

Liverpool Head & Neck Ultrasound Course

Course Syllabus

This intensive two-day comprehensive course with hands on workshop, focuses on Ultrasound (US) techniques (hands on training), its application, US guided sampling relevant to head & Neck, and an expert panel discussion which will allow an excellent opportunity to ask questions and discuss clinical scenario, including difficult decision-making scenario.

Core Learning Objectives of this course

By the end of this course, participants will be able to:

- Optimize high-frequency US equipment for the imaging of soft tissue structures of the neck.
- Develop a systematic approach to scanning techniques pertinent to head and neck US and utilise strength of neck US to its full potential.
- Systematically evaluate complex thyroid, salivary gland, and lymph node pathologies.
- Apply advanced modalities such as Colour Doppler, Elastography, and Contrast-Enhanced Ultrasound (CEUS) to neck soft tissue structures.
- Safely plan and execute US guided fine-needle aspirations (FNA) and core needle biopsies (CNB) in the neck.
- Gain understanding of role and appropriateness of FNA and CNB in various head & neck presentations and pathologies.
- During scenario based talks and hands on workshop delegates will learn and practice various intervention relevant to head & neck (on suitable phantoms).
- Learn and ask questions during the interactive expert panel discussion (containing radiologists, surgeons, oncologists and cytopathologist), providing unique opportunity to discuss difficult and challenging scenario.
- Learn about use of cytology in US-guided FNA techniques, including the context of One Stop Clinic. Cytopathologists will help develop the concepts to hone the sampling techniques to improve adequacy of obtained samples.

Course Contents (refer to course programme)

Principles of Ultrasound

Learning Objectives

- Equipment Optimization & Transducer Selection and preset.
- Transducer Mechanics: Linear arrays vs. curved arrays; electronic focusing; footprint selection for the cervical region.



- Frequency Optimization: Balancing high-frequency spatial resolution (10–15 MHz) with penetration limits in deep cervical compartments.
- System Control Mastery: Real-time optimization using Time Gain Compensation (TGC), overall gain, compound imaging (spatial compounding), and harmonic imaging.
- Artifact Identification & Elimination

Neck Anatomy, spaces and US correlation

Learning Objectives

- Identify anatomical boundaries of cervical zones, fascial layers, and vascular compartments.
- Characterize normal sonographic signatures of thyroid tissue, parathyroid glands, lymph nodes, and salivary glands.
- Distinguish normal vascular variants from pathological expansions within the neck spaces.
- Nodal level anatomy
- Execute a highly reproducible, comprehensive multi-planar sweep protocol of the central and lateral neck compartments.
- Develop and learn step-by-step scan protocol

Thyroid

Learning Objectives

- Normal thyroid and its variant with clinical relevance
- Classification & Risk Stratification (TI-RADS & BTA) - Apply standardized risk-stratification systems—specifically EU-TIRADS and British Thyroid Association (BTA) U-classification—to calculate malignancy probability scores for detected nodules.
- Determine appropriate clinical next-steps—including FNA thresholds, active surveillance timelines, or routine follow-up intervals—based on calculated risk scores and maximum nodule dimensions.
- Synthesize sonographic findings into a standardized clinical report utilizing universally accepted lexicon and risk-stratification nomenclature.
- Differentiate between benign and malignant sonographic features.
- Assess the vascular architecture of thyroid lesions, also valuable to plan path of FNA needle.
- Incorporate tissue elasticity indicators (where elastography is available) to evaluate the relative stiffness of a nodule as an adjunctive marker for malignancy.
- Formulate a structured evaluation protocol for incidental thyroid findings discovered on cross-sectional imaging (CT, MRI) or FDG-PET CT and other molecular/functional imaging.
- Appraise the risk and clinical significance of a 18F-FDG PET-avid thyroid nodule.



Thyroid – what does a surgeon want to know

🎯 Learning Objectives

- Evaluate the exact anatomical relationship of a nodule or malignancy to the thyroid capsule, specifically checking for signs of extrathyroidal extension (ETE) into adjacent structures like the recurrent laryngeal nerve, trachea, or oesophagus.
- Map the central and lateral neck compartments methodically to identify lymph node metastases, providing the exact anatomical boundaries for central Vs lateral neck dissection a surgeon requires to plan.
- Crucial spatial landmarks, including the inferior extension to superior mediastinum.
- Evaluation of thyroidectomy bed and neck in Post thyroidectomy patients for recurrence or metastatic disease.
- Communicate ultrasound findings using a highly precise, clinically actionable lexicon that answers the surgeon's three core pre-operative questions: Where is it exactly, what does it invade, and where has it spread?

