



HUMANITAS MEDICAL SCHOOL

PATHOLOGY AND DIAGNOSTIC

INTEGRATED LISTS OF LESSONS AND SYLLABUS

Faculty: Cecilia Garlanda (Clinical Pathology), Francesca Panvini and Giorgio Da Rin (Clinical Biochemistry), Michela Bernardi Letterio Politi and Marco Francone (Radiology), Silvia Uccella, Piergiuseppe Colombo, Lorenzo Renne, Arturo Bonometti, Sara Fraticelli and Luca Di Tommaso (Pathology)

Year/Semester 3rd year/1st semester

Credits 9

Course coordinator: Luca Di Tommaso (luca.di_tommaso@hunimed.eu)

EXAM

The exam consists in a written test (Clinical Pathology and Clinical Biochemistry) and an oral evaluation (Radiology and Pathology).

The written test:

This part of the exam will take place on the first day of the exam session.

Structure: 15 multiple choice questions (5 Clinical pathology; 10 Clinical biochemistry) with only one correct answer

Passing threshold for admission to the oral evaluation: **at least 8 correct answers overall**

Passing the written test is a prerequisite for the oral evaluation.

The written test will be kept valid **within the entire academic year** (winter, summer, and fall session)

The oral evaluation:

On day 2 of the exam candidates that have successfully passed the written test will be admitted to the oral evaluation of Radiology.

On day 3 of the exam, candidates that have successfully passed Radiology will be admitted to the oral evaluation of Pathology.



In case of failure of the Pathology evaluation, the Radiology evaluation will be kept valid **only within the same exam session**

Evaluation criteria:

written (D1)	Oral radiology (D2)	Oral Pathology (D3)
grade 8: 6	Sufficient examination: 6	Sufficient examination: 6
grade 9-10 and 11-12: respectively 7 or 8	Discrete examination: 7 or 8	Discrete examination: 7 or 8
grade 13-14 and 15: respectively 9 or 10	Good/excellent examination: 9 or 10	Good/excellent examination: 9 or 10

The final grade will be determined by the sum of the individual grades (written+oral1+oral2)

Notes:

The candidate who refuses the overall final grade (formulated at the end of pathology) will have to take the entire oral exam (radiology and pathology) again, during one of the following sessions.

The candidate who withdraws or fails the exam can keep the votes obtained up to that point as valid only for the duration of the same session (for example, a student who withdraws or fails pathology will be able to keep both written and imaging grades and show up **for the next date of the same session**).

LIST OF LESSONS.

PATHOLOGY LESSONS

- Topic 1.** What is pathology: yesterday, today and tomorrow (2h)
 - Topic 2.** The role of pathology in the precision-medicine era (2h)
 - Topic 3.** Neoplastic disease of the prostate basic (2h)
 - Topic 4.** Neoplastic disease of urinary bladder and urinary tract (2h)
 - Topic 5.** Neoplastic disease of the kidney basic (2h)
 - Topic 6.** Neoplastic disease of the testis (2h)
 - Topic 7.** Inflammatory diseases of upper GI tract (2h)
 - Topic 8.** Inflammatory diseases of lower GI tract, with particular attention to RCU and Crohn disease (2h)
 - Topic 9.** Neoplastic disease of upper GI tract (2h)
 - Topic 10.** Neoplastic disease of lower GI tract (2h)
 - Topic 11.** Inflammatory and autoimmune disorders of the liver, biliary system and pancreas (2h)
 - Topic 12.** Neoplastic diseases of the liver, biliary system and pancreas (2h)
 - Topic 13.** Frozen section: guiding surgeon's hand (2h)
 - Topic 14.** Neoplastic disease of the lung, pleura and mediastinum (2h)
 - Topic 15.** Neoplastic and not neoplastic diseases of the breast (2h)
 - Topic 16.** Neoplastic and not neoplastic diseases of the cervix (2h)
 - Topic 17.** Neoplastic and not neoplastic diseases of the uterus (2h)
 - Topic 18.** Neoplastic and not neoplastic diseases of the ovary (2h)
 - Topic 19.** Neoplastic and not neoplastic diseases of CNS* (2h)
 - Topic 20.** Neoplastic and not neoplastic diseases of the skin (2h)
 - Topic 21.** Neoplastic and not neoplastic diseases of thyroid (2h)
 - Topic 22.** Tumors of the soft tissue (2h)
 - Topic 23.** Tumors of the bone (2h)
- Practice (2h):** The clinical pathological correlations (gross specimen and clinical features)



CLINICAL PATHOLOGY LESSONS

Topic 1. Laboratory tests of humoral immunity

Topic 2. Laboratory evaluation of the cellular immune system

Topic 3. Laboratory tests for cancer

CLINICAL BIOCHEMISTRY LESSONS

Topic 1. Aims and fields of the clinical laboratory

Topic 2. Laboratory organization

Topic 3. Preanalytical Variables and their Influence on the Quality of Laboratory Results

Topic 4. Types of methods in laboratory medicine

Topic 5. Characteristics of laboratory tests

Topic 6. Laboratory test prescription

Topic 7. Reference intervals and clinical decision limits

Topic 8. Patient Safety in Laboratory Medicine

Topic 9. Laboratory evaluation of kidney function

Topic 10. Laboratory diagnosis of liver disease

Topic 11. Biomarkers for coronary artery disease and heart failure

Topic 12. Laboratory evaluation of disorders of calcium metabolism

Topic 13. Classical “serum proteins,” diagnostics



Topic 14. Testing for Hemostasis and Thrombosis

Topic 15. Urinalysis

Topic 16. Laboratory evaluation of thyroid function and disorders of the anterior and posterior pituitary



RADIOLOGY LESSONS

Topic 1. Conventional radiography.

