M.D. PATHOLOGY COURSE

Broad goals & Objection

The Goals of MD Pathology course is to produce a specialist who is competent to provide laboratory based diagnosis to illness. Is able to teach undergraduate and to a certain extent post-graduate, and should have an idea regarding the rudiment of research. He or she should on successfully completing the training and examination be:

a) Capable of offering a high quality diagnostic opinion in a given clinical situation with an appropriate and relevant sample to tissue, blood, body fluids etc. for the purpose of diagnosis and overall well being of the ill.

b) Should be able to teach Pathology to undergraduate, Post graduates, Nurses and Paramedical staff including laboratory personnel. In addition of these responsibilities he/she should be able to supervise and work with subordinates and colleagues in a laboratory.

c) Capable of pursuing clinical and laboratory based research and should be able to systematically write a paper and publish in a journal.

d) Maintain accurate records of the tests and their results for reasonable periods of time so that these may be retrieved as when necessary.

e) Make and record observations systematically that is use for archival purpose and for furthering the knowledge of Pathology.

f) TO be able to correlate clinical and laboratory finding with pathology findings at autopsy, indentify discorrelation and the cause of death due to disease.

g) Should be capable of effective disposing laboratory waste to ensure minimization of risk to infection and accidents to laboratory personnel.

COURSE DESCRIPION

Duration of course;

It is 3 years post-graduate training course after MBBS (Internship completed). The intake is through the P.G. entrance test conducted by the A.M.U. 25% Students are taken through the central pool of the All India competition. The Intake and the training there after, is as per the norms by the Medical Council of India.

Course Description

High Degree of Professional competence and theoretical knowledge is Expected in the following fields.

1. **Pathologic Anatomy (Surgical Pathology and Cytopathology)**

The study of Pathologic Anatomy including all aspects of Pathology as encompassed in the branches of general Pathology and Systemic Pathology.

a) General Pathology

Normal cell and structure and function. The changes in cellular structure and function in disease. Courses of disease and its Pathogenesis. Reaction of cells, Tissues, organ systems and the body as a whole to various sublethal and lethal injury.

b) Systemic Pathology:

The study of normal structure and function of various organ systems and the Aetiopathogensis, gross and microscopic alterations of structure and functions these organ systems is disease. All organ systems are to be studied. This forms the basis of Histopathology (Surgical Pathology), Cytopathology, Autopsy Pathology and clinicalpathological correlation.

2. **Hematology:**

The study of Haematology including all aspects of the disease of the blood and bone marrow. This would involve the study of the normal and the cause of disease and the changes thereof.

3. **In the following fields:** The student is expected to achieve reasonable working knowledge and diagnostic skill, and he able to run independently a routine service in a teaching or non-teaching Hospital.

(i) Laboratory Medicine (clinical chemistry clinical Biochemistry/ chemical pathology and Microscopy/ Clinical pathology including parasitology)

(ii) Transfusion Medicine (Blood banking)

4. **General Acquaintance:**

Following are the fields in which the students is expected to acquire a general Acquaitance of techniques and competence to understand and interpret data without being called upon called to achieve technology proficiency.

a) Immunopathology

b) Electron Microscopy

c) Histochemistry

d) Immunohistochemistry

e) Use of radioisotopes

f) Cytogenetics

g) Tissue culture

h) Medical statistics

i) Molecular biology

j) Maintenance of records

k) Information retrieval, computer Internet in medicine

l) Flow cytometry

COURSE CONTENT/SYLLABUS

SURGICAL PATHOLOGY (MDPT 01)

Knowledge:

a) The student should be able to demonstrate understanding of the histogenetic and patho-physiologic process associated with various during discussion with colleagues, clinicians, students and patients.
b) Should be able to identify problems in the laboratory and offer viable solutions.

Skill:

a) Given the clinical and operative data, the students should be able to indentify. 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.
b) To demonstrate ability to perform a systemic gross examination of the tissue 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 the tissue in the paraffin blocks.
c) Given the relevant clinical, operative and radiological data, the student should be able to identify and systemically and accurately describe the chief histomorphological alterations in the tissues received in the surgical pathology services. He/ She should also correctly interpret and as far as possible, correlate with the clinical data to diagnose at least 90% of the routine surgical material on an average being encountered in the Surgical Pathology Services without the aid of the clinical data.
d) Start the automatic tissues-processing machine and verbally demonstrate his understanding of the principle of its running.
e) Process a tissue, make a paraffin block and cut section of good quality on a rotary machine
f) Stain paraffin sections with at least the following:

    1) Haematoxyline and eosin
    2) Stain for collagen and elastin fibre and reticulin
    3) Iron stain
    4) PAS Stains
    5) PATH
    6) AFS

g) Demonstrate understanding if the principles of:

1) Fixation of tissue
2) Processing of tissue for section cutting
3) Section cutting and maintenance of related equipment
4) Differential (Special) stains and their Litility

h) Cut a frozen section of the tissue received from the operating room for quick diagnosis, stain and interpret the slide in correlation with the clinical data provided and correctly diagnose at least 75 percent of the lesions within 15 minutes.

i) Demonstrate the understanding of the utility of various immunohistochemical stains especially in the diagnosis of tumour subtype.

