

Passed by Academic Council (Resolution No. 355/2006) dtd. 30/05/2006, subject to Uniformity in the Examination pattern.

Curriculum for M.Ch (Cardio Thoracic Surgery)

GOAL

The overall goal of the training program is to produce a specialist who can serve as a tertiary care physician capable of carrying out effective treatment for cardiac, vascular and thoracic surgical problems. The M.Ch. course in Cardio-Vascular and Thoracic surgery will aim at inculcating a rational approach in treatment of patients by imparting sound knowledge of the subject and by teaching surgical skills to the post-graduate student.

Objectives: The following should be fulfilled to achieve the goal of the training program.

Cognitive Domain :

- 1) Diagnose cardiac, vascular and thoracic surgical problems based on clinical methods.
- 2) To interpret relevant laboratory, radiological and cardiological investigations for the purpose of diagnosis
- 3) To arrive at a treatment plan/s based on 1 & 2 and discuss the pros and cons with the patient and his family.
- 4) Be able to carry out emergent surgical management for cardiac/vascular and thoracic surgical emergencies after quickly assessing the patient and synthesizing available clinical and investigational information.
- 5) To keep abreast of the current knowledge and recent advances in the field.
- 6) To attend continuing education programme for updating the knowledge.
- 7) To carry out research and publications in the field
- 8) To teach the undergraduate medical students and nursing, physiotherapy, occupational therapy and perfusion students.

Skills:

- 1) To perform diagnostic and therapeutic procedures such as pleural tapping, insertion of intercostals drains.
- 2) To perform emergent surgical procedures for trauma, vascular emboli.
- 3) To perform and assist planned open and closed cardiac procedures. To perform and assist for vascular and thoracic surgical procedures.
- 4) To effectively manage the patients in post operative intensive care.
- 5) To manage the preoperative workup of patients undergoing planned surgery.

Affective Domain:

- 1) To adopt ethical practices in dealing with patients, colleagues, subordinates, superiors and health care workers.
- 2) To promote cordial interpersonal relation
- 3) To perform as a team
- 4) To learn to be a leader when the need arises.
- 5) To develop communication skills to interact with patients, relatives, colleagues and paramedical staff.
- 6) To learn to order investigations and prescribe drugs rationally.
- 7) To be aware of ethical issues in human and animal research.

SYLLABUS FOR M. Ch. DEGREE IN CARDIOVASCULAR & THORACIC SURGERY

SECTION II : SYLLABUS

NOMENCLATURE OF THE DEGREES

M. Ch. : MAGISTER CHIRURGIA

SUBJECT

CARDIO-VASCULAR AND THORACIC SURGERY

COURSE OF STUDY

The course of study shall include:

- i) A wide coverage of Basic Sciences like Anatomy, Physiology, Biochemistry, Pathology, Microbiology, Pharmacology and Immunology pertaining to the Cardiovascular and Respiratory systems and the Chest and its contents;
- ii) a thorough knowledge , theoretical as well as practical, of the various investigative procedures - invasive and non-invasive - including biochemical, radiological and ultrasonographic investigations, radioisotope scanning and dynamic function studies such as pulmonary function tests, cardiac catheterisation and oesophageal manometry;
- iii) a detailed knowledge of and practical experience in clinical and operative paediatric and adult cardiac surgery, surgery of great vessels and peripheral arteries and general thoracic surgery including surgery of the chest wall, diaphragm, oesophagus, mediastinum, trachea , lungs and pleura ; and
- iv) a broad knowledge or Cardiology, Respiratory Medicine and other medical problems relating to Cardiovascular-thoracic Surgery , as well as of Computer application.

The course of study shall include the theory and applied aspect of:

1] Anatomy and Embryology: Applied anatomy of

- *** heart including cardiac valves , skeleton of heart, muscle arrangement, blood supply, venous drainage, nerve supply, morphology of cardiac chambers and septae ,structure of cardiac muscle
- *** aorta, major branches , arteries involved in collateral supply in chest , arteries used as conduits
- *** vena cave and their tributaries.
- *** trachea ,bronchi and lungs ; pulmonary arteries
- *** mediastinum and mediastinal structures
- *** thoracic esophagus
- *** diaphragm
- *** structure and function of a gene
- ** rest all the anatomy related to heart, lungs and systemic blood vessels

2] Physiology:

The Heart :

- * basic physics of membrane potential ,action potential
- *** myocardial action potential,
- *** energy for contraction of cardiac muscle,
- *** cardiac cycle
- *** regulation of cardiac function
- *** rhythmic excitation of heart,
- *** Myocardial metabolism , -- under various conditions(full /empty beating, fibrillating, cold, arrested state
- * skeletal & smooth muscle contraction , difference from the myocardium

