Radiology - ortopantomogram

3.DM
Dental Panoramic Tomographic Equipment

- X-ray tube (generator)
- Slit beam primary collimator
- Secondary collimator
- Cassette assembly
- Patient positioning devices
  - Control panel
Dental panoramic X-ray

- Y.V. Patero, 1959, Helsinki
- Film 15x30cm
- Tomography
- Rotation of tube and film, head stable
- 15sec, 55-85kV, 2-30mA
Terminology.

Orthopantomograph  
OPG
Dental Panoramic Tomograph  DPT
Dental Panoramic Radiograph  DPR
Panoral
Where does the name come from?
Ortho = true, correct
Pan = panoramic
Tomography = sectional radiography.
Tomography.

- Technique that uses synchronous movement of X-ray tube and film cassette, which are linked by a rigid arm which rotates around a pivot.
- X-ray tubehead moves in one direction around patient while film moves in opposite or same direction.
- Records a "slice" or section of patient.
- A tomograph or "slice" shows the tissues within that section sharply defined and in focus.
- This section is referred to as the focal plane or focal trough.
- In the case of the jaws this slice must be curved.
The Orthopantomograph (OPG).

- An extra-oral radiograph.
- All the teeth and their supporting structures shown on one film.
- Image quality inferior to intra-oral films.
- Both the film and the X-ray tubehead move during the exposure.
- Tomography is a radiographic technique which shows only a section or ‘slice’ of the patient.
- In the case of the OPG, the section shown contains the teeth, maxilla, mandible and some surrounding structures.
Indications:

- Overall picture of both dentition, retention of teeth, developmental stages
- Assessment of any pathology which is too large for periapical x-ray
- Fractures, cysts, tumors
- Antral disease
- Orthodontic assessment
- Condylar heads of TMJ – surface
- Periodontal disease – overall
- Prosthodontic evaluation
- Implants – vertical height of alveolar bone
- Acute facial swelling with restricted mouth opening
OPG

- Magnification 1,5x
- Real shadows – structures within focal line
- Ghost shadows – structures opposite to focal line
Hard tissue real shadows

- Teeth, jaws
- Floor of maxillary sinus
- Hard palate
- Zygomatic arches
- Styloid processes
- Hyoid bone
- Nasal septum and conchae
- Orbital rim
Soft tissue shadows

- Mouth cavity
- Maxillary sinus
- Soft palate
- Nasal cartilages
- Ear lobe
- Lips, cheeks, nasolabial folds
Artefacts - shadows

- Cervical spine – vertebrae
- Contralateral side of the mandible
- Palate
- Earings, necklace, skeleton dentures, fixed orthodontic appliance, osteosynthetic plates
- Protective apron placed high on the neck
OPG scheme
Fig. 15.17 A dental panoramic tomograph showing the main real hard tissue shadows, including the plastic support, drawn in on one side of the radiograph, NS — nasal septum, MIT — middle and inferior turbinates, CM — orbital margin, HP — hard palate, A — floor of antrum, Z — zygomatic arch, EAM — external auditory meatus, MP — mastoid process, SP — styloid process, H — hyoid, P — plastic head support.
OPG artefacts

Fig. 15.19 A dental panoramic tomograph showing the main anatomical ghost or artefactual shadows drawn on one side of the radiograph, PI — palate, Md — mandible, CV — cervical vertebra.
Obr. RTG – 20-ročný muž s diagnózou ALL po indukčnej liečbe.
25 – zubný kaz blízky zubnej dreni; 38,48 – semiretencia s perikoronitídou
Obr. RTG – Stav chrupu 33-ročného muža s relapsom ALL
Ponechané korene zubov 16,15,12,25,35,48; radikulárna cysta čeľuste zo zuba 12, retencia zuba 45, zubný kaz blízky zubnej dreni zuba 27 (vlastný materiál)
Advantages:

- Easy to examin, good overall picture of large area – good screening method
- Lower dosage in comparison to intraoral status (10 i.o.x-rays)
- Comparison of both sides, relation of pathologies to adjacent structures
- Field limitation technique – dose reduction
Advantages.

- Good patient compliance.
- Shows both jaws on one film without superimposition.
- Useful on patients with limited mouth opening or gag reflex.
- Valuable for showing lesions too large to show on intra-oral radiographs.
- Useful as part of an orthodontic assessment when there is a need to show developing dentition.
- Useful to demonstrate unerupted teeth.
Dissadvantages:

- Structures not in focal line not visible
- Overlying shadows
- Magnification of final picture 1.3-1.5x
- Requires cooperation with patient for a longer time 15 sec. – children
- Deformities of cervical spine – positioning of the patient
Disadvantages.

- Lack of definition (compared with intra-oral radiographs).
- Requires accuracy of technique.
- Final image is distorted and magnified. X 1.3
- Narrow focal trough, represents only a section of the patient.
- Overlapping of contact points.
- Unwanted shadows.
- Ghost images.
Contraindications.

