MGM INSTITUTE OF HEALTH SCIENCES
(Deemed University u/s 3 of UGC Act, 1956)
Grade 'A' Accredited by NAAC
Sector-01, Kamothe, Navi Mumbai - 410 209
Tel 022-27432471, 022-27432994, Fax 022 - 27431094
E-mail : registrar@mgmuhs.com | Website : www.mgmuhs.com

MGM 07 Pathology

Program Outcomes:

PO1. Diagnose routine and complex clinical problems on the basis of histopathology (surgical pathology) and cytopathology specimens, blood and bone marrow examination and various tests of Laboratory Medicine (clinical pathology, clinical biochemistry) as well as Blood Banking (Transfusion Medicine).

PO2. Interpret and correlate clinical and laboratory data so that clinical manifestations of diseases can be explained.

PO3. Advise on the appropriate specimens and tests necessary to arrive at a diagnosis in a problematic case.

PO4. Correlate clinical and laboratory findings with pathology findings at autopsy, identify miscorrelations and the causes of death due to diseases (apart from purely metabolic causes).

PO5. Should be able to teach Pathology to undergraduates, postgraduates, nurses and paramedical staff including laboratory personnel.

PO6. Plan, execute, analyse and present research work.

PO7. Make and record observations systematically and maintain accurate records of tests and their results for reasonable periods of time. Identify problems in the laboratory, offer solutions thereof and maintain a high order of quality control.

PO8. Capable of safe and effective disposal of laboratory waste.

PO9. Able to supervise and work with subordinates and colleagues in a laboratory.

SUBJECT SPEIFIC COMPETENCIES

A. Cognitive domain

A post graduate student upon successfully qualifying in the MD (Pathology) examination should have acquired the following broad theoretical competencies and should be:

1. Capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample of tissue, blood, body fluid, etc. for the purpose of diagnosis and overall wellbeing of the ill.

2. Able to teach and share his knowledge and competence with others. The student should be imparted training in teaching methods in the subject which may enable the student to take up teaching assignments in Medical Colleges/Institutes.

3. Capable of pursuing clinical and laboratory based research. He/she should be introduced to basic research methodology so that he/she can conduct fundamental and applied research.

B. Affective domain

1. The student will show integrity, accountability, respect, compassion and dedicated patient care. The student will demonstrate a commitment to excellence and continuous professional development.

2. The student should demonstrate a commitment to ethical principles relating to providing patient care, confidentiality of patient information and informed consent.

3. The student should show sensitivity and responsiveness to patients' culture, age, gender and disabilities.

C. Psychomotor domain

At the end of the course, the student should have acquired skills, as described below:

Surgical pathology

Skills

- Given the clinical and operative data, the student should be able to identify, and systematically and accurately describe the chief gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose at least 80% of the lesions received on an average day from the surgical service of an average teaching hospital.
- A student should be able to demonstrate ability to perform a systematic gross examination of the tissues including the taking of appropriate tissue sections and in special cases as in intestinal mucosal biopsies, muscle biopsies and nerve biopsies, demonstrate the orientation of tissues in paraffin blocks.
- The student should be able to identify and systematically and accurately describe the chief histo-morphological alterations in the tissue received in the surgical pathology service. He/she should also correctly interpret and correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day.
- Be conversant with automatic tissue processing machine and the principles of its running.
- Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome.
- Stain paraffin sections with at least the following:

    (i) Haematoxylin and eosin
    (ii) Stains for collagen, elastic fibers and reticulin
    (iii) Iron stain
    (iv) PAS stain
    (v) Acid fast stains
    (vi) Any other stains needed for diagnosis.

- Demonstrate understanding of the principles of:

(i) Fixation of tissues

(ii) Processing of tissues for section cutting

(iii) Section cutting and maintenance of related equipment

(iv) Differential (special) stains and their utility

- Cut a frozen section using cryostat, stain and interpret the slide in correlation with the clinical data provided.
- Demonstrate the understanding of the utility of various immuno-histochemical stains especially in the diagnosis of tumour subtypes.

Cytopathology

Skills

- Independently prepare and stain good quality smears for cytopathologic examination.
- Be conversant with the techniques for concentration of specimens: i.e. various filters, centrifuge and cytocentrifuge.
- Independently be able to perform fine needle aspiration of all lumps in patients; make good quality smears, and be able to decide on the types of staining in a given case.
- Given the relevant clinical data, he/she should be able to independently and correctly:

(i) Diagnose at least 75% of the cases received in a routine laboratory and categorize them into negative, inconclusive and positive.

(ii) Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.

