主　　　題：耳鼻喉頭頸外科超音波未來之發展

Moderator:　陳俊男 Chun-Nan Chen 臺大醫院耳鼻喉部
　　　　　　林琬妮 Wan-Ni Lin 林口長庚醫院耳鼻喉部

| 時間 Time | 演講題目 Topic | 演講者 Speaker |
|---|---|---|
| 09:00-09:10 | Opening Remarks | 楊宗霖 Tsung-Lin Yang 臺大醫院耳鼻喉部 |
| 09:10-09:35 ENT-S01 | Ultrasound Neuromodulation | 蕭名彦 Ming-Yen Hsiao 臺大醫院復健部 |
| 09:35-10:00 ENT-S02 | Ultrasound-guided Interventional Pain Management in Head and Neck | 周韋翰 Wei-Han Chou 臺大醫院麻醉部 |
| 10:00-10:20 ENT-S03 | Modulating Tumor Microenvironment by Ultrasound with Oxygen-loaded Microbubbles | 何奕儒 Yi-Ju Ho 國立陽明交通大學 工程生物科學學院 |
| 10:20-10:40 | Coffee Break | |
| 10:40-11:00 ENT-S04 | Ultrasound in Parotid Tumor: Literature Review and Our Experience | 葉家齊 Chia Chi Yeh 長庚醫院耳鼻喉科 |
| 11:00-11:20 ENT-S05 | The Application of Neck Ultrasound for Thyroid Cancer from Diagnosis to Recurrence --Limited Experience Sharing | 林玟君 Wen-Chun Lin 臺中榮民總醫院耳鼻喉科 |
| 11:20-11:40 ENT-S06 | The Application of Ultrasound and Sialendoscopy in Patients with Chronic Sialadenitis | 張嘉帆 Chia-Fan Chang 臺北榮民總醫院耳鼻喉頭頸醫學部 |
| 11:40-12:00 ENT-S07 | Artificial Intelligence-assisted Head and Neck Ultrasound | 鄭評嘉 Ping-Chia Cheng 亞東醫院耳鼻喉科 |

## ePoster

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|---|---|---|
| ENT-P01 | Utility of Sydney System for Reporting the Neck Lymphadenopathy Underwent Real-time Ultrasound Guided Fine-Needle Aspiration | 廖立人 Li-Jen Liao 亞東紀念醫院 |

ENT-S01
**Ultrasound Neuromodulation**

*Ming-Yen Hsiao*
*Department of Physical Medicine and*
*Rehabilitation, National Taiwan University*
*Hospital, College of Medicine, National Taiwan*
*University*

Focused ultrasound (FUS) has emerged as a promising modality for various brain therapies, including thermal ablation for essential tremor and neuropathic pain, and non-invasive blood-brain barrier (BBB) opening for targeted drug delivery. In parallel, focused shockwave therapy (FSW), characterized by a single, high-amplitude acoustic pulse with a prolonged negative phase, offers enhanced cavitation efficiency. We have developed FSW-mediated BBB opening techniques that require lower doses of microbubbles and less acoustic energy than conventional FUS. Furthermore, we introduced a novel FSW-mediated method to open the blood-cerebrospinal fluid barrier, demonstrating safe and effective drug delivery to the CNS in multiple disease models.

Another key mechanism gaining recognition is ultrasound-induced neuromodulation through the activation of mechanosensitive ion channels, enabling parameter-dependent, target-specific brain stimulation. In addition, FUS-mediated modulation of glymphatic flow presents a novel therapeutic approach for CNS disorders associated with impaired waste clearance, such as stroke, Alzheimer's disease, and hydrocephalus.

In our photothrombotic stroke mouse model, LIFU restored CSF influx, reduced infarct volume and edema, and improved neurological outcomes. In a human pilot study, subacute stroke patients received LIFU targeting the contralesional motor cortex. No adverse events were observed, and patients exhibited sustained improvements over three months.

Collectively, these results highlight the safety, feasibility, and therapeutic potential of LIFU for non-invasive brain stimulation and paving the way for novel treatments of CNS disorders.

ENT-S02
**Ultrasound-guided Interventional Pain Management in Head and Neck**

*Wei-Han Chou*
*Department of Anesthesiology, National Taiwan*
*University Hospital*

Ultrasound-guided interventional techniques for managing head and neck pain enhance precision and safety while allowing for smaller injectate volumes. The advantages over traditional landmark or fluoroscopic methods include:
1. **Dynamic Identification of Vessels:** Utilizing color/power Doppler, practitioners can dynamically identify variant arteries and veins, significantly reducing the risk of embolism and hematoma.
2. **Clear Delineation of Fascial Planes:** This technique enables precise targeting of fascial planes that dictate drug spread, facilitating effective nerve blocks and perineural hydro-dissection.
3. **Avoidance of Ionizing Radiation:** This is particularly crucial for younger patients, pregnant women, or those with high cumulative exposure to radiation.
4. **Portability and Cost Efficiency:** The ultrasound equipment is portable, allowing for use in various settings. Ultrasound can be more cost-effective compared to serial fluoroscopic suites in many healthcare systems.
5. **Immediate Visualization of Complications:** Practitioners can quickly identify complications such as intravascular injection or hematoma.