Circulation :

- *** Physics of blood , blood flow and pressure
- *** Physical characteristics of the systemic circulation and function of large and small arteries ,arterioles, capillaries and veins.
- *** control of blood flow to individual organs (brain, heart, kidneys)
- *** arterial pressure control : rapid and long term control
- *** cardiac out put , venous return & their regulation
- *** Pulmonary circulation
- *** coronary circulation
- *** cardiac failure and circulatory shock

Respiration`:

- ***Mechanism of pulmonary ventilation, pulmonary volumes and capacity
functions of respiratory passageways
- *** physical principle of gas exchange & diffusion of O₂ & CO₂.
- ***transport of O₂ & CO₂ in blood.
- ** regulation of respiration
- ** Body fluids , Kidneys and Acid base balance
- ** Metabolism

CNS :

- *brain waves,
- ***thoracic autonomic system
- ** Basic characteristics of sympathetic and parasympathetic function

Hypothermia :

*** Core temperature and surface temperature, Insulator system of body, heat transfer from body core , heat production and loss, regulation of body temperature , isotherms and oikilotherms Effect on metabolic rate, heart, circulation, blood viscosity, ions, hormone release, solubility of blood gases, pH changes, SVR/PVR

3] Bacteriology, Virology, Parasitology & immunology :

- *** Streptococci , Staphylococci, Common gram negative bacteria
- *** Mycobacteria
- *** Aspergillosis and fungi affecting heart and cardiac valves.
- *** immunology relevant to heart and lung transplantation
- *** life cycle of Echinococcus
- *** HIV virus

4] Pathology:

- *** General pathology required to understand specific pathology:
degeneration, infarction, necrosis, stunning, hibernation
 - *** gross and microscopic pathology of
- 1) rheumatic heart disease
 - 2) syphilitic heart disease
 - 3) tuberculous heart disease
 - 4) atherosclerotic cardio vascular disease
 - 5) cardiac myxoma
 - 6) suppurative lung diseases
 - 7) hydatid disease of lung
 - 8) pulmonary tuberculosis
 - 9) benign tumors of lung
 - 10) carcinoma of lung

11) Medistinal tumors and Thymic hyperplasia and Thymomas.

12)CHD: (including the anomalies and variants associated with) ASD, VSD, AV canal, PDA, AP window, RASOV,TOF, Pulmonary atresia , TAPVC, Tric.atresia, Single Ventricle physiologies, Transposition complexes, Truncus arteriosus Ebstein's anomaly, Pulmonary stenosis , aortic stenosis, coarctation of aorta,

13)HIV related infections

14)Burger's disease

15) specific and non specific aorto arteritis

** gross and microscopic features of

- 1) valvular heart diseases not covered above
- 2) cardiomyopathies
- 3) benign and malignant diseases of pleura
- 4) benign and malignant tracheal tumors
- 5) benign and malignant tumors of esophagus
- 6) cardiac tumors other than myxoma
- 7) CHD : not covered in the above list

5] Pharmacology:

*** antibiotics , antitubercular , antifungal and antiviral drugs

*** Pharmacology of drugs used in the treatment of

- 1) congestive cardiac failur
- 2) hypertension
- 3) angina pectoris
- 4) peripheral vascular disease
- 5) acidbase imbalance
- 6) supra ventricular and ventricular arrhythmia
- 7) chemotherapy of carcinoma lung

*** Pharmacology of drugs used as

- 1) oral and parenteral anti coagulants, antiplatelet agents, fibrinolytic agents, and their antidotes.
- 2) bronchodilators , mucolytics
- 3) systemic and pulmonary vasodilators conduit dilators for bypass grafts vasoconstrictors
- 4) diuretics
- 5) Others :

*** adenosine , antifibrinolytics, serine protease inhibitors,
constituents of cardioplegia , Free radical Oxygen Scavengers

