

The Future of Oral Surgery is I-CAT 3-D Dental Imaging



Oral Surgery ■ Orthognathic Surgery ■ Dental Implantology ■ 3-D Dental Imaging

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Game Changing Technology

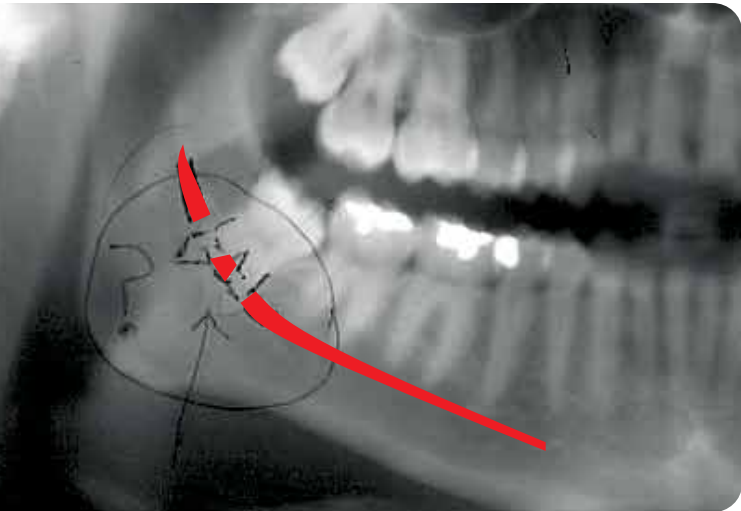
Three-dimensional cone CT scanning now offers the dental clinician complete and total visualization of the dental anatomy to compliment treatment planning for dental implant reconstruction, surgical orthodontic management and dental alveolar procedures involving adjacent anatomical structures such as the mandibular nerve or maxillary sinus. This “game changing” technology allows more

predictable treatment. The treating oral surgeon has an unencumbered view of the teeth, jaws and associated anatomy. 3-D dental imaging allows for better treatment planning and gives both the dentist and the patient the ability to understand treatment options and potential problems associated with dental therapeutics.

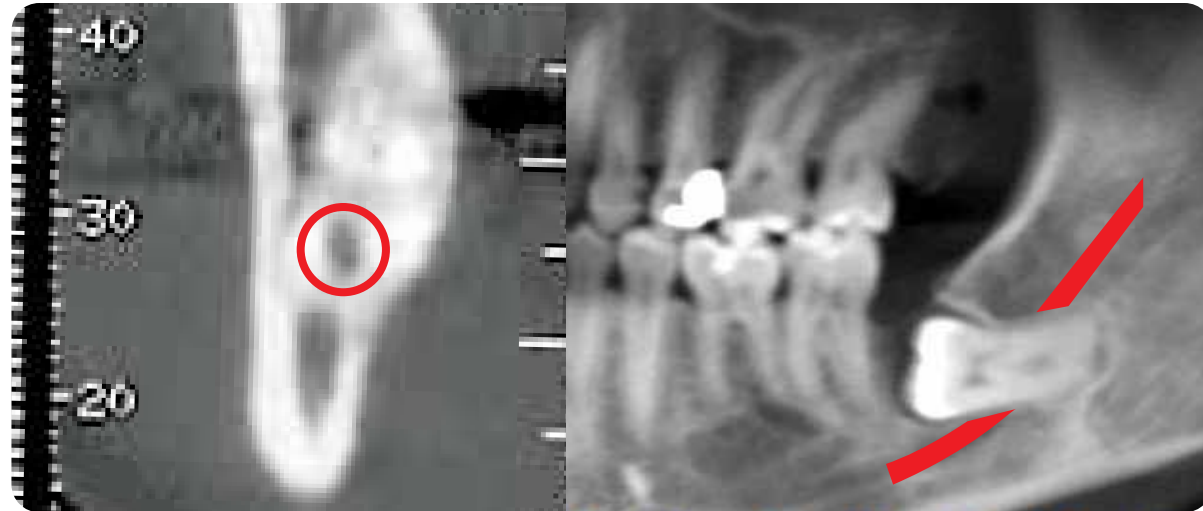
The Right Picture is Worth a Thousand Words