Effective pain management in the head and neck involves several interventional techniques. Cervical facet joint and medial branch interventions are suitable for diagnostic blocks and radio-frequency planning. C2 dorsal root ganglion injection for headache can be performed precisely

Nerve blocks, including greater, lesser, and third occipital nerve blocks, are effective for treating occipital neuralgia and cervicogenic

headaches. Superficial cervical plexus blocks address anterolateral neck neuropathic pain.

For radicular pain syndromes, deep selective cervical nerve root blocks minimize epidural spread while effectively targeting the nerve roots. Stellate ganglion blocks at C6 or C7 can reduce the risk of vascular injuries and are indicated for complex regional pain and refractory headaches.

Additionally, ultrasound-guided peripheral branch blocks of the trigeminal nerve and myofascial trigger point injections are beneficial for managing neuralgia and cervical dystonia. These techniques enhance treatment outcomes and improve patient care in the head and neck region.

## ENT-S03
## Modulating Tumor Microenvironment by Ultrasound with Oxygen-loaded Microbubbles

*Yi-Ju Ho*
*Department of Biological Science and Technology, College of Engineering Bioscience, National Yang Ming Chiao Tung University*

Microbubbles, originally developed as ultrasound imaging contrast agents, not only provide microvascular flow information but also serve as carriers for therapeutic drugs and gases. When stimulated by focused ultrasound, microbubbles undergo cavitation—expansion and contraction—that enables localized release of their payload and enhances vascular permeability, thereby promoting targeted drug or gas delivery. Given that oxygen is a critical energy source involved in regulating cellular metabolism, our research team developed a localized oxygen therapy strategy using oxygen-loaded microbubbles activated by focused ultrasound. This approach rapidly increases the oxygen partial pressure at the targeted site in vivo and sustains it for over an hour, effectively reoxygenating hypoxic tissues. In tumor therapy, oxygen-loaded microbubbles can reoxygenate hypoxic tumors and promote normalization of the tumor vasculature. This

improves both oxygen and drug delivery, thereby enhancing the efficacy of chemotherapy, radiotherapy, and anti-tumor immune activation, while also potentially reducing radiation-induced tumor fibrosis. Furthermore, treatment with oxygen-loaded microbubbles has demonstrated the ability to prevent ischemia-reperfusion injury and reduce infarct size following thrombolysis in ischemic stroke models. Given these multi-functional capabilities, our research team believes that oxygen-loaded microbubbles hold significant translational potential. In the future, this technology may enable the development of an ultrasound-guided, localized oxygen therapy platform for precision medicine and accelerate its advancement into clinical trials and therapeutic applications.

## ENT-S04
## Ultrasound in Parotid Tumor: Literature Review and our Experience

*Chia-Chi Yeh, Yi-Chan Lee, Kai- Ping Chang*
*Department of Otolaryngology– Head and Neck Surgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan*

Briefly present the findings of ultrasound in parotid area and the importance to differentiating the depth of the parotid tumor before the surgical intervention.

We evaluate the diagnostic efficacy of the minimum fascia-tumor distance (MFTD) in distinguishing deep-lobe benign parotid tumors from superficial-lobe tumors through both an original study and a meta-analysis. In our study, patients with tumors in the deep lobe had a significantly greater MFTD than patients with tumors in the superficial lobe. Furthermore, we also got a cutoff value (3.50mm) with good sensitivity and specificity. Our meta-analysis included seven studies covering a total of 1689 tumors. The pooled values for sensitivity, specificity, and diagnostic odds ratio (OR) of MFTD were 81.0%, 89.0%, and 32.2, respectively. The MFTD demonstrated reliable diagnostic accuracy in identifying deep

lobe benign parotid tumors and may be incorporated into standard evaluations before parotidectomy.

Limitations of the MFTD in ultrasound are still needed discussion and a more objective and acceptable procedure guideline should be developed.

## ENT-S05
### The Application of Neck Ultrasound for Thyroid Cancer from Diagnosis to Recurrence --Limited Experience Sharing

*Wen-Chun Lin*
*Department of Otolaryngology--Head & neck Surgery, Taichung Veterans General Hospital*

Neck ultrasonography plays a pivotal role in head and neck surgery, particularly in the diagnosis of newly detected thyroid carcinoma, the detection of cervical lymph node recurrence, and pre-operative localization using methylene blue.

For newly diagnosed thyroid cancer, ultrasound-guided fine-needle aspiration cytology provides real-time imaging and improves diagnostic accuracy, reducing unnecessary surgical inter-ventions.

