



# MEDICAL IMAGING

## 医学影像学

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## Course Description

Medical imaging refers to several different technologies that are used to view the human body in order to diagnose, monitor, or treat medical conditions. Each type of technology gives different information about the area of the body being studied or treated, related to possible disease, injury, or the effectiveness of medical treatment. The main parts of medical imaging include techniques and diagnostic

radiology. Medical imaging techniques describes the principle of different imaging modalities in physics, including X-ray imaging, computed tomography (CT), magnetic resonance imaging (MRI), ultrasound and nuclear isotope imaging. Diagnostic radiology refers to the application of different imaging modalities used in all the major organ systems.

The course provides an introduction to both clinical and technical aspects and covers applications in all the major organ systems: brain, heart, abdomen and musculoskeleton. An introduction to ongoing research and new developments in the different modalities and techniques will be given. The course will be given by a multi-disciplinary group of lecturers with background in clinical radiology, nuclear medicine, informatics, medical physics and radiation protection.

## Objectives



### KNOWLEDGE

At the end of the course, the MBBS students should have a basic understanding in the following areas:

1. Knowledge of basic principles for medical imaging based on advanced image modalities: X-ray, MRI, CT, Ultrasound and Nuclear isotope imaging.
2. Knowledge of technological similarities and differences between the different modalities and choice of equipment for different clinical applications.
3. Knowledge of normal and abnormal appearance of different diagnostic imaging modalities in the major organ systems, and of the typical signs of different diseases in clinic.
4. Knowledge of new applications and technology trends for the different modalities.



### SKILLS

At the end of the course, the MBBS students should have a basic ability in the following areas:

1. Master the application of different medical imaging technique procedures used in clinic.
2. Master the ability of reading medical imaging, and identifying imaging signs of different diseases.

## Teaching and Learning Methods

**Theory:** Teaching the medical imaging to students is provided with lectures and tutorials. The principles of different imaging techniques will be introduced based on the basic physics, and the diagnostic radiology will be taught referring to the pathophysiology of different medical conditions.

**Practical:** Practical training asks for medical students to master the basic principles, methods, procedures and strategies for the major medical imaging techniques used in clinic. The student is advised to stay at the medical imaging department for a period time, and practice the skill of reading medical images under the guidance of the teachers in clinic.

## Recommended Reference books

- Adam, A K Dixon. 2008. Grainger & Allison's Diagnostic Radiology [M]. 5th ed. New York: Elsevier Churchill Livingstone.
- Liu Linxiang. 2012. Diagnostic Imaging [M]. 2nd ed. Bei Jing: People's Military Medical Press.
- Qu Xiaofeng, Bian Jie, Guo Dongmei. 2014. English Tutorial of Medical Imaging [M]. Bei Jing: Peking Union Medical College Press.

## Schedule Table

Part	Contents	Hours	Part	Contents	Hours
1	Imaging Techniques	3	7	Imaging of the Urogenital System	3
2	Imaging of Central Nervous System	3	8	Imaging of the Mammary Glands	3
3	Imaging of Head and Neck	3	9	Imaging of the Osteoarticular and Muscular System	12
4	Imaging of the Respiratory System	12	10	Interventional Radiology	3
5	Imaging of the Circulatory System	3			
6	Imaging of the Digestive System	9	Total		54

## Course Contents



### PART 1 IMAGING TECHNIQUES

#### Chapter 1 X-ray Imaging

1. The principles of X-ray imaging.

2. Equipment of X-ray and property of radiograph.
3. Clinical applications of X-ray imaging.
4. Characteristics of X-ray images.
5. The security of X-ray examinations.

## Chapter 2 Multi-detector Computed Tomography (MDCT)

1. The principles of MDCT.
2. Technical overview of MDCT.
3. Image reconstruction and analysis.
4. Clinical applications of MDCT.
5. Characteristics of MDCT images.
6. Radiation dose considerations.

## Chapter 3 Magnetic Resonance Imaging (MRI)

1. The principles of MRI.
2. Instrumentation: magnets, coils and computers.
3. Pulse sequences.
4. Clinical applications of MRI.
5. Characteristics of MRI images.
6. Safety considerations.

## Chapter 4 Ultrasound

1. The principles of ultrasound.
2. Ultrasound instrument.
3. Clinical applications of ultrasound.
4. Characteristics of ultrasound images.
5. Safety of ultrasound.

## Chapter 5 Radionuclide Imaging

1. The principles of radionuclide imaging.
2. Radionuclide imaging instruments.
3. Clinical applications of radionuclide imaging.
4. Characteristics of radionuclide images.
5. Safety considerations.

## Chapter 6 New Development of Medical Imaging

1. Molecular imaging and the development.
2. Quantitative medical imaging.

## Chapter 7 Diagnostic Radiology Thought Procedures

1. The principles of reading.
2. The procedures of reading.



## PART 2 IMAGING OF CENTRAL NERVOUS SYSTEM

### Chapter 1 Brain

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Congenital malformation of the brain.
5. Trauma.
6. Infectious diseases of brain.
7. Cerebral vascular diseases.
8. Intracranial neoplasm.
9. Others.

### Chapter 2 Spine

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of spine.



## PART 3 IMAGING OF HEAD AND NECK

### Chapter 1 Eyes and Orbit

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of eyes and neck.

### Chapter 2 Ears

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of ears.

### Chapter 3 Nose and paranasal sinuses

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.

4. Diseases of nose and paranasal sinuses.

### Chapter 4 Pharynx and Larynx

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of pharynx and larynx.



## PART 4 IMAGING OF THE RESPIRATORY SYSTEM

### Chapter 1 Lungs

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the lungs.

### Chapter 2 The Chest Wall, Pleura and diaphragm

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the chest wall, pleura and diaphragm.

### Chapter 3 Mediastinum

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the mediastinum.



## PART 5 IMAGING OF THE CIRCULATORY SYSTEM

### Chapter 1 Heart and Pericardium

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Congenital heart disease.
5. Nonischaemic acquired heart disease.
6. Ischaemic heart disease.

## Chapter 2 Great Vessels

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the great vessels.



## PART 6 IMAGING OF THE DIGESTIVE SYSTEM

### Chapter 1 Esophagus and Gastrointestinal tracts

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the esophagus and gastrointestinal tracts.

### Chapter 2 Liver, Biliary system, Pancreas and Spleen

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of liver.
5. Diseases of biliary system.
6. Diseases of pancreas.
7. Diseases of spleen.



## PART 7 IMAGING OF THE UROGENITAL SYSTEM

### Chapter 1 Urinary System

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of kidney.
5. Diseases of ureter.
6. Diseases of bladder.

### Chapter 2 Adrenal Glands

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of adrenal glands.

### Chapter 3 Female Genital System

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of female genital system.

### Chapter 4 Male Genital System

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of male genital system.



## PART 8 IMAGING OF THE MAMMARY GLANDS

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the breast.



## PART 9 IMAGING OF THE OSTEOARTICULAR AND MUSCULAR SYSTEM

### Chapter 1 Skeleton

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the bone.

### Chapter 2 Joints

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the joints.

### Chapter 3 Soft Tissue

1. Methods of examination.
2. Normal anatomy and variance.
3. Common abnormal imaging signs.
4. Diseases of the soft tissue.





## PART 10 INTERVENTIONAL RADIOLOGY

1. Principles of interventional radiology.
2. Equipment of interventional radiology.
3. Clinical applications of interventional radiology.
  - (1) Contraindications.
  - (2) Complications.
  - (3) Medicine.
  - (4) Preoperative preparation.
  - (5) Postoperative treatment.
4. Security of interventional radiology.