- Assessment of early dental decay.
- Early periodontal disease.
- Pulpitic pain assessment.
- Assessment of anterior teeth, e.g. trauma.
- Unco-operative patients.
- Patients who cannot keep still.
- Kyphosis.
Radiographic technique.

- Check patient details.
- Explain procedure to patient, show them the bite block which they must bite on.
- Patient preparation, remove all radiopaque objects.
- Load cassette carefully.
- Careful and accurate patient positioning.
- Choice of exposure.
- Stand in a safe position.
- Remove patient from machine.
Digital sensors
Follicular cyst 38 – destructing the bone of angulus and ramus mandibulae
OPG in Implantology:
A systematic approach is always required. You must be logical, ordered & thorough. This avoids missing any details. Apply this systematic approach to both the entire radiograph & specific lesions.

**General overview of entire film**

What type of radiograph is it?
Which area of the mouth is it?
If a young patient do chronological & developmental ages match?
Trace the outline of normal anatomical structures
Investigate pathologies (i.e. fracture, bone loss, periapical inflammation)
Specific observations of
Teeth
Apical tissues
Periodontal tissues
Other structures depending upon view

Specific observations of Periodontal tissues
Width of periodontal ligament space
Level & quality of crestal bone
Vertical or horizontal bone loss
Furcation involvement's
Calculus deposits
Apical pathology
Furcation pathology

Specific observations of specific lesions
Site
Size
Shape
Outline
Radiodensity & internal structure
Effect on adjacent structures
Comparison with previous films
Inferior Alveolar Canal
1. Alveolar Crest
2. Lamina Dura
3. Periodontal Ligament Space (superimposed)
4. Bony Trabecular Plate including marrow space
1 Answer:
Marrow space

2 Answer:
Periodontal ligament space

3 Answer:
Bony trabecular plate

4 Answer:
Lamina dura

5 Answer:
Pulp canal

6 Answer:
Alveolar crest

7 Answer:
Root dentine

8 Answer:
Enamel
A – vertical bone loss

B - calculus present, distal to the 1st molar.
Calculus - arrows.

resorption of alveolar bone:
Vertical 16, horizontal 14, 15
The floor of the maxillary sinus.

The maxillary sinus is where the arrow is and the pointer is pointing to the floor, an opaque line.
A periapical radiograph showing an infrabony defect on the distal of the upper first molar. This patient has periodontitis and a bruxing habit. This is termed “secondary” occlusal trauma.
Posttraumatic apical root resorption of 14
A periapical radiograph of 14 showing completed endodontic treatment and after adjustment of occlusal trauma (from previous slide).

Cervical burnout is arrowed. Cervical burnout is a radiolucent shadow seen at the neck of the teeth and is a radiological artifact. The x-ray beam has less tissue to pass through in this area of the tooth. Therefore there is less tooth to absorb the x-ray beam giving its characteristic triangular appearance.
A periapical radiograph showing alveolar bone loss around the lower incisor teeth in a patient with periodontitis.
A periapical radiograph showing an endo-perio lesion affecting the mesial root of 46. The distal canal has been root filled prior to mesial root amputation.
The thin extension of the restoration onto the root is an overhang that should be removed as it may contribute to plaque accumulation. Note the residual cyst 46.
Retained deciduous root tips (note periodontal membrane space & lamina dura around fragments)

The roots of the deciduous molar are very long and flared and retained remnants of them are relatively common, particularly in the premolar area. Also note the round radiolucency at the apex of the second premolar tooth (consistent with the mental foramen).
A radio-opacity was noted as incidental finding from the following periapicals. Further radiographic examination was undertaken with a dental orthopantomogram (OPG):
A Salivary calculus in the duct of the sub-mandibular salivary gland
OPG (orthopantomograph)- 4 regions
1 nasal septum
2 inferior nasal concha
3 orbit
4 basal border of the nasal cavity
5 posterior border of the nasal cavity
6 maxillary sinus
8 incisive foramen
9 anterior nasal spine
1 maxillary sinus
4 zygomatic arch
5 coronoid process
6 pterygoid process of the sphenoid bone
8 pterygopalatine fossa
9 articular process
10 articular tubercle of the temporal bone
11 styloid process
1 lower Mn border
2 mental protuberance
4 mental fovea
5 mental foramen
6 mylohyoid line
7 submaxillary fovea
8 hyoid bone
9 base of the tongue
10 external auditory meatus + ear
12 shadow of lips
NORMAL OPG

Mn movement during exposure

ERRORS
Foreign body

Static electricity

Dirty film

Water drops
Insufficient rinsing
Cyst in paranasal sinus
Cysts:

Left – radicular cyst 34

Below – follicular cyst 38
Mandibular fracture
Osteosynthesis, interfering opacity
Subperiosteal implant
Deposition of filling material