Additionally, cervical lymph node evaluation with ultrasound-guided FNA cytology or wash-Tg demonstrates high sensitivity in detecting potential metastases or recurrences, thus offering critical guidance for subsequent clinical management.

For cases of cervical lymph nodes metastasis or localized recurrence, ultrasound-guided methylene blue injection preoperatively enables precise localization of target lesions. This approach facilitates accurate intraoperative identification, potentially shortening operative time and mini-mizing complication risks.

This presentation will review recent evidence and our limited experience in our hospital to highlight the value and practical techniques of neck ultrasonography in diagnosing primary thyroid cancer, detecting cervical lymph node recurrence, and guiding preoperative methylene blue locali-zation, ultimately aiming to enhance surgical precision and patient safety.

## ENT-S06
### The Application of Ultrasound and Sialendoscopy in Patients with Chronic Sialadenitis

*Chia-Fan Chang*
*Department of Otorhinolaryngology— Head and Neck Surgery, Taipei Veterans General Hospital School of Medicine, National Yang Ming Chiao Tung University, Taipei, Taiwan*

Chronic sialadenitis is one of most common non-neoplasm diseases in major salivary glands. The causes of chronic sialadenitis may be related to recurrent infection, obstruction, lymphoepithelial disease, granulomatous disease, immunoglobulin G4 disease, post-treatment effect, etc. Patients may present with unilateral or bilateral swelling, or pain of the salivary gland, foul taste in the mouth, or xerostomia.

High-resolution ultrasound is a cost-effective, noninvasive imaging modality which can be used as the first diagnostic imaging tool in assessment of chronic sialadenitis. Chronic sialadenitis has a variable imaging depending on the severity and duration of disease. Focal or diffuse lesions, dilated ducts, areas of calcification, or stones within the glands may be detected. Correlation of imaging findings with clinical presentation can aid correct diagnosis.

Sialendoscopy is a minimal invasive surgery and offers direct visualization of the ductal system, enabling diagnosis of ductal pathology and conducting intervention. Chronic sialadenitis is the main indication for sialendoscopy, especially in patients with chronic obstructive sialadenitis, juvenile recurrent parotitis, Sjogren disease, or radioactive iodine sialadenitis. When the surgeon combines use of ultrasound and sialendoscopy, the diagnosis could be more accurate and the management strategy could be more com-prehensive.

In summary, both ultrasound and sialendo-scopy are complementary modalities for the diagnosis and treatment of chronic sialadenitis. In this lecture, I will share our experience with integrating ultrasound before, during, and after sialendoscopy. This combined approach could achieve high rates of symptom relief with low complication and recurrence rates, and should be considered a first-line management strategy for patients with chronic sialadenitis.

ENT-S07

## Artificial Intelligence-assisted Head and Neck Ultrasound

*Ping-Chia Cheng*
*Department of Otolaryngology-Head and Neck Surgery, Far Eastern Memorial Hospital.*

Ultrasound is the main imaging modality in the evaluation of head and neck tumors due to its real-time capability, cost-effectiveness, and non-invasive nature. However, the diagnostic performance of ultrasound is operator-dependent, often influenced by the clinician's experience. Recent advances in artificial intelligence (AI), particularly in deep learning, have significantly enhanced the automation and interpretation of ultrasound images. Integrating AI into ultrasound workflows can improve consistency, reduce inter-operator variability, and assist non-expert users. In this section, I will share the applications of AI in thyroid nodule assessment, lymph node evaluation, salivary gland analysis, and anatomical education.

ENT-P01

## Utility of Sydney System for Reporting the Neck Lymphadenopathy underwent Real-time Ultrasound Guided Fine-Needle Aspiration

*Li-Jen Liao[1], Wan-Lun Hsu[2]*
*[1]Department of Otolaryngology, Far Eastern Memorial Hospital, Taipei, Taiwan [2]Data Science Center, College of Medicine, Fu Jen Catholic University, New Taipei City, Taiwan*

**Background:**

The Sydney lymphadenopathy cytology system was proposed in 2020, but its validation for neck ultrasound-guided fine-needle aspiration cytology remains to be explored.

**Materials and Methods:**

Patients with lymphadenopathy who under-went ultrasound and cytology were included. The final diagnosis relies on histology and consensus of the multidisciplinary team. Cytology results follow the Sydney system (L1-L5); L3-L5 categories indicate malignancy, and we further calculate sensitivity, specificity, and overall accuracy

**Results:**

From July 2020 to April 2023, a total of 208 patients were included, of which 68 had malignant tumors and 140 were benign cases. According to the Sydney system, the malignancy rates for L2 to L5 are 2%, 89%, 100%, and 98%, respectively. The Sydney system demonstrated 97% sensitivity, 99% specificity, and 99% accuracy in the diagnosis of neck lymphadenopathy

**Conclusion:**

The study shows that the Sydney system is highly effective in reporting neck lympha-denopathy.