(iii) Indicate correctly the type of tumour, if present

(iv) Identify with reasonable accuracy the presence of organisms, fungi and parasites

Haematology

Skills

- Correctly and independently perform the following special tests, in addition to doing the routine blood counts:

    (i) Haemogram including reticulocyte and platelet counts.
    (ii) Bone marrow staining including stain for iron
    (iii) Blood smear staining
    (iv) Cytochemical characterization of leukemia with special stains like Peroxidase, Leukocyte Alkaline Phosphatase (LAP), PAS, Sudan Black, etc.
    (v) Hemolytic anemia profile including HPLC, Hb electrophoresis etc.
    (vi) Coagulation profile including PT, APTT, FDP.
    (vii) BM aspiration and BM biopsy

- Demonstrate familiarity with the principle and interpretation of results and the utility in diagnosis of the following:
    (i) Platelet function tests including platelet aggregation and adhesion and PF3 release
    (ii) Thrombophilia profile: Lupus anticoagulant (LAC), Anticardiolipin Antibody (ACA), Activated Protein C Resistance (APCR), Protein C (Pr C), Protein S (Pr S) and Antithrombin III (AT III)
    (iii) Immunophenotyping of leukaemia
    (iv) Cytogenetics
    (v) Molecular diagnostics.

- Describe accurately the morphologic findings in the peripheral and bone marrow smears, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least

90% of the cases referred to the Haematology clinic, given the relevant clinical data.

Laboratory Medicine

Skills

- Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step; be able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arrive at a diagnosis.
- Demonstrate familiarity with and successfully perform:
    i) routine urinalysis including physical, chemical and microscopic, examination of the sediment.
    ii) macroscopic and microscopic examination of faeces and identify the ova and cysts of common parasites.
    iii) a complete examination: physical, chemical and cell content of Cerebrospinal Fluid (C.S.F), pleural and peritoneal fluid.
    iv) semen analysis.
    v) examination of peripheral blood for commonly occurring parasites.

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- Independently and correctly perform at least the following quantitative **e**stimations by manual techniques and/or automated techniques.

    (i) Blood urea
    (ii) Blood sugar
    (iii) Serum proteins (total and fractional)
    (iv) Serum biIirubin (total and fractional)

- Demonstrate familiarity with the following quantitative estimations of blood/ serum by Automated Techniques:

Serum cholesterol, Uric acid, Serum Transaminases (ALT and AST/SGOT and SGPT), etc.

- Prepare standard solutions and reagents relevant to the above tests, including the preparation of normal solution, molar solution and buffers.
- Explain the principles of Instrumentation, use and application of the instruments commonly used in the labs eg. Photoelectric colorimeter, Spectrophotometer, pH meter, Centrifuge, Electrophoresis apparatus, ELISA Reader, flow cytometer, PCR, chemiluminiscence.

Transfusion Medicine

Skills

The student should be able to correctly and independently perform the following:

- Selection and bleeding of donors
- Preparation of blood components i.e. Cryoprecipitates, Platelet concentrate, Fresh Frozen Plasma, Single Donor Plasma, Red Blood Cell concentrates.
- ABO and Rh grouping.
- Demonstrate familiarity with Antenatal and Neonatal work up.
    (i) Direct antiglobulin test
    (ii) Antibody screening and titre
    (iii) Selection of blood for exchange transfusion
- Demonstrate familiarity with principle and procedures involved in:

    (i) Resolving ABO grouping problems.
    (ii) Identification of RBC antibody.
    (iii) Investigation of transfusion reaction.
    (iv) Testing of blood for presence of:
        (a) HBV (Hepatitis B Virus Markers).
        (b) HCV (Hepatitis C Virus Markers)
        (c) HIV (Human Immunodeficiency Virus Testing)

(d) VDRL

(e) Malaria

Immunohistochemistry

Skills (desirable)

- Be able to perform immuno-histochemical staining using paraffin section with at least one of the commonly used antibodies (Cytokeratin or LCA) using PAP method.

COURSES OUTCOME

Syllabus

Course contents:

The study of Pathologic Anatomy includes all aspects of Pathology as encompassed in the branches of General and Systemic Pathology. Only the broad outlines are provided.

A) General Pathology:

Normal cell and tissue structure and function.

The changes in cellular structure and function in disease.

Causes of disease and its pathogenesis.

Reaction of cells, tissues, organ systems and the body as a whole to various sublethal and lethal injuries.

B) Systemic Pathology:

The study of normal structure and function of various organ systems and the aetiopathogenesis, gross and microscopic alterations of structure of these organ systems in disease and functional correlation with clinical features.

C) Haematology

The study of Haematology includes all aspects of the diseases of the blood and bone marrow. This would involve the study of the normal, and the causes of diseases and the changes thereof.

1. Laboratory Medicine (Clinical Biochemistry/Clinical Pathology including Parasitology).
2. Transfusion Medicine (Blood Banking).
3. The student is expected to acquire a general acquaintance of techniques and principles and to interpret data in the following fields.

    a) Immunopathology
    b) Electron microscopy
    c) Histochemistry
    d) Immunohistochemistry
    e) Cytogenetics
    f) Molecular Biology
    g) Maintenance of records
    h) Information retrieval, use of Computer and Internet in medicine.
    i) Quality control, waste disposal

It is difficult to give a precise outline of the Course Contents for post graduate training. A post graduate is supposed to acquire not only the professional competence of a well-

trained specialist but also academic maturity, a capacity to reason and critically analyse scientific data as well as to keep himself abreast of the latest developments in the field of Pathology and related sciences. A brief outline of what is expected to be learnt during the MD Course is given under each head.