Topic 2. Contrast Media.

Topic 3. Ultrasound, Computed Tomography and Magnetic Resonance

Topic 4, Fundamentals of chest X-Ray semeiotics

Topic 5. Radiology of upper and lower GI tract

Topic 6. Radiology of the pancreas

Topic 7. Fundamentals of brain imaging

Topic 8. Fundamentals of breast imaging

Topic 9. Interventional Radiology and Image guided therapy

Topic 10. Rad-path correlation in lung cancer

Topic 11. Rad-path correlation in focal liver lesions

Topic 12. Rad-path correlation in breast cancer

Topic 13. Rad-path correlation in primary brain tumors

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PATHOLOGY SYLLABUS

Overview:

At the end of the Course, students should have knowledge and understanding skills to be able to describe what is Pathology; what are the main areas of application of Pathology in personalized medicine, with particular regard to molecular biology and digital pathology; how does Pathology integrate in the management of a patient. The final goal will be to interpret all the information listed in the pathological report

General Learning Outcomes

- Interpret the terminology used in the report (histotype, grade; diagnosis, prognosis and prediction)
- Explain the basic principles and clinical significance of immunohistochemistry and molecular pathology
- Illustrate and exemplify the role of histology and immunocytochemistry in the management of an oncological patient.
- Discuss the advantages and limits of cytology in the diagnostic workflow and in the screening.
- Explain why, when and how they should use cytology, histology or both.
- Interpret the impact of molecular pathology in the management of oncological diseases.
- Comment on processing, diagnosis and clinical significance of sentinel lymph node procedure.
- Discuss the significance of intraoperative examination in guiding surgeon's hand.
- Explain the role of biopsy sampling and surgical resection as regard the pathological staging and grading of tumors.
- The role of imaging and of clinical informations in the diagnostic pathological process.
- Interpret and discuss a pathology report of a patient with a tumoral lesion.

Learning/teaching methods

- Lectures
- Tutorial activities with digital slides.

Texts

Kumar, Abbas, Ester: Robbins and Cotran, Pathologic Basis of Disease, 10th Edition, Elsevier



Learning Outcomes for specific lessons

What is pathology: yesterday, today and tomorrow

What pathology is

The basic instruments: macroscopic and microscopic evaluation

How pathology has evolved over the years

The new tools: Molecular Pathology and Digital Pathology

The report of pathology and the check list

The pathology archive as a bank of tissue samples for treatment and research

The role of pathology in the precision-medicine era

Cells, tissues and organs: different information from different specimens

Principles of fixation, sampling, and processing

Gross evaluation and microscopic pattern recognition

The diagnostic workflow: from fine needle biopsy to intra-operative examination

Histotype, grading and staging

Beyond morphology: the phenotype aiding to prove the histopathological diagnosis

The role of molecular pathology in the precision medicine

The role of digital pathology: augmented microscopy and Artificial Intelligence in the precision medicine

Neoplastic and not neoplastic disease of the prostate

Describe the zonal anatomy of the prostate.

Describe the main gross and histological features of prostatitis and benign hyperplasia.

Illustrate the epidemiology of prostatic neoplasm.

Describe the topographical distribution of tumor in the gland.

Illustrate the main morphological features of adenocarcinoma of the prostate, with focus on acinar and ductal tumors.

Describe malignant non-invasive “in situ” (PIN and Intraductal) tumors in the prostate.

Describe the diagnostic strategy of prostate cancer, and the different type of tissue you need for a diagnosis.

Understand the different architectures in the Gleason system and the correlation to ISUP Grade Groups.

Justify the role of immunohistochemistry in the diagnosis of prostate adenocarcinoma.

List the histological prognostic parameters of prostate cancer.

Describe staging of prostate tumor.

Understand the significance of frozen sections in management of prostate tumor patient.

Indicate what information you need for a pathological report of prostate adenocarcinoma to be complete.

Neoplastic diseases of urinary tract and bladder

Describe the microscopic anatomy of the muscular layers of the urinary bladder.

Define a (bladder) diverticulum.



Indicate the epidemiology, risk factors and the main morphological features of neoplasms in bladder, ureter and renal pelvis.

Describe the natural history of papillary and non-papillary neoplasms of the bladder with emphasis on in situ carcinoma (CIS), muscle invasiveness, multifocality.

Define the impact of grading classification on bladder tumors prognosis.

Describe staging in bladder carcinoma.

Understand the significance of frozen sections in management of bladder and ureteral tumor patient.

Indicate the potential and limits of the different cytological and histological procedures in the diagnosis of urological tract tumours.

Indicate what information you need for a pathological report of a urinary tract tumor to be complete.

Neoplastic diseases of the kidney

Describe the main types of renal tumors.

Illustrate and describe the gross and microscopic features of the clear cell RCC.