AUTOPSY PATHOLOGY

Knowledge:

a) Should be aware of the techniques of autopsy
b) Should have sufficient understanding of various disease processes so that a meaning clinic-pathological correlation can be made.

Skills:

a) Demonstrate the 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 in at least 90% of autopsies in an average teaching hospital. In exceptional circumstances, help of a frozen section may be obtained.
b) Identify and correctly diagnose at least 90% of the microscopic lesions found in most autopsies, and be able to correctly the Pathologic changes with the patient's clinical history and events of a few days proceeding death.
c) Write correctly and systematically provisional and final anatomic diagnosis reports (on gross and microscopy respectively) the major findings at autopsy, and the autopsy protocol as per prescribed instructions, of a standard fit for an international journal.

CYTOPATHOLOGY (MD PT 02)

Knowledge:

a) Should posses the background necessary for the evaluation and reporting of cytopathology specimens.

b) Demonstrate verbal familiarity with, the guide the clinical residents in the following, keeping in view the special requirements of the each case (cytohormonal status, malignancy, infection etc.

c) Choice of site from which smears may be taken (as in case of vaginal smears)

d) Type of smears(morning specimens, pre-menstrual specimens)

e) Method of obtaining various specimens (Urine sample, gastric smear, colonic Lavage etc.)

Skills:

a) Independently prepare and stains good quality smears for cytopathologic examination and be conversant with the principles and preparations of solutions of stains

b) Demonstrate conversance with the techniques for concentration of specimen i.e. various filters and cytocentrifuge.

c) Independently be able to perform fine needle aspiration of palpable superficial lumps in patients, make good quality smears, and be able to decide on type of staining in a given case.

d) Given the relevant clinical data he/she should be able to independently and correctly:

1) Evaluate hormonal status in all cases as may be required.
2) Diagnose the status of malignancy or otherwise in at least 75% of cases received in a routine laboratory and categorize them into negative, inconclusive and positive.
3) Demonstrate ability in the technique of screening and dotting the slides for suspicious cells.
4) Indicate correctly the type of tumors, if present in at least 75% cases.
5) Identify with reasonable accuracy the presence of organism, fungi and parasites in at least 75% cases.

Haematology (MDPT 03)

Knowledge:

a) Should demonstrate the capability of utilizing the principles of the practice of haematology for the planning of tests, interperation and diagnosis of disease of blood and bone marrow.

b) Should be conversant with various equipment used in haematology laboratory.

c) Should have knowledge of automaton and quality assurance in haematology.

Skills:

a) Correctly plan a strategy of investigation at least of the cases referred for special investigation in the haematology clinic and give ample justification for each step in consideration of the relevant clinical data provided.

b) Correctly and independently perform the following special tests, in addition to being the routine haematological counts:

i) Haemogram including reticulocyte and platelet count
ii) Bone morrow staining including stain for iron
iii) Blood smear staining
iv) Osmotic fragility
v) Fetal haemoglobin
vi) Sickling phenomenon
vii) Bleeding time
viii) Clotting time
ix) Prothrombin time (PT)
x) Activated partial thromboplastin time (APTT)
xi) Haemoglobin electrophoresis, paper electrophoresis
xii) Coomb's test
xiii) Clot solubility test

c) Cytochemical characterization of leukemia with special stains like peroxidase, Leukocyte alkaline Phosphatase (LAP) ,PAS, Sudan black, Oil red O, Acid Phosphatase (including tartarate resistant) and Non-specific enolase.

d) Demonstrate familiarity with the principle and utility in the diagnosis of the following
i)Red cell indices
ii) Plasma haemoglobin
iii) Haemosiderin in urine
iv) Presumptive test for complete antibodies
v) Ham's acid test
vi) Sugar water test
vii) Serum electrophoresis
viii) Platelet function test including platelet

aggregation and adhesion and PF3 release

ix) Russell's viper venom time
x) Coagulation function assays
xi) Screening for coagulation factor inhibitors
xii) Fibrin degration products (FDP)
xiii) Monitoring of anticoagulation therapy
xiv) Test for thrombosis: lupus anticoasgulant

activated protein C resistance (APCR), protein C, protein S (PrS)

xv) Serum ferritin
xvi) Serum iron and binding capacity
xvii) Immunopheretic typing
xviii) Cytogenetics

e) Perform a successful bone marrow aspiration/iliac crest biopsy, and stain the peripheral and bone marrow smear with Romanowsky stains.