On regular x-ray exams the identification of the mandibular nerve adjacent to the roots of an impacted third molar presents a diagnostic dilemma and a potential surgical misadventure. Without additional three-dimensional imaging there is no way to accurately determine the anatomic path of the mandibular nerve. With 3-D dental imaging the patient can be immediately reassured of the path

of the neurovascular bundle relative to the root system of any impacted mandibular tooth. The adjacent pictures are of the distal root system of tooth #32 which was sectioned and removed without injury to the neurovascular bundle.

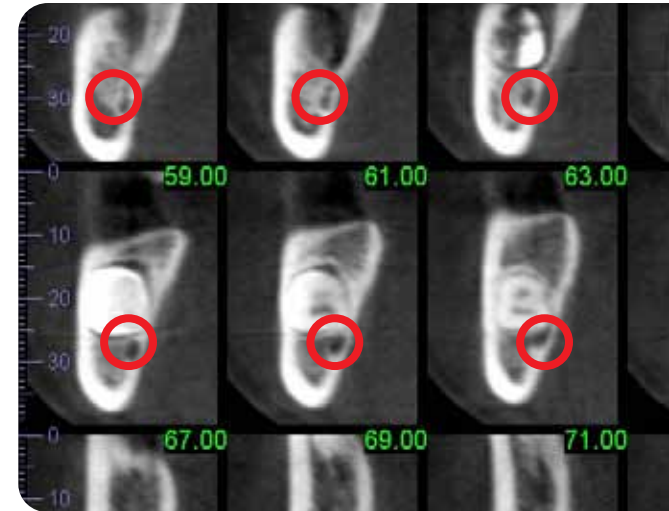


Traditional 2-D Panelipse



New 3-D Dental Imaging

Traditional 2-D Panelipse



New 3-D Dental Imaging

Patients are **Three**-Dimensional Treat Them That Way!

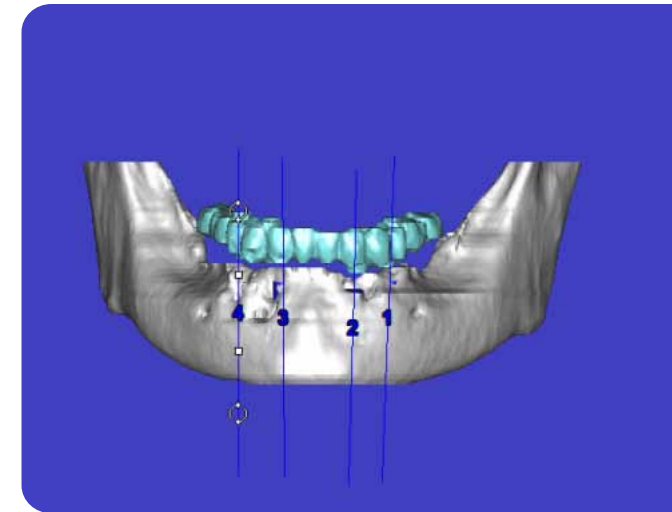
What are the indications for 3-D dental imaging of impacted third molars?