Describe the impact of sarcomatoid change and necrosis in renal cell carcinoma.

Understand the differences between tumor with cystic changes and cystic tumor among clear cell neoplasms.

Describe the microscopic features of the papillary renal cell carcinoma.

Illustrate the so-called molecularly-defined renal cell carcinoma types.

Describe and compare gross and microscopic features of chromophobe renal cell carcinoma and oncocytoma

Describe the utility to use grading in most common histotypes of renal tumor.

Illustrate the role of immunohistochemistry in differential diagnosis of renal cell tumors.

Neoplastic diseases of the testis

Describe the epidemiology of testicular tumor with particular regard to the age distribution of different histotypes.

Illustrate the rationale for classification in testicular tumor.

Define germ cell neoplasia in situ and describe its pathogenetic role in germ cell neoplasia.

Define the terms prepubertal-type, postpubertal-type, pure, mixed and regressed germ cell tumor.

Illustrate the clinical, serological, gross, microscopic and immunohistochemical features of seminoma, embryonal carcinoma, yolk sac tumor, choriocarcinoma, teratoma.

Describe the staging system of testicular tumor.

Inflammatory diseases of upper GI tract

Illustrate the main etiologies and morphology of inflammatory esophagus diseases with emphasis on gastroesophageal reflux disease (GERD), eosinophilic esophagitis and infectious esophagitis

Illustrate the integrated role of clinical, endoscopic and histological features for the diagnosis of Barrett's Esophagus

Illustrate the macroscopic and microscopic features of Barrett's esophagus

Illustrate the main histological features for grading dysplasia in Barrett's esophagus

Illustrate the natural history of dysplasia in Barrett's esophagus

Illustrate the main etiology and morphological features of acute and chronic gastritis (infectious and autoimmune) with emphasis on the role of HP infection

Illustrate the main complications of chronic gastritis, with particular regard to HP infections



Inflammatory diseases of lower GI tract, with particular attention to RCU and Crohn disease

Illustrate the main morphological findings of celiac disease

Illustrate the main morphological findings of self-limiting, infectious, antibiotic-associated, ischemic and microscopic colitis

Illustrate the main morphological features of idiopathic inflammatory bowel diseases (IBD) with emphasis on the distinction between Ulcerative colitis and Crohn diseases with emphasis on epidemiology, etiology, pathogenesis, clinical, macroscopical and microscopical features

Discuss the main complication of IBD

Discuss the link between cancer and IBD and illustrate the role of colorectal biopsy and the concept and classification of mucosal dysplasia

Neoplastic disease of upper GI tract

Illustrate the main histologic types of malignant esophageal tumors and principles for grading and staging

Discuss the role of intestinal metaplasia in esophageal and gastric carcinogenesis

Illustrate the sequence of morphological events linking HP infection to gastric cancer and malignant lymphoma

Illustrate the histologic features of gastric dysplasia with emphasis on dysplasia grading and on the concept of “indefinite for dysplasia”

Illustrate the natural history of gastric dysplasia in chronic gastritis

Illustrate the main macroscopical and microscopical features of gastric cancer with emphasis on gender, age, tumor histotype, molecular findings, grading and staging

Discuss the concept and natural history of early gastric cancer

Illustrate the main prognosticators and predictive biomarkers of gastric cancer.

Illustrate the main features of handling and processing a mucosal/submucosal resection for gastric cancer

Neoplastic disease of lower GI tract

Illustrate the morphological spectrum of intestinal polyps including colorectal adenomas

Illustrate the morphological sequence adenoma-carcinoma and the concepts of low and high grade dysplasia (colorectal adenoma)

Illustrate the main macroscopical and microscopical features of colorectal carcinoma with emphasis on tumor histotype, molecular changes, grading and staging

Discuss the significance of the main prognosticators and predictive biomarkers currently used in the pathology report of colorectal cancer

Inflammatory and autoimmune disorders of the liver, biliary system and pancreas

Illustrate the role of the liver biopsy in the characterization of inflammatory diseases of the liver.

Discuss the concept of liver biopsy adequacy in these settings.

Illustrate the main features and significance of some histopathological elementary lesions (spotty necrosis, piecemeal necrosis, confluent necrosis, cholestasis, pericentral and periportal fibrosis, septal fibrosis, nodular fibrosis, steatosis) occurring in different etiological settings (viral, metabolic, autoimmune, drug-induced) of chronic hepatitis

Illustrate the concepts of grading and staging in chronic inflammatory conditions of the liver in the biopsy and their quantification in a scoring system



Illustrate the main etiology and morphological features and complications of acute and chronic pancreatitis

Neoplastic diseases of the liver, biliary system and pancreas

Illustrate the pathogenesis and morphology of liver cirrhosis

Illustrate the role of the liver biopsy in the diagnostic work up of benign and malignant liver tumors

Illustrate the epidemiology, natural history and main pathological features of hepatocellular carcinoma and cholangiocarcinoma

Illustrate the main macroscopical and microscopical features of precursors of hepatocellular carcinoma in cirrhosis/chronic liver disease

Illustrate the main features of benign liver tumors with emphasis on adenomas and their distinction from focal nodular hyperplasia

Discuss the concept of phenotypical and molecular heterogeneity of adenomas

Discuss the diagnostic role of FNAB (fine needle aspiration biopsy) in pancreatic lesions

Illustrate the precursors of pancreatic adenocarcinoma (PanIN)

Illustrate the main macroscopical and microscopical features (cystic, solid) pancreatic tumors with emphasis on sex, site (head, body, tail), histotype and natural history

Illustrate the main criteria for grading and staging of pancreatic cancer and the main morphological prognosticators

Illustrate the main features for handling and processing a surgical resection for pancreatic cancer

Illustrate the main clinical, morphological and immunohistochemical features of neuroendocrine tumors of the pancreas with emphasis on criteria for diagnosis and prognosis

Neoplastic disease of the lung, pleura and mediastinum

Illustrate the pathogenetic basis and the main etiological agents of pleuro-pulmonary tumors.