Practical Workshop 1:

🎯 Learning Objectives

- Live demonstration to consolidate above.
- Healthy volunteer scanning by delegates – neck sweeps, neck levels, normal structures and landmarks

Salivary glands

🎯 Learning Objectives

- Identify normal anatomy of parotid, submandibular and sublingual glands, including Stensen's/Wharton's ducts.
- Differentiate normal homogeneous, moderately hyperechoic/isoechoic glandular parenchyma from surrounding subcutaneous fat and muscular structures using high-resolution linear transducers.
- Apply scanning technique: Demonstrate a systematic bilateral scanning protocol in both transverse and longitudinal planes, utilizing Colour/Power Doppler as appropriate.
- Evaluate obstructive disease (Sialolithiasis)
- Focal Lesions and Neoplasms (including metastatic deposit)- differentiate benign from malignant features.
- Involvement of superficial Vs deep lobe of parotid and include this in US report.
- Identify systemic and autoimmune involvement: Describe parenchymal heterogeneity and scoring patterns (such as OMERACT criteria) associated with Sjögren's disease, IgG4-related disease, or sarcoidosis.



Parathyroid glands

Learning Objectives

- Anatomy and Embryology - explain the embryological descent of the parathyroid glands and how this dictates common ectopic locations.
- Differentiate between the typical locations of the superior and inferior glands relative to the recurrent laryngeal nerve and the thyroid lobes.
- Pathologies and clinical conditions – Parathyroid adenoma, hyperplasia and carcinoma.
- High resolution scanning techniques - execute a systematic parathyroid ultrasound scanning protocol using a high-frequency linear transducer, optimizing patient positioning and stretching from the hyoid bone to the sternal notch.
- Appraise common US mimics, implementing strategies to reliably differentiate enlarged parathyroid glands from thyroid nodules, cervical lymph nodes, and the oesophagus.
- Diagnostic correlation and multimodality Imaging
- Synthesize ultrasound results with nuclear medicine studies (Tc-99m Sestamibi / SPECT/CT) to verify functional uptake, maximizing pre-operative localization specificity.
- Evaluate the specific diagnostic clinical indications for ordering cross-sectional problem-solving modalities, such as 4D-CT (evaluating rapid arterial enhancement and washout) or Choline PET/CT.
- Formulate a multi-modality diagnostic framework to accurately localize and confirm ectopic parathyroid adenomas hidden within the chest or deep neck compartments.
- Outline the indications and risks for US guided interventional procedures, including FNA with PTH washout for difficult diagnostic cases

Practical Workshop 2: Neck Pathologies (volunteering patients)

Learning Objectives

- Skill Station – Thyroid
- Skill Station – Parathyroid glands
- Skill Station – Salivary glands

US New technique/advances

Learning Objectives

- Review and demo of new/upcoming US technology, like AI for thyroid nodule evaluation – pros and cons.



Lymph node assessment and neck levels

Learning Objectives

- Define the anatomical boundaries of seven cervical lymph node levels (levels I–VI/VII) according to standard classifications.
- Demonstrate a systematic scanning protocol to ensure complete coverage of the neck, pertinent to all neck level.
- Identify normal versus abnormal lymph node characteristics (size, shape, shape, signal (echo), softness).
- Correlate specific lymph node levels with common primary drainage sites (e.g, Level I with the oral cavity/submandibular gland, supraclavicular/Virchow's node with thoracic or gastrointestinal malignancies).

Metastatic neck and other nodal pathologies

Learning Objectives

- Differentiate normal and reactive lymph nodes from metastatic and malignant lymph nodes based on key sonographic features.
- Recognize specific internal architectural changes highly indicative of malignancy, such as microcalcifications, cystic necrosis, and reticular patterns.
- Assess for extranodal extension (formerly extracapsular spread - ECS) by evaluating the nodal borders and the loss of surrounding tissue planes.
- Disease-Specific Nodal Profiles - Thyroid carcinoma metastasis: Identify characteristic features like microcalcifications, cystic changes, and hyper-echogenicity. Squamous cell carcinoma (SCC) metastasis: Identify prone-to-cystic necrosis, rounded, hypoechoic nodes. Lymphoma: Recognize large, rounded, pseudocystic, markedly hypoechoic nodes with variable vascularity, including distribution of lymphadenopathy.
- Compare cervical nodal pathologies with non-neck regional nodal basins (e.g., axillary, inguinal) to identify common overlapping features of metastatic disease.

