

## 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*

We have performed basic research on regeneration of the middle ear mucosa and research designed for clinical application and have used virtual-reality technology to develop a navigation system to make surgery safer. We have entered the data from cholesteatoma surgery cases into a database and have performed an analysis of the surgical cases, an assessment of the surgical procedures, an epidemiologic survey, and an assessment of surgical outcomes. A genetic analysis of patients with hearing impairment was performed in collaboration with Shinshu University.

Operations for middle ear diseases have been performed in approximately 200 cases annually. Cochlear implant surgery has also been performed in several cases annually, and favorable results have been achieved. Operations on the skull base for cholesteatoma lesions of the petrous portion of the temporal bone have been performed in collaboration with the department of neurosurgery, and the numbers of cases in which hearing and facial-nerve function were preserved have increased. Approaches via the posterior cranial fossa, middle cranial fossa, and labyrinth have been used in operations for acoustic neuromas.

Outpatient clinics for otitis media and hearing impairment are held every Monday afternoon; the principal activities are the examination and follow-up of patients and the management of postoperative data. Changes in total middle ear cavity pressure associated with transmucosal gas exchange are measured in relation to the period of tympanostomy tube insertion for exudative otitis media and are used to make decisions about the timing of tube removal.

In neuro-otology, analyses of the results of experiments to demonstrate a relationship between fingertip contact pressure and postural control have been performed with a dynamic analyzer that employs a force plate and analysis software. In addition, the causative semicircular canal on the affected side in patients with benign paroxysmal

positional vertigo is identified with nystagmus tests using an infrared charge-coupled device camera or with electronystagmography, and physical therapy is performed.

### *Rhinology*

We have performed prospective clinical studies of endoscopic sinus surgery for paranasal sinusitis and of the postoperative course. We have used an endoscopic intranasal approach to treat many patients with diseases of the skull base, including paranasal sinus diseases, meningocele, pituitary diseases, and cerebrospinal fluid leaks, and have assessed the advantages and disadvantages of minimally invasive surgery.

With the aim of expanding the indications for and improving the safety of endoscopic sinus surgery, we developed a system for the superimposed display of stereoendoscopic images and stereonavigation and have applied it clinically.

We have investigated the involvement of fungi in intractable eosinophilic paranasal sinusitis. *Alternaria* induces production of interleukins 5 and 13 and interferon  $\gamma$  by isolated peripheral blood mononuclear cells from patients with paranasal sinusitis, but no such responses have been observed in healthy subjects. In addition, we have shown that the aspartate protease secreted by *Alternaria* induces various immunological reactions mediated by the protease-activated receptor-2 expressed on the surface of eosinophils and airway epithelial cells. We have also continued research related to the involvement of staphylococcal superantigens. With the aim of identifying the pathomorphogenetic factors of nasal allergy, we performed gene expression analysis of fibroblasts cultured from the inferior turbinates of patients with perennial allergic rhinitis and of healthy subjects. A comparative study of associations between the phenotypes and clinical disease patterns showed that the pattern of expression of many genes differed according to whether allergy was present.

### *Head and neck cancer*

The main treatments for head and neck cancer are surgery, radiotherapy, chemoradiotherapy, and radiotherapy combined with superselective intra-arterial chemotherapy. We treat patients only after considering such factors as the location of the primary cancer, disease stage, possibility of curative surgery, presence of complications, performance status, age, and social and family background in each case.

1. Surgery: To perform curative surgery with consideration for maximal preservation of function, we have been performing reconstructive surgery with free flaps (rectus abdominis flaps, free jejunal flaps, forearm flaps, and anterolateral thigh flaps) for patients with advanced cancer (50 to 60 patients annually). In addition, we perform partial laryngectomy in cases of recurrence after radiotherapy and cases of T2-T3 laryngeal cancer and make efforts to preserve the larynx.

2. Radiotherapy has mainly been conducted on an outpatient basis to treat early cancer cases. Chemoradiotherapy has also been performed with the oral anticancer preparation S-1.

3. We perform chemoradiotherapy, with cisplatin and fluorouracil (5-FU) and concomitant radiotherapy, and subsequently perform adjuvant chemotherapy. Eligible cases are cases of cancers of the oropharynx, hypopharynx, or cervical esophagus in

which laryngeal preservation is impossible and cases in which curative resection is impossible. We are planning to assess the introduction of chemoradiotherapy with a combination of the oral anticancer drug S-1 and cisplatin or chemoradiotherapy with a combination of 3 drugs by adding taxotere to cisplatin and 5-FU.

4. Radiation therapy combined with superselective intra-arterial infusion chemotherapy is an effective treatment for patients with extremely advanced disease for which curative surgery is impossible, and its introduction is being considered. We are using narrow-band imaging endoscopy (narrow-band filter endoscopy) for the early diagnosis of cancers of the head and neck and are striving for early detection of superficial cancers of the oropharynx and hypopharynx.

#### *Research on phonation and swallowing function*

##### 1. Phonosurgery

We perform day surgery in the outpatient clinic with a flexible fibroscope or perform laryngomicrosurgery under general anesthesia to treat vocal cord polyps, vocal nodules, and vocal cord cysts. We have introduced the latest microflap method for laryngomicrosurgery. We are performing research to enable stricter determination of surgical indications by making comparisons based on evaluations by means of preoperative and postoperative acoustical analyses, aerodynamic tests, and surveys.

We have been performing laryngeal framework surgery in cases of unilateral recurrent nerve paralysis in which there has been no improvement after atelocollagen injection day surgery.

##### 2. Diagnosis and treatment of spasmodic dysphonia

Botulinum therapy is the treatment of first choice for spasmodic dysphonia and was approved by the University's Ethics Committee in December 2004. The number of cases has been increasing, and the results of treatment surgical treatment for cases in which botulinum therapy proves ineffective are being assessed.

##### 3. Evaluation and treatment of swallowing disorders

Cooperation with other departments, such as the departments of neurology and rehabilitation, and teamwork with allied medical personnel, including nurses, are important for the evaluation and treatment of swallowing disorders. We evaluate patients on the basis of videoendoscopic examination of swallowing and video fluorography tests and have been assessing treatment strategies and conducting swallowing exercises.

#### *Research on sleep apnea syndrome*

The relationship between sleep disorders and physical diseases, including metabolic syndrome, has been attracting attention. In children, attention has been drawn to the fact that sleep disorders affect the development of brain functions, including emotions, as in children who suddenly have tantrums. The aspects we have been studying include: the stability of nose breathing and sleep, sleep disorders in allergic rhinitis (pollinosis), attention deficit-hyperactivity disorder-like manifestations, the physical development of children with obstructive sleep apnea syndrome, and new surgical treatments for adults with obstructive sleep apnea syndrome.

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