Illustrate how pulmonary tumors arise through a series of morpho-phenotypic and molecular events, and how some of them may be of diagnostic, prognostic and predictive importance.

Illustrate the main histopathological and cytopathological approaches to the diagnosis of pleuro-pulmonary tumors.

Illustrate the main histotypes of pulmonary tumors with regard to epidemiology, gross and microscopical features and behaviour with emphasis on grading and staging.

Illustrate which are the main information which have to be reported in a pathological diagnosis of pleuro-pulmonary tumors.

Neoplastic and not neoplastic diseases of the uterus

List the settings that may lead to chronic endometritis

Describe the incidence, common locations, pathogenesis and clinical features of endometriosis.

Define adenomyosis.

Explain the relationship between endometrial hyperplasia and endometrial adenocarcinoma.

Illustrate risk factors, pathogenesis, clinical features, and spread of endometrial carcinoma.

Describe and compare the typical clinical presentation and microscopic features of uterine leiomyoma and leiomyosarcoma.

Define malignant mixed müllerian tumor and endometrial stromal tumor.

Neoplastic and not neoplastic diseases of the cervix

Illustrate the epidemiology of cervical carcinoma.



Define the cervical transformation zone.

List risk factors for the development of cervical carcinoma.

Illustrate the correlation between HPV genotype and the risk of cervical carcinoma.

Explain the role of human papillomaviruses (HPV) in the pathology of benign and malignant cervical tumors.

Illustrate the morphologic and biologic spectrum of squamous intraepithelial lesion (SIL) in PAP smear.

Illustrate the morphologic and biologic spectrum of cervical intraepithelial neoplasia (CIN).

Correlation between cytological information (SIL) and pathological findings (CIN).

Describe the impact of PAP test in the screening and prevention of cervical carcinoma.

Role of vaccination in cervical carcinoma.

Illustrate the main morphological features of cervical carcinoma with regard to histotype, invasive properties, staging and grading and way of metastatization

Neoplastic and not neoplastic diseases of the breast

Epidemiology of a breast nodule.

Define the pathological (cytology, histology and gross findings) and clinical features of fibrocystic disease

Define the pathological features and the clinical significance of the followings: a. non-proliferative fibrocystic changes; b. proliferative fibrocystic changes; c. ductal hyperplasia; d. sclerosing adenosis

Compare and contrast the major clinical and pathological features of the following breast diseases: a. fibroadenoma; b. phyllodes tumor; c. intraductal papilloma.

Describe the epidemiological features of invasive and not invasive carcinoma of the female breast.

Describe the potential impact of family history of breast cancer on a patient with a breast nodule.

Compare and contrast the pathological (cytology, histology and gross findings) and clinical features (relative incidence and prognosis) of the following types of breast carcinoma: a. high-grade in situ ductal carcinoma; b. low-grade in situ ductal carcinoma; c. in situ lobular carcinoma; d. infiltrating ductal carcinoma ; e. infiltrating lobular carcinoma.

Describe the role, if any, of special types (tubular, medullary, mucinous, etc) of breast cancer.

Discuss the role of fine needle aspiration (FNA) in the diagnosis of a patient with a breast nodule.

Discuss the role of core-biopsy in the diagnosis of a patient with a breast nodule.

Describe the role of intraoperative examination in a patient with a breast nodule.

Describe how stage and grade impact on the clinical course of breast cancer.

List the main clinical or pathologic features that predict poor survival in breast cancer.

Illustrate the role of biomolecular profile (estrogen, progesteron, MIB1 and HER2 expression) on the management of a patient with breast cancer.

Know the correlation between the morphological and the molecular classification of breast cancer.

Define the pathological and clinical features of gynecomastia.

Know the main pathological and clinical features of invasive male breast cancer.

Neoplastic and not neoplastic diseases of the ovary

Describe the pathogenesis and clinical features of polycystic ovarian disease.

Illustrate the basis of the classification of ovarian tumors and incidence of main histological types.

Describe and contrast the pathologic and clinical features of ovarian surface tumors (serous and mucinous cystadenomas, borderline tumors, and carcinomas).

Illustrate the issue of peritoneal involvement in the staging of ovarian surface tumors.



Describe the usual clinical presentation and pathologic features of mature cystic teratomas.

Describe the two most common types of sex cord-stromal tumors: granulosa-theca cell tumors and fibrothecomas.

Define Krukenberg tumor.

Neoplastic and not neoplastic diseases of thyroid

Illustrate the main etiology and morphological features and complications of thyroiditis, multinodular goiter, hyperthyroidism and hypothyroidism.

