehabilitation, and engage in teamwork with co-medical staff, such as nurses. We consider therapeutic strategies for clinical conditions by evaluating patients using videoendoscopy and videofluorography tests and are promoting training for swallowing.

Sleep apnea syndrome

We have attempted to construct a system that can deal with patients from various clinical fields besides otorhinolaryngology, including psychiatry, respiratory medicine, cardiovascular internal medicine, pediatrics, and dentistry, and with visiting medical officers. However, because the number of patients visiting our hospital is increasing, novel approaches are required. Thus, we are planning to provide remote medical care and to perform examinations for sleep disorders using "telesomnology," which is an applied version of an information technology topic covered by the Japanese Society of Sleep Research, starting this year. The clinical research items covered as research concepts include: 1) nasal breathing and the stability of sleep, 2) sleep disturbance associated with allergic rhinitis (pollen allergy), 3) attention-defict hyperactivity disorder—like symptoms in children with obstructive sleep apnea syndrome (OSAS), 4) physical development of children with OSAS, 5) maxillofacial growth and sleep-disordered

breathing in children with the adenoid facies, 6) a new surgical treatment for adult OSAS, integrating knowledge from many clinical departments, and 7) the development of telesomnology.

Sleep has been found to have significant associations with otorhinolaryngologic diseases, such as allergic rhinitis and gastroesophageal reflux disease.

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