f) Describe accurately the morphologic finding in the peripheral and bone marrow smears, identifying and quantitatinng the morphologic abnormalities in disease sttes and arriving at a correct diagnosis in at least 90% of cases referred to the haemotology clinic, given the relevant clinical data.

g) Posses the working knowledge of the following:

i)Bone marrow transplantation
ii) Prenatal diagnosis of genetic haematological diseases
iii) Molecular biology of haematological diseases.

LABORATORY MEDICINE (MDPT 03)

Knowledge:

a) Demonstrate familiarity with the normal range of value of the chemical content of body fluids, significance of the altered values and interpretation thereof.

b) Posses knowledge of the principles of following specialized organ function tests and the relative utility and limitation of each and significance of altered values

i)Renal function test
ii) Gastric and pancreatic function test
iii)Endocrine function test
iv) Tests for malabsorption

c) Explain the biochemical principle involved in the above estimation

d) Know the principle, advantage and disadvantage, scope and limitation of automation in laboratory.

e) Learn the principles and methodology of quality control in laborator.

Skills:

a) 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. He should be able to correctly interpret the laboratory data of such studies and discuss their significance with a view to arrive at a diagnosis.

b) Demonstrate familiarity with and successfully perform a routine urine analysis including physical, chemical and microscopic examination of the sediments

c) Demonstrate familiarity with and successfully perform the macroscopic and microscopic examination of faeces and identify the ova and cyst of common parasites.

d) Independently and successfully perform a complete examination; physical, chemical and cell count of C.S.F. pleural and peritoneal fluids.

e) Successfully perform an examination of peripheral bllod for the commonly occurring parasites.

f) Independently perform a semen analysis

g) Independently and coorectly perform atleast the following quantitative estimation by manual techniques and/or Automated Techniques.

i)Blood Urea

ii) Blood Sugar
iii) Serum protein, total & fractional
iv) Serum Bilirubin, total & fractional
v) Serum Amylase

h) Demonstrate familiarity with the following quantitative estimation by Automatec Techniques and manual method-

i) Serum cholestrl
ii) Uric acid
iii) Serum Transminases
iv) Serum Alkaline phosphatases
v) Creatinine
vi) Serum calcium and phosphorus
vii) Serum electrolyte (Na+ and K+)

i) Demonstrate familiarity with:

i) Determination of bicarbonates
ii) Blood gas analysis

j) Prepare standard solution and reagents relevant to the above tests including preparation of normal solution, molar solutions and buffers

k) Explain the principle of instrumentation use and application of the followings:

i)Photoelectric colorimeter
ii) Spectrophotometer
iii) PH meter
iv) Flame photometer
v) Centrifuge
vi) Analytical balance
vii) Electrophoresis apparatus
viii) Light microscope
ix) Blood gas analyzer
x) Tumor Markers

TRANSFUSION MEDICINE (BLOOD BANKING) (MDPT 03)

Knowledge:

It is expected that student should possess knowledge of the following aspect of transfusion medicine.

a) Basic immunology
b) ABO and Rh group
c) Clinical signification if other blood bank
d) Transfusion therapy including the use of whole blood and RBC concentrate
e) Blood concentrate therapy
f) Rationale of Pre-transfusion testing
g) Infections transmitted in blood
h) Adverse reactions to transfusion of blood and components
i) Quality control in blood bank

Skills:

It is expected that the stuident should correctly and independently perform the following

a) Selection and bleeding of donors
b) Preparation of blood components i.e. cryoprecipaitate , platelet concentrate, fresh frozen plasma, single donor plasma and red cell concentrate.
c) ABO and Rh grouping
d) Resolving ABO grouping problems by secretors in plasma
e) Demonstrate familiarity with antibody screening and cross matching by-
    i)LISS (Low-inonic salt solution)
    ii) Enzymes
    iii) AHG (anti Human Globulin)
f) Steps o be taken if above are positive and if there is incompatibility
g) Demonstrate familiarity with with Antenantal and Neonatal work:
    i)Direct antiglobulin test
    ii) Antibody screening and titre
    iii) Selection of blood for exchange transfusion
h) Demonstrate familiarity with principle and procedure involved in
    i)Resolving ABO Grouping
    ii) Identification of RBC antibody
    iii) Investigation of transfusion reaction
    iv) Testing of blood for presence of:
        1) HBV(Hepatitis B virus markers)
        2) HCV (Hepatitis C virus markers)
        3) HIV (Human Immunodeficiency Virus testing)
        4) VDRL
        5) Malaria- Parasite