Discuss the diagnostic role of FNA (fine needle aspiration) in neoplastic and non-neoplastic thyroid lesions

Illustrate the neoplastic and non-neoplastic pathologies displaying follicular pattern.

Illustrate the main clinical, morphological, immunohistochemical and molecular features of papillary, follicular, medullary and undifferentiated (anaplastic) carcinoma, with emphasis on criteria for diagnosis and prognosis

List the components of the multiple endocrine neoplasia (MEN) syndromes type I, IIA, and IIB and describe genetic alterations in MEN syndromes.

Discuss how to manage a patient with a solitary thyroid nodule.

Describe how cytology impact on the diagnosis of a patient with a solitary thyroid nodule.

Describe how to manage a patient at risk of medullary carcinoma.

Neoplastic and not neoplastic diseases of CNS

Distinguish the histologic from the biologic malignancy in primary brain neoplasms.

Compare and contrast the clinical manifestations of a localized mass effect and the generalized increased intracranial pressure.

Compare the incidence and distribution of meningiomas and gliomas and illustrate the main histological subgroups of glial tumors.

List the histologic features to be evaluated when grading a glial neoplasm.

Describe the clinical course and prognosis of glial neoplasms.

Illustrate the role of intraoperative examination in the diagnosis of primary and metastatic brain tumors

Illustrate the main prognostic features of glial tumors with emphasis on immunocytochemical and molecular markers

Indicate the putative cell of origin of medulloblastoma, the age group most likely to develop this neoplasm, and typical routes of dissemination.

Indicate the main neoplasms that can metastasize to the brain and discuss the main clinico-pathological features of help in the differential diagnosis with primary tumors

Explain the similarities and the differences between schwannomas and neurofibromas.

Describe the major clinical features of neurofibromatosis 1 and 2.

Illustrate the clinico-pathological features of intracranial hematoma (intraparenchymal, subdural, extradural).

Illustrate the main histopathological features of Alzheimer and Parkinson diseases.

Melanocytic and not melanocytic tumors of the skin

Illustrate the significance of the following terms: Macule, Papule, Plaque, Pustule, Vesicle, Bullae, Blisters; acantholysis, acanthosis, dyskeratosis, erosion, exocytosis, hydropic swelling,



hypergranulosis, hyperkeratosis, lentiginous growth, papillomatosis, parakeratosis, spongiosis, ulceration, vacuolization and illustrate in which pathological context these alterations are more likely to take place.

Discuss the role of immunofluorescence in the diagnosis of bullous lesions of the skin

Describe the nonmelanocytic pigmented disorders of the skin.

Define a melanocytic nevus in terms of clinical manifestations.

List the variant forms of melanocytic nevi.

Know the importance of the family history of patients with multiple nevi.

Define a dysplastic nevus in terms of architectural and cytologic features and clinical significance.

Discuss the concept that some dysplastic nevi are precursors of malignant melanomas.

Define a malignant melanoma in terms of architectural difference from a melanocytic nevus.

Describe the risk factors for the development of a malignant melanoma.

List the clinical early warning signals for melanoma and the main histological variants of melanoma.

Discuss the concept of orizontal and vertical growth in melanoma.

Illustrate the main phenotypic features of melanoma cells.

Discuss the significance of tumor regression as prognostic parameter related to the staging of melanoma

Illustrate the Breslow and Clark criteria and their significance in the staging of melanoma.

Illustrate the role of sentinel node dissection in the evaluation of melanoma staging

Discuss the predictive significance of b-raf mutation in melanoma cells

List all the information that need to be reported in a diagnosis of melanoma.

Illustrate the potential sites of a metastasis for a melanoma

Define actinic keratosis in terms of clinical presentation, etiology and behaviour.

Define squamous cell carcinoma of the skin in terms of etiology, pathogenesis, and prognosis.

List the predisposing factors for the development of a squamous cell carcinoma of the skin.

Illustrate criteria useful to define the grading of squamous cell carcinoma.

Discuss whether keratoacantoma is a nosologic entity

Define a basal cell carcinoma in terms of frequency, pathogenesis, localization, and clinical outcome.

Illustrate the differential diagnosis of basal cell carcinoma

Describe the treatment of basal cell carcinoma and how it differs from the treatment of squamous cell carcinoma

Tumors of the soft tissue

describe the basic concepts for connective tissue tumors classification.

illustrate the most important clinic-pathological features to asses a patient with a soft tissue mass.

define the 'intermediate' biologic potential category.

discuss the epidemiology of soft tissue neoplasm.

illustrate the 'FNCLCC grading system'

illustrate the most frequent benign and intermediate malignancy soft tissue tumours, in particular lipoma, tenosynovial giant cell tumor, schwannoma, fibromatoses.

illustrate the most frequent malignant soft tissue tumors, in particular dedifferentiated liposarcoma, myxoid liposarcoma, synovial sarcoma.

discuss the gastrointestinal stromal tumor etiology, risk assessment, therapeutic implications.

discuss pediatric rhabdomyosarcoma and fibrosarcoma and therapeutic implications

illustrate the most important radiological features approach to a bone lesion

discuss the grading system in bone neoplasm



illustrate the epidemiology of most frequent bone sarcomas

Describe epidemiological, clinical, gross and microscopic features of osteochondroma, chondrosarcoma, and osteosarcoma.

