UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Radiology

2425-2-H4601D008

Aims

The student will have to learn:

- the physical principles of ionizing radiation damage on biological matter;
- the meaning of the dosimetric and radiation protection quantities;
- the general principles of radiation protection, related legislation and operational principles for the radiation protection of healthcare professionals and patients;
- the physical and execution principles of the various imaging techniques;
- the main clinical indications to the different imaging techniques and the limits of each of them;
- the diagnostic procedure of the different pathologies: inflammatory, focal benign and malignant;
- the main radiological features of the most common pathologies;
- correctness and pertinence criteria of the various imaging techniques;
  The student has also to be able to interpret autonomously endoral and extraoral radiological images and orthopantomograms (OPGs).

Contents

The course provides the student:

- basic knowledge of radiation protection;
- fundamental theoretical knowledge of general diagnostic radiology and of odontostomatologic imaging.

Detailed program

RADIATION PROTECTION

- Introduction to the physics of ionizing radiation: electromagnetic radiation, radioactivity, natural and artificial sources of ionizing radiation, interaction of radiation with matter.
- Definition and historical evolution of radiation protection.
- Mechanisms of induction of radiation damage on biological matter
- Dosimetric and radiation protection quantities: absorbed dose, Linear Energy Transfer, equivalent dose, effective dose
- Classification of biological effects induced by ionizing radiation: somatic / genetic, deterministic / stochastic
- The principles of radiation protection: justification, optimization, dose limitation
- Legislation on radiation protection (D. Lgs. 101 of 2020): types of exposure, obligations and responsibilities, training, classification of workers, dose limits, classification of working environments, physical and health surveillance, obligations of the employer and of the workers.
- Basic radiographic principles and techniques:
    - X-ray tube;
    - characteristics of the X-ray emission spectrum as a function of voltage, current, filtration, anode material, waveform
    - efficiency of an X-ray tube, half-value layer, equivalent energy
    - X-ray image formation
    - principle of operation of Computed Tomography (TC)
    - characteristics of the radiation field (primary, residual, diffuse, escape)
- Operational principles for radiation protection of healthcare professionals:
    - activities at risk of exposure in the health sector
    - general operating principles to reduce the risk of irradiation: time, distance, shielding, operating methods
    - use of X-rays for diagnostic purposes in healthcare and dentistry (intraoral radiography, Cone Beam CT and Orthopantomography)
    - standards of radiation protection in dentistry
- Operational principles for patient radiation protection:
    - medical exposures, clinical liability, unjustified medical exams, optimization, diagnostic reference levels, quality controls, exposures in pregnancy and pediatric exposures
    - radiation protection of the patient in dentistry
    - doses to the patient in dental imaging
    - justification of Cone Beam CT exams

GENERAL RADIOLOGY AND ODONTOSTOMATOLOGIC IMAGING

- Imaging techniques basics:
  x-ray films, projection’s geometry, radiographic quality control;
- Endoral and extraoral

radiographies; panoramic radiography; normal radiographic anatomy;

- Digital systems and Scanora Tomography; specialized radiographic techniques; CT general information; spiral CT; Dentascan; multislice CT; cone-beam CT; MRI: physical basics, general clinical information, mention of radiobiology;

- Radiographic interpretation of pathology: dental caries; pathology of periodontium;

- Maxillary cysts
  (Odontogenic cysts: general features, radicular cyst, dentigerous cyst,
  odontogenic keratocysts). Inflammatory pathology of maxillary alveolar
  processes (periapical lesions, pericoronitis, acute and chronic
  osteomyelitis, osteonecrosis). Maxillary bones benign neoplasms (palatal and mandibular
  tori, exostoses and enostoses, ameloblastoma and variants, odontoma,
  ameloblastic fibroma and other odontogenic tumors,
  non odontogenic tumors). Maxillary bones primary and secondary malignant
  neoplasms;

- Pediatric pathology: OPG
  (growth, number and classification of deciduous and permanent teeth);
  teleradiographic exams of the skull: indications and purposes; requirements;
  bone age: methods and purposes; mention of guidelines and radioprotection;