BASIC SCIENCES (in relation to Pathology) (MDPT-02)

These facilities are limited in our Institution, but effort is made so that the student gests an opportunity to be familiar with all aspects of expected training.

a) Immunopathology

Knowledge

i) Demonstrate familiarity with the current concepts of structure and function of the immune system, with its aberration and mechanisms thereof.

ii) 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) Radioimmuno assay
c) HLA typing

b) Electron microscopy

Knowledge

i)Demonstrate familiarity principles and techniques of electron microscopy and working of electron microscope.

ii) Recognize the appearance of the normal subcellular organelles common abnormalities (when provided with appropriate photographs)

c) Enzyme Histochemistry

Knowledge

Should be familiar with the principles, use interpretation of the common enzyme histochemistry procedures (Alkaline phosphatase , Acid Phosphatase.)

Glucose-6-Phosphatase Dehydrogenase, Succinyl Dehydrogenase, Chloracetate Esterase and Acetyl cholinesterase.

Skills:

i) Operate the cryostat, and demonstrate familiarity with the principles of its working and be able to stain sections for some cell constituents.

ii) Should be familiar with the commonly used enzyme histochemical procedures.

d) Immunohistochemistery

Knowledge:

Demonstrate familiarity with the principles and procedures of various immunohistochemical stains employing monoclonal and polyclonal antibodies.

Skills:

Should be able to perform immunohistochemical staining using paraffin sections with at least one of the commonly used antibodies (cytokeratin or LCA) using PAP (Peroxidase- antiperoxidase) method.

e) Molecular Biology

Knowledge:

Should understand the principles of Molecular biology especially to the understanding of desease processes and its use in various diagnostic tests.

Skills:

Should be conversant with the step of a polymerase chain reaction (PCR) and should demonstrate understanding of the principles of Western Blot, Southern Blot, Northern Blot and Hybridication Procedures.

f) Flow Cytometry

Should be familiar with the principles, use and working of flow cytometry.

g) Medical Statistics

Knowledge:

Demonstrate familiarity with importance of statistical method in assessing data from patients, material and experimental studies.

Skills:

Calculate means, standard deviation and standard error from the given experimental data.

h) Radioiscotope and Autoradiography

Knowledge:

Demonstrate familiarity with the principles of the commonly used radioisotopes in medicine.

i) Tissue culture

Knowledge:

Demonstrate familiarity with methods of tissue culture.

j) Cytogenetices

Demonstrate familiarity with methods of karyotyping and Fluorescent in-situ Hybrization (FISH)

RESEARCH

M.D. Pathology Thesis

1. **Section of thesis topic**

   Subject of the thesis will be selected by the candidate towards the end of first year under the guidance of Faculty/Supervisor. A protocol will be prepared for consideration by the departmental Board of Studies.

2. **Approval of thesis topic**

   The Board of Studies if the department will consider the thesis topic. The constraint and the ethical aspects will be discussed and only then the subject/topic will be passed. This will again be reconsidered at the Faculty meeting of the college.

3. **Research Work**

   Once the thesis protocol is approved, the candidate starts his/her research work under the direct supervision of his/her guide/co-guide.

4. **Progress of thesis**

   Six monthly progress of the thesis to be presented by the candidate in the department's seminar room.

5. **Submission of Thesis**

   The candidate is required to submit the thesis 6 month before the final M.D. Path examination. The thesis will be sent to two external and two internal examiners for evaluation report and acceptance.

EVALUATION

Internal (Formative) Assessment:

1. Internal Assessment is done at the end every Lab Posting and reviewed even Six months.
2. A Logbook is maintained recording the duration of posting, the period of absent and skills performed. Record of individual student maintained in the book regarding journal clubs, seminars attended and partaken as well as undergraduate teaching activities with remarks by the teachers/ Faculty member
3. Research work is assessed every six months.
4. Awarding grades- The grades are endorsed by more than on faculty member the following way.

   A+= 80% - 89%
   A-= 75% - 79%
   B+= 70% - 74%
   B= 60% - 69%
   C= < 50%

5. The internal assessment result is conveyed to the candidate periodically so that the candidate knows where he or she stand.

UNIVERSITY (SUMMATIVE) ASSESSMENT

The summative examination is held at the end of the three years of the training programme this would include assessment of the thesis and a formal examination on the theoretical and practical aspects of the specially of Pathology.