Illustrate the clinical, morphological and prognostic features of Ewing sarcoma.

Practice 1: The clinical pathological correlations

gross evaluation of surgical/autoptic specimen and correlation with clinical feature



CLINICAL PATHOLOGY SYLLABUS

Overview:

The course has the aim to describe laboratory techniques used in the diagnosis of clinical conditions associated with inflammatory and immune disorders, as well as in cancer.

General Learning Outcomes

- Understanding the significance of laboratory tests in the management of differential diagnoses in conditions associated with inflammation, immune disorders, and cancer.

Learning/teaching methods: Lectures and small group activities (journal paper presentations). The aim of small group activities is to involve students in reading (on their own, in small groups) and the publicly discussing some examples from the literature related to the topics presented in frontal lessons, and to increase student engagement in a collaborative learning setting. Participation is mandatory.

Learning Outcomes for specific lessons

Laboratory tests of humoral immunity

- Immunoassays and immunochemistry
- Laboratory evaluation of inflammatory and immune reactions: the acute phase response proteins, the complement, cytokines and chemokines, and immunoglobulins in laboratory diagnosis.

Laboratory evaluation of the cellular immune system

- Immunophenotyping and applications of Flow cytometric analysis.
- Blood count test
- Laboratory evaluation of the cellular immune system, leukocyte alterations
- Biomarkers of cellular immunity

Laboratory tests for cancer:

- Circulating cancer biomarkers: Classification and clinical applications
- Liquid biopsy: Detecting circulating tumor cells (CTC) and nucleic acids (ctDNA)
- Inflammation and cancer



CLINICAL BIOCHEMISTRY SYLLABUS

Overview

The module of Clinical Biochemistry is focused on general concepts of Laboratory Medicine, which represent the fundamental background to assist clinicians to substantiate diagnoses, help preventing diseases and monitoring treatments. In particular, the module will be a comprehensive course dealing with the general concepts on prescribing clinical analyses, obtaining results and their interpretation.

General learning goals

To understand on how the laboratory can help clinicians to

1. Making diagnoses
2. Preventing diseases
3. Making decision on appropriate treatment
4. Monitoring treatment

Teaching Methods

Lectures, clinical case presentation and interactive discussion

Text book & Consultation materials

Laboratory medicine diagnosis of disease in the clinical laboratory - M. Laposata - Ed. McGraw Hill Professional

The PowerPoint presentations used across lectures will be made available

Learning Outcomes for specific lessons

Topic 1. Aims and fields of the clinical laboratory

Learning goals

Describe the total testing process

Discuss the role of the laboratory across the healthcare continuum

Illustrate the Value of Laboratory Medicine

Topic 2. Laboratory organization

Learning goals

Describe the sections of a clinical laboratory

Illustrate organization of a core-lab section and satellite specialized laboratory areas

Discuss emergency laboratory models

Define point-of-care testing (POCT)

Describe POCT limitations

Topic 3.

Preanalytical Variables and their Influence on the Quality of Laboratory Results



Learning goals

Understand why preanalytical variation is a significant contributor to laboratory errors.
Identify the common sources of preanalytical variation: patient-related pre-analytical variables, sample-related pre-analytical variables
Discuss the potential effects of phlebotomy, tube additives, and order of draw.
Discuss ways to detect and reduce preanalytical errors

Topic 4. Types of methods in laboratory medicine

Learning goals

Discuss the various immunoassay formats used in clinical laboratories
Describe the advantages and disadvantages of using immunoassays for quantitative analyses
Illustrate the principles of spectrophotometric measurement
Discuss the calibration of spectrophotometric methods
Describe the general concepts of gas chromatography and liquid chromatography
Discuss the general concepts of gel electrophoresis and capillary electrophoresis
Illustrate the concept of tandem mass spectrometry
Describe the steps involved in PCR.

Topic 5. Characteristics of laboratory tests

Learning goals

Describe the Analytical performance specifications of Laboratory Tests
Discuss the Clinical performance characteristics of Laboratory Tests

Topic 6. Laboratory test prescription

Learning goals

Understanding the indications to prescribe laboratory tests, their limitation and appropriateness of prescription
Describe the general principles for selecting the most appropriate laboratory test based on its diagnostic performance characteristics

Topic 7. Reference intervals and clinical decision limits

Learning goals

Describe the concept of reference intervals and importance to laboratory medicine
Identify the challenges associated with establishing reference intervals for subgroups of the population (i.e., pediatrics and geriatrics)
Understanding the differences between reference and clinical decision limits
Discuss Biological variation, reference change values and index of individuality

Topic 8. Patient Safety in Laboratory Medicine

Learning goals

Describe potential errors in total testing process
Discuss the evolution from Laboratory-Related Errors to Diagnostic Errors



Topic 9. Laboratory evaluation of kidney function

Learning goals

Describe laboratory measurement of biomarkers of kidney function
Illustrate measure and estimate glomerular filtration rate
Discuss limitations of biomarkers to assess kidney function.

Topic 10. Laboratory diagnosis of liver disease

Learning goals

Describe biomarkers to assess the synthetic, metabolic, and excretory functions of the liver. Discuss traditional patterns of liver-associated enzymes and injury markers in the background of various types of hepatic disease.