Pathologist perspective on FNAs and biopsy - Tips and pitfalls

Learning Objectives

- Compare FNAC and core needle biopsy (CNB): Evaluate the technical advantages, limitations, and specific clinical scenarios where FNAC is preferred over core biopsy, or vice versa, from a pathologist's perspective.
- Navigate common diagnostic pitfalls: Recognize and mitigate frequent pre-analytical errors, including blood obscuration, crush artifacts, cystic fluid dilution, and targeting necrotic areas.
- Overview of Thy categories and Bethesda System.



- Improve multidisciplinary communication: Formulate effective strategies for structured reporting and feedback loops between radiologists and pathologists to resolve discordant radiologic-pathologic findings.

How to prepare slide for cytology

Learning Objectives

- Identify and select the correct materials required for cytological sampling, including glass slides, needles, syringes, and personal protective equipment (PPE).
- Maintain a clean and organized workspace to prevent sample contamination.
- Perform the FNA or CNB collection technique safely and effectively.
- Demonstrate the "squash" (compression) technique to create a uniform, single-cell monolayer without crushing the cells.
- Apply alternative smear techniques (such as the line smear or starfish prep) based on the fluid viscosity of the sample.
- Overview of Fixation & Processing
- Rapid On-Site Evaluation (ROSE)
- Label slides accurately with patient identifiers, date, and anatomical site according to laboratory compliance standards.
- Troubleshoot common slide preparation errors, such as overly thick smears, excessive blood contamination, or drying artifacts.

One stop neck clinic

Learning Objectives

- Indications & Triage: Determine appropriate clinical indications for neck ultrasound and evaluate when to escalate to alternative or complementary modalities (such as cross-sectional CT, MRI, or FNA).
- Systematic Scanning: Perform a complete, reproducible, and standardized B-mode and Colour/Power Doppler scan of the entire neck in a time-efficient manner.
- US guided Intervention: Demonstrate competence in performing safe, real-time, ultrasound-guided FNA or CNB of focal neck lesions or lymph nodes.
- Clinic Workflow & Patient Care (Operational/One-Stop Model) Same-Day Triage & Communication: Execute a multidisciplinary "one-stop" workflow where clinical assessment, ultrasound imaging, image-guided sampling, and initial risk stratification/counselling occur within a single patient visit.
- Structured Reporting: Generate clear, structured sonographic reports utilizing standardized neck-imaging and reporting terminology (e.g., TI-RADS or equivalent regional guidelines) that directly inform surgical or oncological management.
- Patient Experience & Safety: Manage patient anxiety during same-day invasive procedures (FNA/CNB) and adhere strictly to local aseptic technique and anticoagulation safety protocols.



Metastatic neck – Surgeons and Oncologists perspective

Learning Objectives

- Multidisciplinary understanding of metastatic neck disease management, optimizing patient outcomes through synchronized surgical and oncological decision-making.
- Accurately classify neck dissections (radical, modified radical, and selective) based on the levels of nodal involvement.
- Correlate preoperative imaging (CT, MRI, PET-CT) with intraoperative surgical landmarks to plan safe resection margins.
- Determine the clinical indications for choosing observational management (active surveillance) versus therapeutic neck dissection.
- Formulate intraoperative strategies to safely manage critical structures (e.g., internal jugular vein, carotid artery, spinal accessory nerve).
- Evaluate immediate and long-term postoperative complications, and what imaging modalities to utilise to exclude or establish these.
- Risk Stratification & Staging - Analyze histopathological risk factors—specifically i-ENE and positive margins—to justify adjuvant therapies.
- Differentiate treatment pathways based on viral status, specifically p16/HPV-associated versus HPV-negative squamous cell carcinomas.
- The Multidisciplinary/Tumor Board Collaboration to formulate Salvage Strategies, Survivorship & Functional Outcomes

Intervention in H&N - FNA and Core Needle Biopsy (CNB)

Learning Objectives

1. Knowledge & indicative understanding
 - Recall neck anatomy and safe zones: Identify critical structures in the head and neck (carotid artery, internal jugular vein, vagus nerve, trachea, etc).
 - Compare FNA vs. CNB: Explain the distinct clinical indications, diagnostic yields, cellular vs. histological sampling differences, and complication profiles (e.g., hemorrhage, nerve injury, seeding) for both techniques.
 - Assess pre-procedure safety: Evaluate patient contraindications, review coagulation status and antiplatelet/anticoagulant medications, and obtain informed/written consent. WHO checklist.
2. Execute probe and needle alignment
 - Understand beam geometry: Describe in-plane versus out-of-plane needle-tracking physics, acoustic shadowing, and how to troubleshoot a "vanishing needle" under real-time ultrasound.
 - Master in-plane needle visualization to track the entire shaft and tip continuously.
 - Master out-of-plane needle visualization to pinpoint the exact intersection of the needle tip with the target lesion.
 - Apply proper local anaesthesia without obscuring the target.