** immunosuppresants used in heart lung trans plant

** drugs used in pre-anesthetic medication and anesthesia

Cardio – Thoracic Surgery

- 1 * Function of the gas Exchange System and its Evaluation
- 2 * Anesthesia for CardioThoracic surgery.
- 3 *** Postoperative Care and complications in CardioThoracic surgery .
- 4 ** Ventilatory assistance and support. Respiratory support in infants
- 5 *** shock : types, diagnosis ,management. Cardio pulmonary resuscitation.
- 6 *** Use of Antibiotics in Cardiac and Thoracic Surgery
- 7 ** Computer Application in Cardio thoracic Surgery.
- 8 *** Thoracic Incisions, complications of incision including sternal dehiscence
- 9 *** Thoracic trauma.
- 10 ** Pulmonary resection Anatomy and Techniques.
- 11 ***Thoracic Imaging.
- 12 ** Esophagoscopy
- 13 ** Bronchoscopy: trans bronchial biopsy and bronchoalveolar lavage.
- 14 ** Thoracoscopy : general principles, diagnostic & therapeutic procedures
- 15 * Developmental Abnormalities of the airways and lungs
- 16 ***sequestration of lung,
- 17 * Surgical treatment of the Bullous Emphysema.
- 18 ***Diagnosis of Benign, diffuse Pulmonary Disease.
- 19 ***Pneumonia, Bronchiectasis, and lung abscess.
- 20 ** Thoracic infections caused by Actinomycetes, Fungi, Opportunistic organisms, and Echinococcus.
- 21 ***Surgical treatment of tuberculosis
- 22 * Molecular biology and immunology of lung and esophageal cancer.
- 23 ** Benign tumors of the lower respiratory tract.
- 24 *** Lung carcinoma :diagnosis, staging, surgery for- ,limited pulmonary resection, bronchoplastic techniques for
- 25 ** Multimodality Therapy of Carcinoma of the Lung: Irradiation, Chemotherapy, and Immunotherapy.
- 26 * Indications for Resection of Pulmonary Metastases.
- 27 ** Thoracic disorders in an immunocompromised host
- 28 ** Pulmonary embolism acute & chronic
- 29 ** Pulmonary AV fistule
- 30 * Lung Transplantation.
- 31 ** Benign & Malignant Disorders of Pleura
- 32 *** Pleural Space Problems & Thoracoplasty
- 33 ***Thoracic Outlet Syndrome
- 34 ** Chest wall & sternal abnormalities & management of chest wall tumours

- 35 * Diaphragm : developmental, traumatic, neoplastic disorders, dysfunction & pacing
- 36 *** Mediastinal tumours, Thymic tumors and management of myasthenia gravis
- 37 ** Trachea : tumors , strictures , tracheomalacia ,tracheal resections & reconstructions .
- 38 ** The Esophagus : Anatomy & Functional Evaluation .
- 39 ** Esophageal injuries
- 40 * Medical & Surgical Treatment of Hiatal Hernia .
- 41 * Barrette's Esophagus.
- 42 * Nissen Fundoplication .
- 43 * Hill Procedure .
- 44 * Belsey Mark IV Procedure.
- 45 * Benign Strictures of Esophagus .
- 46 * Paraesophageal Hiatal Hernia.
- 47 * Esophageal Dysmotility.
- 48 * Treatment of Achalasia & Gastroesophageal Reflux.
- 49 ** Thoracoscopic Esophageal Surgery .
- 50 * Carcinoma of Esophagus, surgical options Resection, Reconstruction, Palliative treatment of Carcinoma of the Esophagus .
- 51 ***special diagnostic and therapeutic procedures in cardiac surgery:
Echocardiography, Cardiac catheterization, angiography and interventional techniques ,
PTCA & stenting , Fibrinolytic therapy in the management of acute myocardial infarction,
Role of CT scan, MRI , radionuclide imaging in Cardiovascular Diagnosis.
- 52 ** Normal & Abnormal Development of the Heart.
- 53 *** Peri operative care of the pediatric cardiac patient.
- 54 * Anesthesia for Pediatric Cardiac Surgery.
- 55*** Management of Cardiopulmonary Bypass in adults,infants & children .Pump,
oxygenators, filters, tubings, cannule, ultrafiltration for CPB
- 56 *** Deep Hypothermia & Total Circulatory Arrest.
- 57 *** Myocardial Protection & cardioplegia: rationale of various constituents, common
cardioplegic solutions. Constitution of cardioplegia used at the candidates institute.
- 58 *** Palliative Procedures in Congenital Heart Disease
- 59 ** Tracheoesophageal Compressive Syndromes of Vascular Origin: Rings & Slings.
- 60 *** Anomalous Pulmonary and Systemic Venous Connections.
- 61 *** Atrial Septal Defects and Cor Triatriatum.
- 62 *** Ventricular Septal Defect.
- 63 *** Patent Ductus Arteriosus and Aortopulmonary Window.
- 64 *** Atrioventricular Septal Defects.
- 65 *** Tetralogy of Fallot and related physiological complexes
- 66 *** Complex of Functional Single Ventricle.