- Bone pathologies: Fibrous
  Dysplasia - Periapical Cemental Dysplasia (PCD) - Florid Osseous Dysplasia -
  Cemento-ossifying Fibroma - Central Giant-cell Granuloma - Aneurysmatic Bone
  Cyst - (Cherubinism) - Paget’s disease - Histiocytosis X. Systemic Pathologies:
  Hyperparathyroidism, Acromegaly, Diabetes Mellitus. Osteoporosis. Rachitism.
  Renal Osteodystrophy. Growth Disorders: Cleido-cranial Dysplasia - Crouzon
  Syndrome -
  Goldenhar Syndrome (Hemifacial Hypotrophy) - Stafne defect - Palatoschisis -
  Focal Osteoporotic Bone Marrow Defect. Calcifying and Ossificans Pathology of
  Soft Tissues and Salivary Glands: Calcified Lymph
  Nodes - Dystrophic Calcifications of Tonsilla - Blood vessels calcified -
  Sialoliths - Phleboliths - Heterotopic Bones: Ligamentum Stylohyoideum
  Ossification - Ossificans Myositis;

- Implants: Typology (blade, subperiosteal, root-form). Imaging Techniques: endoral apical and occlusal
  x-ray – Teleradiography – OPG – Conventional Tomography (Scanora) – Dentascan
  and Cone-Beam CT – Simplant. Residual Bone Evaluation. Bone Graft and Maxillary
  Sinus Lift. Preoperative Program. Follow-up. Failure Signs. Other Implants.
  Maxillary Sinuses: Normal Development and Variations. Imaging Techniques.
  Inflammatory
  Alterations: Mucous Membrane Thickening, Periostitis, Sinusitis, Empyema,
  Polyps, Ritention Pseudocysts, Mucocele;

- Temporomandibular Joints:
  Radiographic and Functional Anatomy; Diagnostic Imaging: OPG, Projections:
  Transcranial - Transpharyngeal - Transorbital - Transmaxillary -
  Fronto-Condylal Projection - Axial Submentovertex; Conventional Tomography; CT;
  MRI; (Arthrography). Growth Anomalies: Condyloid Hyperplasia; Condyloid
  Hypoplasia; Juvenile Osteoarthritis; Coronoid Hyperplasia; Condylus Bifidus.
  Soft Tissues Anomalies and Internal Lesions: Disk Dislocation with/without
  Reduction; Discal Perforation and Deformity; Fibrous Adherences and Effusion.
  Remodeling and Osteoarthritic Pathologies: Remodeling; Degenerative Articular

Disease; Rheumatoid Arthritis; Juvenile Rheumatoid Arthritis; Psoriasic Arthritis and Ankylosing Spondylitis (AS); Septic Arthritis. Intraarticular Loose Bodies: Synovial Chondromatosis; Chondrocalcinosis;

- Traumas: Traumatic Lesions of the Teeth: Concussion, Luxation, Avulsion, Crown Fractures, Root Fractures, Crown-Root Fractures, Vertical Root Fractures Traumatic Lesions of the Facial Bones: Mandibular Fractures: Body, Condyle, Alveolar Process; Maxillary Fractures: Middle Third, Horizontal (Le Fort I), Pyramidal (Le Fort II), Cranio-Facial Disjunctions (Le Fort III); Zygomatic Fractures

Prerequisites

Teaching form

Lectures

Textbook and teaching resource

- L. De Florio, G. Ghigi: Compendio di Radiologia Odontostomatologica (2nd edition) Idelson-Gnocchi
- S.C.White, M.Phqroah: Radiologia odontoiatrica (4th edition) A. Delfino editore

Teachers will provide further didactic material.

Semester

Second semester

Assessment method

Written exam with multiple choice questions and open questions.

The exams will take place in the university computer labs on the EsamiOnline platform.

The final written exam will verify the learning of the fundamental concepts of radiation protection, general radiology and odontostomatological imaging, including some questions on the vision and recognition of diagnostic images.

The final written exam will be assessed as follows:

- 1 point for each correct multiple choice question;
- -0.2 points for each wrong multiple choice question;
- 0 points for each multiple choice question left blank;
- from 0 to 3 points for each open question, based on the completeness, correctness and conciseness of the answer provided.
  The total score will be renormalized on a scale from 0 to 30 cum laude and rounded up to the nearest integer to determine the final grade.

There are no intermediate tests.

Office hours

From monday to fryday, by appointment required by mail

Sustainable Development Goals

GOOD HEALTH AND WELL-BEING