- Execute controlled needle oscillation with an optimal intra-lesional/nodular dwell time to maximize cellular yield while minimizing blood contamination.
 - Prepare quality direct smears or liquid-based cytology collections.
 - Ultrasound-Guided CNB - select the appropriate gauge device (typically 18G to 14G depending on the lesion and depth).
 - Deploy the spring-loaded or semi-automated core biopsy mechanism safely while avoiding adjacent neurovascular structures.
 - Handle, fix, and transport core tissue fragments appropriately for histopathology and ancillary testing.
3. Safety, Complication Management & Quality assurance
- Implement checklist discipline (confirm patient identity, side/site, indication, and time-out protocols prior to skin puncture).
 - Manage immediate complications: Recognize and manage minor haemorrhage, vasovagal reactions, or hematoma formation post-biopsy.
 - Evaluate sample adequacy: Correlate real-time needle placement and imaging findings with on-site cytology evaluation or core-tissue visual inspection to reduce non-diagnostic or repeat-tap rates.
 - Self-audit of adequacy.

Other neck lumps

Learning Objectives

- Review of other non-malignant presentations, including lesions, that can be characterised on US itself or with use of other modalities and do not require intervention.
- Important consideration will be ectopic thyroid, residual thymus, ranula and laryngocoele etc.
- Possible branchial cleft cyst, ideally require exclusion of other pathologies and differentiation with cystic/necrotic metastatic node. Please be beware of calling/labelling cystic/necrotic metastatic node, a branchial cleft cyst.

Salivary gland Intervention

Learning Objectives

- Compare the indications, contraindications, and clinical outcomes of various image-guided techniques, including sialendoscopy, balloon dilation, and ultrasound-guided core needle biopsy.
- Technical & Practical Skills.
- Other procedures, like salivary gland wash out and US guided botox injection.
- Perform high-resolution ultrasound evaluations of the major salivary glands and identify relevant landmarks like the facial artery and retromandibular vein.
- Demonstrate safe and accurate ultrasound-guided FNA and CNB of salivary masses.
- Execute cannulation and contrast injection for fluoroscopic sialography or cone-beam CT sialography.



- Apply image-guided techniques to manage obstructive disease, including wire-guided balloon dilation of strictures or stone retrieval/fragmentation.
- Clinical Judgment & Patient Care.
- Formulate a patient-specific pre-procedural plan, including the management of antithrombotic medications and informed consent.
- Recognize and acutely manage intra-procedural and post-procedural complications, such as ductal perforation, sialocele formation, infection, or transient nerve neuropraxia.
- Establish an evidence-based post-interventional follow-up strategy to monitor ductal patency and symptom relief.

Practical Workshop – 3 – Intervention hands-on session (1)

Learning Objectives

- Skill station 1 Lymph nodes FNA
- Skill station 2 slide prep.
- Skill station 3 Thyroid FNA

Practical Workshop – 4 – Intervention hands-on session (2)

Learning Objectives

- Skill station 1– Core Biopsy
- Skill station 2 Ablation of solid lesion
- Skill station 3 Ablation of cyst

Lessons learnt and how to avoid error

Learning Objectives

- Key take home points – to be explained by review of cases, e.g, Zoom out, “If it looks cystic it’s solid and if it looks solid it’s cystic”(but cysts can look cystic and solid lesions can look solid!), Be systematic, Tailor your techniques, Perfection.
- To stab or not to stab? That is the question!”
- Don’t do the wrong thing in the first place”
- Analyze documented clinical diagnostic pitfalls, "near misses," and cognitive errors in neck radiology to identify systemic patterns that lead to misinterpretation or delayed diagnoses.
- Correlate historical false-positive and false-negative interpretations with specific, unmitigated acoustic artifacts, technical limitations, or subtle anatomical variants that frequently mimic true pathology.
- Evaluate the impact of incomplete or unstructured scanning sweeps on the failure to detect occult multi-compartment lymphadenopathy, skip metastases, or synchronous secondary lesions.

- Formulate defensive, evidence-based reporting and scanning strategies (e.g, cross-checking ambiguous ultrasound findings with multi-modality imaging like CT, MRI, or PET) to reconcile diagnostic discrepancies.
- Synthesize peer-review feedback, retrospective case audits, and root-cause analyses of diagnostic errors to construct a personal clinical checklist designed to enhance procedural accuracy and patient safety.

With Best Wishes

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