Topic 11. Biomarkers for coronary artery disease and heart failure

Learning goals

Describe the pathophysiology of acute coronary artery disease
Discuss the diagnostic criteria of World Health Organization for Myocardial Infarction definition, with a focus on high-sensitivity cardiac troponin assays
Describe the pathophysiology of heart failure
Describe the clinical utility of B-type natriuretic peptide and N-terminal-proBNP in heart failure
Discuss how cardiac troponin and B-type natriuretic peptides have become the standard blood biomarkers for acute coronary syndrome and HF, respectively.

Topic 12.

Laboratory evaluation of disorders of calcium metabolism

Learning goals

Describe clinical laboratory tests used in the evaluation of calcium disorders
Illustrate the conditions involving excesses or deficiencies of calcium
Discuss markers of bone turnover

Topic 13. Classical “serum proteins,” diagnostics

Learning goals

Understanding the general characteristics of serum proteins.
Protein separation and quantitation by zone electrophoresis (e.g., albumin and globulins).
The significance of protein results in different clinical settings.
Explain the physiology of serum free light chains and the reasons why testing is clinically important.
Discuss pathological and nonpathological protein electrophoresis patterns

Topic 14. Testing for Hemostasis and Thrombosis

Learning goals

Describe the action of platelets in hemostasis.
Describe the progression of hemostasis from initial activation to fibrinolysis.
Describe the most important tests for laboratory diagnosis of hemorrhagic and thrombotic coagulopathies
Discuss how a 1:1 mixing study can distinguish a clotting factor deficiency from an inhibitor of coagulation



Topic 15. Urinalysis

Learning goals

Illustrate chemical, physical and morphological examination of urine

Discuss the limitations of physical, chemical, and microscopic examination techniques in urinalysis

Interpret images obtained from microscopic analysis of urine

Topic 16. Laboratory evaluation of thyroid function and disorders of the anterior and posterior pituitary

Learning goals

Describe the roles of thyrotropin-releasing hormone, TSH, thyroxine, and triiodothyronine in the regulation of the hypothalamus_pituitary_thyroid axis.

Illustrate laboratory tests for assessment of thyroid functions

Describe the anterior and posterior pituitary hormones, their sites of action and expected physiological effects

Illustrate appropriate laboratory tests for the initial evaluation of suspected pituitary dysfunction and recognize patterns of test results associated with each condition



RADIOLOGY SYLLABUS

General learning outcomes

Upon completion of this course, students should be able to:

- Demonstrate a comprehensive understanding of various diagnostic imaging modalities, with a particular emphasis on modern MRI and CT techniques, and their applications in clinical practice.
- Evaluate the technical aspects of radiological images, from X-ray to nuclear medicine and MR and CT scans, to ensure diagnostic quality and accuracy.
- Utilize contrast media effectively and ethically in different imaging procedures.
- Interpret basic imaging findings and correlate them with the underlying pathological conditions in a wide range of clinical scenarios.
- Recognize the clinical significance of interventional radiology procedures and understand their role in modern diagnostic and therapeutic interventions.
- Apply their radiological knowledge to enhance their clinical decision-making skills, including the ability to develop and follow correct diagnostic algorithms based on imaging findings.

These updated general learning outcomes encompass the importance of diagnostic imaging procedures in modern medicine and emphasize the integration of radiological knowledge into clinical practice, including the ability to correlate imaging findings with pathological substrates and follow appropriate diagnostic algorithms.

Teaching Methods:

The course will employ a combination of teaching methods, including:

Lectures: To provide foundational knowledge and principles for each topic.

Case Studies: To illustrate practical applications and enhance critical thinking.

Hands-on Training: To allow students to practice image interpretation.

Group Discussions: To encourage peer learning and problem-solving.

Laboratory Work: For practical experience in acquiring and processing images.

Topic 1. Conventional Radiography

General Learning Outcomes:



- Describe the principles and data acquisition strategies used in radiography, mammography, fluoroscopy, and angiography.
- Explain the importance of radiation safety in radiography.
- Recognize the fundamental differences between various radiographic techniques.

Specific Learning Outcomes:

Students should be able to:

- Identify and differentiate between common bone fractures and dislocations.
- Recognize the radiographic features of lung diseases such as pneumonia, pneumothorax, and pleural effusion.
- Understand the role of radiography in evaluating soft tissue abnormalities. In particular, regarding breast imaging, recognize the main mammographic features (i.e. micro-calcifications, distortions, mass lesions)

Topic 2. Contrast Media

General Learning Outcomes:

- Understand the rationale for using contrast media in radiology.
- Identify relative and absolute contraindications for contrast media use.
- Discuss the role of contrast agents in different imaging modalities.

Specific Learning Outcomes:

Students should be able to:

- Explain the use of iodinated contrast media in CT scans for visualizing blood vessels and organs.
- Describe the principles of contrast-enhanced mammography for breast imaging.
- Recognize complications associated with contrast media administration, such as contrast-induced nephropathy.

Topic 3. Ultrasound, CT, and MRI

General Learning Outcomes:

- Explain the basic principles of ultrasound, computed tomography, and magnetic resonance imaging.
- Compare the strengths and limitations of each imaging modality.
- Interpret images obtained from ultrasound, CT, and MRI scans.