(1) For the formal examination there should be two external and two internal examiners. The Theory papers are set by Internal & External Examiners and suitably moderated by the Internal Examiners.

1- **THEORY PAPERS**

Paper – I Systemic Pathology (MDPT 01)

Paper – II – General Pathology, Pathophysiology, Immunopathology cytology & Laboratory Medicine. Molecular genetics (MDPT 02)

Paper – III – Haematology, Transfusion Medicine, Chemical Pathology (MDPT 03)

Paper – IV – Recent advances & applied aspects (MDPT 04)

Each paper composed of ten short answer questions (SAQ) or one long answer questions (LAQ) and six short answer questions (SAQ).

II – **PRACICAL EXAMINATION** (MDPT 1P)

Practical examination is conducted over a minimum period of two days.

The following aspects are covered:

(1) Clinical Pathology: Discussion of a clinical case history plan relevant investigations of the above case.

Clinical Pathology: Two investigations should be performed.

Complete Urinalysis

Haematology : Discuss Haematology cases given the Relevant history & Plan Relevant investigations. Perform at least two tests.

Exercise

Examine report and discuss (no. of slides variable) and cases Given the history and relevant blood smears and/or bone marrow Aspirate smear.

Transfusion : Perform blood grouping. Perform the necessary exercise given a relevant history.

Histopathology : Examine, report and discuss ten to twelve histopathology slides.

Cytopathology: 3-5 Cytopathology cases given the relevant history and slides.

Lab Tech. : Perform a Haematoxylin and Eosin stain and any special stain on a Paraffin section report on a frozen section.

Autopsy : Given a case history and relevant organs (with or without slides) Give a list of anatomical diagnosis in an autopsy case.

Gross Pathology: Describe findings of gross specimens, give diagnosis and identify the sections to be processed.

Basic sciences: Identify electromicrograph. Identify Histochemical and Immuno-histochemical stains.

Viva Voce is conducted at every stage of the practical examination. Additionally a formal "grand" viva voce is held at the end of the Practical examination. Marking is done by grading rather than actual marking. (MDPT IV)

Model Question Paper for M.D. (Pathology) Examination
Paper I
Systemic Pathology
MDPT – 01
Duration: Three hours

Maximum Marks: 100

Answer all questions:

Discuss the following briefly and to the point. Illustrate your answers with suitable diagrams and flow charts wherever required.

1. Small Round Cell tumors of childhood. 20
2. Asbestos related diseases. 15
3. Cystic diseases of the kidney. 15
4. Gestational trophoblastic diseases. 15
5. Gastrointestinal stromal tumors. 15
6. Pathogenesis of Atherosclerosis. 20

Model Question Paper for M.D. (Pathology) Examination
Paper II
General Pathology / Clinical Pathology / Cytopathology / Med. Genetics
MDPT – 02
Duration: Three hours

Maximum Marks: 100

Answer all questions.

Write briefly on the following.

1. Pulmonary thromboembolism. 10
2. Pathogenesis of AIDS. 20
3. Paraneoplastic syndrome. 10
4. Type IV Hypersensitivity reaction 10
5. Cytology of metastatic neoplasia in lung. 10
6. Relation of Microsatellites to neoplasia. 10
7. Role of P53 oncogene in cancer diagnosis. 20
8. Turner's Syndrome. 10

Model Question Paper for M.D. (Pathology) Examination
Paper III
Haematology / Immunology and Clinical Pathology
MDPT – 03
Duration: Three hours

Maximum Marks: 100

Answer all questions:

Illustrate your answers with suitable diagrams and flow charts wherever required.

1. Discuss the prelymphomatous conditions and lympho-proliferative states often confused with lymphomas. 20
2. Discuss the laboratory evaluation of a patient suffering from acute renal failure. 20
3. Write briefly about.
   a. Numerical abnormalities of sex chromosomes. 15
   b. Immunologic interstitial lung disease. 15
   c. Diagnosis of folate deficiency. 15
   d. Non-immune hemolysis. 15

Model Question Paper for M.D. (Pathology) Examination
Paper III
Recent Advances in Pathology
MDPT – 04
Duration: Three hours

Maximum Marks: 100

Answer all questions:

Illustrate your answers with suitable diagrams and flow charts wherever required.

1. Role of stem cells in modern medicine. 20
2. Discuss Eneimerate the premaliganant conditions of breast and elaborate predictive and prognostic molecular markers of breast cancer. 20
3. Write in brief about:
   a. Nonalcoholic steatohepatitis. 15
   b. Role of polarizing microscope in diagnostic histopathology. 15
   c. Myelofibrosis. 15
   d. Microalbuminuria. 15