



# 3D Radiography Breakthrough: Applications for Dental Professionals

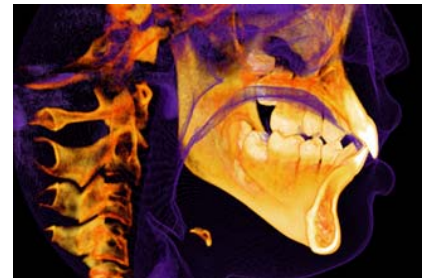
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## Purpose

- Review evolution of radiography
- Describe latest advancement
  - Dental Cone Beam Computed Tomography
  - Aka: CBCT or 3D X-Rays
- Demonstrate innovations and clinical uses for 3D x-rays.
  - Oral surgery
  - Implants
  - Endodontics
  - Periodontics
  - Orthodontics



## Wilhem Conrad Roentgen

- 1895 took first x-ray, over 100 yrs ago
  - He was awarded the first Nobel Prize for physics in 1901.
- Desire to Have 3D Perspective  
Attempts to give 3D Perspective

## Computed Tomography (CT)

- 1972: Godfrey Newbold Hounsfield invented the CT system.
  - 1979: Nobel Prize in Medicine was awarded.
- Initially, view was **only tomographic** (slice views) and **too large slice intervals** (1cm) for dentistry.

## Dentistry's Trend for ~100 years

- Higher quality film images
- Lower x-ray dose
- More compact x-ray units
- Faster exposures
- Quicker film development
- Smaller & more comfortable film packets

## Last 10 Years – Digital Imaging Same 2D Images, but..

- Higher quality images
- Lower x-ray dose
- More compact x-ray units
- Instant exposures & processing
- Smaller & comfortable sensors

## Birth of Cone Beam CT

•**2000/2001**: NewTom installed at Loma Linda University. First in United States.

•**Presently #'s**: >200 CBCT units in US

–Number to double every year over next few years

–by 2010 50% of pano sales will be CBCT

## 3D Volumetric vs. 2D Imaging Dose

Panoramic	=	3 - 11 $\mu$ S
Lateral Ceph	=	5 - 7 $\mu$ S
PA Ceph	=	5 - 7 $\mu$ S
Occlusal	=	5 $\mu$ S
FMS	=	30 - 100 $\mu$ S
TMJ series	=	20 - 30 $\mu$ S
<b>CBCT</b>	=	<b>40-135<math>\mu</math>S for average FOV</b>

## Fee

- Pan, Lateral Ceph, PA Ceph \$200-\$300
- TMJ Series \$250
- Additional films \$\$\$
- \$500 - \$800 for medical CT imaging
- CBCT Imaging Session ~\$400

## Cost & Capabilities

- \$165K-285K (hardware & software) Software  $\geq$ \$7K
  - 0.2mm best slice thickness
  - 12 bit image best resolution
  - Interproximal caries detection has not been demonstrated
  - Metal (crowns, amalgam fillings, etc.) produces scatter artifacts & alters image quality
  - Traditional **intraoral sensors** are here to stay for the meantime
- ADI (Advanced Dental Imaging)

•First imaging center in Las Vegas established in 2004.

–**Dr. James Mah**, DDS, Msc, MRCD(C), DMSc

•Located in Summerlin

•<http://www.advanceddentalimaging.com>



### 3D Revolution Clinical Applications

#### Oral Surgery

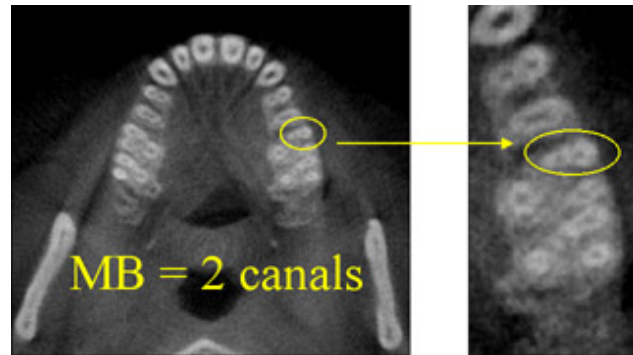
- Dx and Tx Planning of Impacted Teeth
- TMJ Reports & Anatomic Visualization
- Cysts, Neoplasms, or Fractures
- Airway Assessment
- 3D Surgical Models

#### Implantology

- Implant Surgery Adjuncts
- Implant Planning Software
- Image Guided Surgery

#### Endodontic Therapy

- Canal Assessment
- Root Fractures
- Apicoectomy Planning

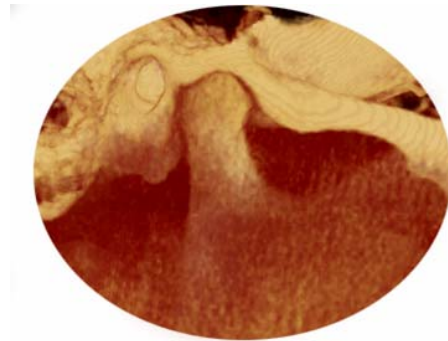


#### Periodontal Therapy

- Diagnosis & Treatment Planning of Osseous Defects

#### Orthodontics

- Complete Dx & Tx Planning
- Virtual patient
  - Soft tissue
  - Bone
  - Teeth
- 3D Modeling & Diagnostic Setups
- Mini-Screw Ortho Implants
- Indirect Bonding of Brackets
- Invisalign Aligner Fabrication



#### CBCT Advantages

- High resolution
- Specifically designed for dentistry
- Lower absorbed radiation dose
- Rapid imaging
- Lower cost
- Easier access – patient sits upright
- Viewing software designed for dentistry

Imagination is the limit!!!! Thank You!!!!