Specific Learning Outcomes:

Students should be able to:



- Identify normal and abnormal findings in abdominal ultrasound, including liver and kidney pathologies.
- Identify normal and the most common abnormal findings atn breast ultrasound
- Interpret CT scans to diagnose intracranial hemorrhage, brain tumors, and traumatic brain injuries.
- Recognize the advantages of MRI in evaluating soft tissue structures like breast, brain, spinal cord, and musculoskeletal system.

Topic 4. Fundamentals of Chest X-Ray Semiotics

General Learning Outcomes:

- Recognize technical adequacy and common artifacts in chest X-rays.
- Identify radiological signs of various pulmonary and pleural pathologies.

Specific Learning Outcomes: Students should be able to:

- Interpret chest X-rays to diagnose conditions like atelectasis, pleural effusion, pneumonia, pneumothorax, pneumomediastinum, pneumopericardium, and subcutaneous emphysema.
- Understand the radiological features of common chest infections and lung malignancies.

Topic 5. Radiology of Upper and Lower GI tract

General Learning Outcomes:

- Describe the radiographic evaluation of the upper and lower gastrointestinal tract.
- Recognize common gastrointestinal pathologies using imaging techniques.

Specific Learning Outcomes:

Students should be able to:

- Interpret barium studies and endoscopic procedures to diagnose conditions like gastroesophageal reflux disease (GERD), peptic ulcers, and colorectal cancers.
- Understand the radiological features of inflammatory bowel disease (IBD) and diverticulitis.

Topic 6. Radiology of the Pancreas

General Learning Outcomes:

- Explain the imaging techniques used for pancreatic evaluation.
- Recognize radiological findings in pancreatic diseases.

Specific Learning Outcomes:

Students should be able to:



- Identify pancreatic tumors, including pancreatic adenocarcinoma and pancreatic neuroendocrine tumors (PNETs).
- Recognize the complications of acute and chronic pancreatitis on imaging.

Topic 7. Fundamentals of Brain Imaging

General Learning Outcomes:

- Identify ischemic, hemorrhagic, and stroke-related abnormalities on brain images.
- Discuss the clinical significance of brain imaging findings.

Specific Learning Outcomes:

Students should be able to:

- Interpret CT and MRI scans to diagnose ischemic strokes, intracerebral hemorrhages, and subarachnoid hemorrhages.
- Recognize brain tumors, including gliomas, meningiomas, and metastases, using imaging.

Topic 8. Fundamentals of Breast Imaging

General Learning Outcomes:

- Understand the principles and techniques of breast imaging.
- Interpret mammograms and recognize the most common breast abnormalities.

Specific Learning Outcomes:

Students should be able to:

- Identify breast masses, calcifications, and architectural distortions on mammograms.
- Describe the BI-RADS (Breast Imaging Reporting and Data System) classification system and its clinical implications.

Topic 9. Interventional Radiology and Image-Guided Therapy

General Learning Outcomes:

- Explain the significance and clinical applications of interventional radiology procedures.
- Describe the role of image guidance in minimally invasive interventions.

Specific Learning Outcomes:

Students should be able to:



- Understand the indications and techniques for procedures such as angioplasty, embolization, and biopsy.
- Recognize the complications and limitations associated with interventional radiology procedures.

Topic 10. Rad-Path Correlation in Lung Cancer

General Learning Outcomes:

- Correlate radiological findings with pathological changes in lung cancer.
- Understand the staging and prognostic implications of lung cancer imaging.

Specific Learning Outcomes:

Students should be able to:

- Identify different types of lung cancer (e.g., adenocarcinoma, squamous cell carcinoma) on imaging.
- Interpret PET-CT scans for staging and treatment planning in lung cancer.

Topic 11. Rad-Path Correlation in Focal Liver Lesions

General Learning Outcomes:

- Correlate radiological findings with pathological changes in focal liver lesions.
- Discuss the diagnostic value of liver imaging in hepatobiliary diseases.

Specific Learning Outcomes:

Students should be able to:

- Recognize liver tumors, including hepatocellular carcinoma (HCC) and metastatic lesions, using imaging.
- Understand the role of contrast-enhanced imaging in characterizing liver lesions.

Topic 12. Rad-Path Correlation in Breast Cancer

General Learning Outcomes:

- Correlate radiological findings with pathological changes in breast cancer.

Specific Learning Outcomes:

Students should be able to:



- Interpret breast imaging findings and correlate them with the pathological changes for different breast diseases

Topic 13. Rad-Path Correlation in Primary Brain Tumors

General Learning Outcomes:

- Correlate radiological findings with pathological changes in primary brain tumors.
- Discuss the diagnostic challenges and treatment implications of brain tumor imaging.

Specific Learning Outcomes:

Students should be able to:

- Recognize common primary brain tumors, such as glioblastoma and meningioma, using MRI and CT scans.
- Understand the importance of functional imaging techniques like fMRI and spectroscopy in brain tumor evaluation.

Suggested books:

- Squire's Fundamentals of Radiology: Seventh Edition
- Learning Radiology, Recognizing The Basics, 4th Edition
- eBook for Undergraduate Education in Radiology from the European Society of Radiology
<https://www.myesr.org/education/ebook-for-undergraduate-education-in-radiology/>