- 67 ** Truncus Arteriosus.
- 68 ** Congenital Malformations of the Aortic Valve and LVoutflow tract.
- 69 *** Coarctation of Aorta and Interrupted Aortic Arch.
- 70 ** Hypoplastic Left Heart Syndrome.
- 71 *** Pulmonary Stenosis with intact IVS
- 72 *** Pulmonary Atresia with intact IVS
- 73 *** Transposition of Great Arteries
- 74 *** Congenitally Corrected Transposition of the Great Arteries.
- 75*** Double Outlet Right Ventricle and Double Outlet Left Ventricle.
- 76 *** Tricuspid Atresia.
- 77 *** Ebstein's Anomaly
- 78 ** Congenital Abnormalities of the Mitral Valve.
- 79 * Heart & heart – lung transplantation in children
- 80 * Circulatory Support in Infants and Children
- 81 ** Anomalies of the Coronary Vessels
- 82 *** Hemorrhagic and Thrombotic Complications of Cardiac Surgery.
- 83 *** Intra-aortic Balloon Counter pulsation, Ventricular Assist Pumping,
- 84 * Artificial Heart.
- 85 ** Preservation of Intrathoracic Organs for Transplantation.
- 86 ** Heart & heart-lung Transplantation.
- 87 ** Cardiomyoplasty, surgical treatment for congestive cardiomyopathies.
- 88 *** Surgery for Bacterial Endocarditis.
- 89 *** Acquired Disease of the Tricuspid Valve.
- 90 *** Acquired Disease of the Mitral Valve.
- 91 *** Acquired Aortic Valve Disease
- 92 ** Surgical management of Hypertrophic Cardiomyopathies
- 93*** Homografts and Auto grafts
- 94 *** Cardiac Valvular Prostheses: design, selection, complications of
- 95*** Coronary Revascularization: non surgical techniques, surgical indications, direct and indirect surgical interventions, conduit selection & harvesting , surgical management of complications of MI, combined Coronary and carotid artery disease.
- 96 ** Surgery for supraventricular & ventricular Arrhythmias.pacemaker therapy.
- 97 *** Aneurysms of the ascending , arch and descending thoracic aorta
- 98 *** Dissections of the Aorta.
- 99 *** Constrictive pericarditis, cardiac tamponade
- 100 * Other diseases of pericardium.
- 101 *** Cardiac myxoma
- 102 * Cardiac Tumors.
- 103 *** History of

- a) heart , lung and vascular surgery (out line)
- b) prosthetic valves
- c) Cardiopulmonary Bypass & cardioplegia
- d) ASD closure
- e) coronary surgery
- f) Cardiovascular & Thoracic (CVT) surgery in India , Mumbai and at the candidate's institution

104 ** legends in CVT surgery

105*** Prosthetic material (biological / artificial) in Cardio, vascular and thoracic surgery

106*** Sutures in CVT Surgery: physical properties of sutures, needle types, recent advances in suture materials.

Vascular

1. ***Physiologic assessment of peripheral arterial occlusive disease
2. ***vascular imaging techniques
3. ***Burger's disease
4. ***Takayasu's disease , Nonspecific aortoarteritis
5. *** management of arterial aneurysms
6. **fibrodysplasia
7. *uncommon arteriopathy
8. ***antithrombotic therapy
9. **angioplasties and endovascular techniques
- 10.***basic vascular surgical technique, Fogarty thrombectomy, endarterectomy
- 11.*** Vascular grafts
- 12.*** Complications of vascular surgery and interventions
- 13.***management of acute ischemia of limbs
- 14.***management of chronic ischemia of limbs and viscera
- 15.*** management of thoracic outlet syndrome
- 16.** other neurovascular conditions involving the upper extremity
- 17.* congenital vascular malformations
- 18.*** management of renovascular hypertension
- 19.***management of extracranial cerebrovascular disease
- 20.* * management of deep venous thrombosis

legend *** : Must Know topic
 ** : Better Know topic
 * : Nice to Know topic

Importance of a topic is decided depending up how frequently a student is likely to encounter it in day today practice.

- * : very uncommon = nice to know
- *** : very common = must know

QUANTUM OF TRAINING

i) The quantum of training shall be sufficient so that at the end of the training period, a candidate will be able to:

- a) Identify the problem in a given patient.
- b) interpret the results of investigations.
- c) perform necessary special procedures / operations pertaining to this super-specialty.
- d) take care of any exigency / complication following the special procedure /operation.
- e) offer appropriate therapy on his/her own in a set up far withdrawn from his/her training centre.

ii) In order to achieve the above objectives, a candidate shall be apportioned graded responsibility in patient care under supervision.

iii) A candidate at the end of the training period must have acquired

- a) capability in conducting cardiopulmonary bypass ;
- b) competence in the intensive care management of patients with cardiac, vascular and thoracic surgical problems ; and
- c) confidence in the operating room by performing under supervision as well as independently.