Surgical Pathology

Knowledge

- The student should be able to demonstrate an understanding of the histogenetic and patho-physiologic processes associated with various lesions.
- Should be able to identify problems in the laboratory and offer viable solutions.

Autopsy Pathology

Knowledge

- Should be aware of the technique of autopsy.
- Should have sufficient understanding of various disease processes so that a meaningful clinico-pathological correlation can be made.
- Demonstrate ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions. Correctly identify all major lesions which have **caused, or contributed to the patient's death, on macroscopic examination alone and on microscopy in at least 90% of the autopsies in an average teaching hospital.**
- In places where non-medico-legal autopsies are not available each student should be made to observe at least five medico-legal autopsies.
- Write correctly and systematically Provisional and Final Anatomic Diagnosis reports.

Cytopathology

Knowledge

- Should possess the background necessary for the evaluation and reporting of

cytopathology specimens.

- Demonstrate familiarity with the following, keeping in mind the indication for the test.

    (i) Choice of site from which smears may be taken

    (ii) Type of samples

    (iii) Method of obtaining various specimens (urine sample, gastric smear, colonic lavage etc.)

    (iv) Be conversant with the principles and preparation of solutions of stains

Haematology

Knowledge

- Should demonstrate the capability of utilising the principles of the practice of Haematology for the planning of tests, interpretation and diagnosis of diseases of the blood and bone marrow.
- Should be conversant with various equipments used in the Haematology laboratory.
- Should have knowledge of automation and quality assurance in Haematology.
- Correctly plan a strategy of investigating at least 90% of the cases referred for special investigations in the Hematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.

Laboratory Medicine

Knowledge

- Possess knowledge of the normal range of values of the chemical content of body fluids, significance of the altered values and its interpretation.
- Possess knowledge of the principles of following specialized organ function tests and the relative utility and limitations of each and significance of the altered values.

    (i) Renal function tests

(ii) Liver function tests

(iii) Pancreatic function tests

(iv) Endocrine function tests

(v) Tests for malabsorption

- Know the principles, advantages and disadvantages, scope and limitation of **a**utomation in the laboratory.
- Know the principles and methodology of quality control in the laboratory.

Transfusion Medicine (Blood Banking)

Knowledge

The student should possess knowledge of the following aspects of Transfusion Medicine.

- Basic immunology
- ABO and Rh groups
- Clinical significance of other blood groups
- Transfusion therapy including the use of whole blood and RBC concentrates
- Blood component therapy
- Rationale of pre-transfusion testing.
- Infections transmitted in blood.
- Adverse reactions to transfusion of blood and components
- Quality control in blood bank

Basic Sciences (in relation to Pathology)

a) Immunopathology

Knowledge

- Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof.
- Demonstrate familiarity with the scope, principles, limitations and interpretations of the results of the following procedures employed in

clinical and experimental studies relating to immunology.

(a) ELISA techniques

(b) Radioimmunoassay

(c) HLA typing

- Interpret simple immunological tests used in diagnosis of diseases and in research procedures.

(i) Immunoelectrophoresis

(ii) Immunofluorescence techniques especially on kidney and skin biopsies

(iii) Anti-nuclear antibody (ANA)

(iv) Anti-neutrophil cytoplasmic antibody (ANCA)

b) Electron Microscopy

Knowledge

- Demonstrate familiarity with the principles and techniques of electron microscopy and the working of an electron microscope (including Transmission and Scanning Electron microscope: TEM and SEM)
- Recognise the appearance of the normal subcellular organelles and their common abnormalities (when provided with appropriate photographs).

c) Enzyme Histochemistry

Knowledge

- Should be familiar with the principles, use and interpretation of common enzyme histochemical procedures (Alkaline Phosphatase, Acid Phosphatase, Glucose-6-Phosphate Dehydrogenase, Chloroacetate Esterase).

d) Immunohistochemistry

Knowledge

- Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP (Peroxidase-anti-peroxidase) and AP-AAP (Alk. Phosphatase-anti-Alk. Phosphatase) ABC (Avidin-Biotin Conjugate) systems; employing monoclonal and polyclonal antibodies.
- Be aware of the limitations of immuno-histochemistry.

e) Molecular Biology

Knowledge

- Should understand the principles of molecular biology especially related to the understanding of disease processes and its use in various diagnostic tests.
- Should be conversant with the principle and steps and interpretation of Polymerase Chain Reaction (PCR), Western Blot, Southern Blot, Northern Blot and Hybridisation) procedures.

f) Cytogenetics

Knowledge

- Demonstrate familiarity with methods of Karyotyping and Fluorescent in-situ Hybridisation (FISH).

g) Tissue Culture

Knowledge

- Demonstrate familiarity with methods of tissue culture.

h) Principles of Medical Statistics

Knowledge

- Demonstrate familiarity with importance of statistical methods in assessing data from patient material and experimental studies.