It would be desirable that a minimum number of operations as stipulated hereunder be performed by the trainee during his training period :

Nature of operation	Number of operations performed	
	Assisted by a Faculty	Independently (under de jure supervision)
Lung resections	5	3
General Thoracic Operations (other than lung resections)	5	2
Operations on Esophagus/Diaphragm	3	-
Closed Heart Operations	5	3
Open Heart Operations	25	15
Vascular Operations	5	2
Minimum total	48	25

(* The number of operations under each category is subject to revision from time to time and if there are compelling reasons then the Board of Examiners can condone deviations from these stipulated minimum numbers.)

iv) A candidate shall be required to spend four weeks in the Department of Cardiology /Chest Diseases and six weeks as an Exchange Visitor at one or two other reputed centres within the city or anywhere in the country. If there are compelling reasons then the Board of Examiners can condone deviations from these stipulations.

v) A candidate shall maintain a Log Book of the Special Procedures / Operations performed by him / her during the training period and its authenticity shall be certified by the concerned Postgraduate Teacher / Head of the Department.

vi) A candidate shall be required to prepare a Dissertation.

vii) Three copies of the Dissertation should be submitted to the University at the stipulated time for evaluation.

viii) The Log Book of Special Procedures / Operations performed by a candidate shall be made available to the Board of Examiners for their perusal at the time of his / her appearing at the Final Examinations.

SCHEME OF EXAMINATION (As per Direction No. 01/2008 dtd. 26/05/2008)

SUGGESTED READING

A. Books :

	Name of the book	Editor / Author	Publisher
1.	Cardiac Surgery Vol. I & II	Kirklin J.W. Barratt - Boyes	Churchill Livingstone
2.	Thoracic and Cardiovascular Surgery	Glenn W.W.L	Appleton Century Croft
3.	General Thoracic Surgery	Thomas W. Shields	Williams & Wilkins
4.	Vascular Surgery Vol. I & II	Robert B. Rutherford	W.B.Saunders & Company
5.	Surgical Anatomy of the Heart	Benson Wilcox	
6.	Hurst's The Heart Vol. I & II	Robert C. Schlant R. Wayne Alexander	McGraw-Hill Inc.
7.	Paediatric Cardiac Surgery	Mavroudis C. Backer C.L.	Mosby
8.	Pathology of Congenital Heart Disease	Anton E. Beeker Robert H. Anderson	Butterworths
9.	Gibbon's Surgery of the Chest	David C. Sabiston Frank C. Spencer	W.B.Saunders & Company
10.	Heart Disease: A Text Book of Cardiovascular Medicine . Vol. I & II	Eugene Braunwald	W.B.Saunders & Company
11.	Moss and Adams Heart Disease in Infants, Children and Adolescents	George C. Emmanouilides Thomas A Rimonschneider Hugh D. Allen Howard P. Gutgesell	Williams and Wilkins

B. Journals

1. Journal of Thoracic and Cardiovascular Surgery
2. Annals or Thoracic Surgery
3. Indian Journal of Thoracic and Cardiovascular Surgery
4. Asian Cardiovascular and Thoracic Annals
5. European Journal of Cardiothoracic Surgery
6. Thorax
7. Indian Heart Journal
8. Journal of American College of Cardiology
9. Circulation

Structured Training Programme Scheme

1st Year – Out patient, Inpatient care

Introduction to intensive care

Familiarization with use of computers for data storage and acquisition.

Literature search and plan for dissertation

Assisting at operations including emergencies.

2nd Year – Outpatient and Inpatient Care

Independent performance of surgical procedures and assisting at operations

Rotations – Cardiology

Vascular Interventional Radiology

Chest Medicine

Thoracic Oncology

3rd Year – Outpatient and Inpatient Care

Assisting and performing major surgical procedures

Research projects finalization and preparing dissertation

Research Training

The candidate will be trained in the ability to

- a) frame a research question
- b) plan a study to answer the question
- c) collect the relevant information and
- d) evaluate appropriately the collected data to arrive at an informed conclusion

The candidate should become conversant with the reporting of these results as a research paper in journals and as a presentation in conferences.

The activities would consist of

- 1) Planning and organising relevant animal/clinical studies to be submitted as a dissertation at the end of the course for evaluation and defence.
- 2) Presentation of at least 2 papers in National/International Conferences is desirable and
- 3) Attendance at least one National/Regional Conference per year is desirable

If possible the candidate may publish his research work in indexed journals.

Training in Medical Audit, Management, Health Economics and Health Information System : This shall be imparted by holding common institutional programmes.