- Radiographic evidence of the neurovascular bundle near the CEJ of the impacted tooth.*
- Change in the contrast of the neurovascular bundle or interruption of the neurovascular canal bony architecture.*
- Change in path or position of the radiographic course of the neurovascular bundle.*
- Deflection of the root anatomy adjacent to or overlying the neurovascular bundle.*

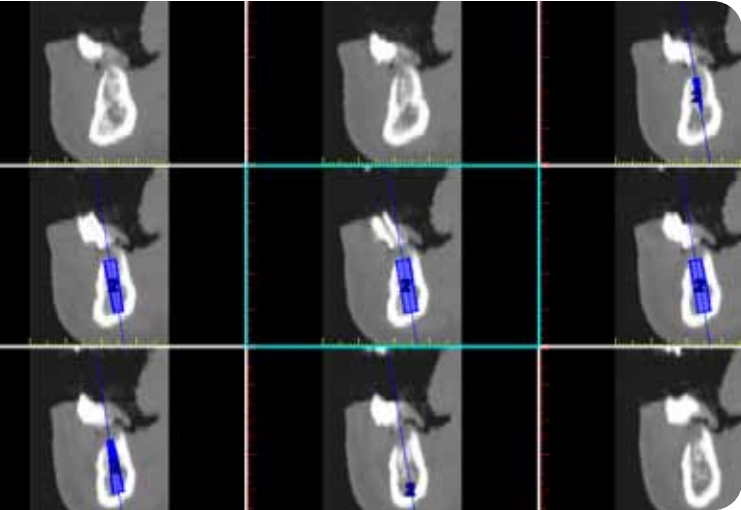
*Blaeser, Bart F., DMD, August, Merideth A., DMD, Dunoff, R. Bruce, Panoramic Radiographic Risk Factors for Inferior Alveolar Nerve Injury After Third Molar Extraction. J Oral Maxillofacial Surg. 61: 417-421, 2003

Dental Implant Reconstruction

Dental implant reconstruction requires precise treatment planning and careful consideration to surrounding anatomic structures. Three-dimensional dental imaging is, in some clinical situations critical for success. For those patients who present with mandibular atrophy, maxillary sinus pneumatization, narrow alveolar ridges or involvement of the mandibular nerve, 3-D dental imaging is state of the art.



A surgical template is visible on the 3-D dental image above. It is used in cross section (see adjacent image) for the placement of the implants in the computer program.

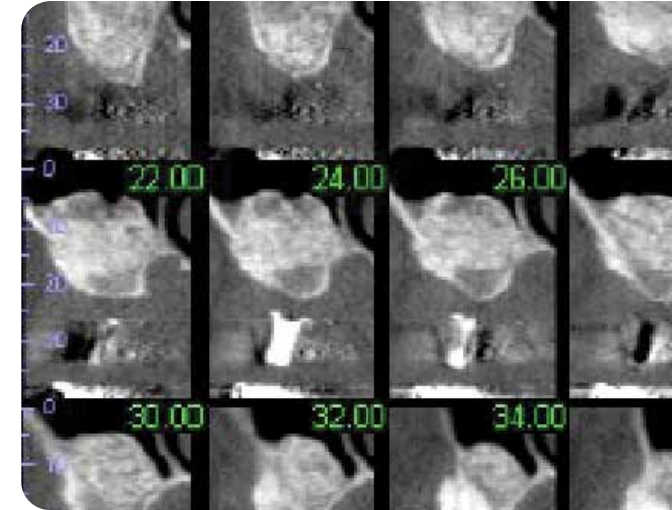


Fixtures are positioned into the 3-D scan with the use of Simplant™ software. From this CT scan, bone templates are fabricated to place the implants into their exact predetermined three-dimensional position.



A bone template is fabricated from the 3-D dental image containing the implants placed in the CT scan. This template fits precisely on the mandible and is used for drilling the implant sites.

Panelipse demonstrating pneumatization of the sinus and missing posterior dentition.



3-D dental imaging confirms bone graft success and availability of grafted bone for implant reconstruction. Titanium tube marks the position for the anterior dental implant fixture.

3-D Dental Imaging to Verify Bone Grafting and Implant Fixture Placement

3-D dental imaging in concert with presurgical planning and accurate surgical execution enhances success of the treatment plan. 3-D dental imaging can be used to determine bone quantity and quality prior to implant placement. It is especially helpful in large three-dimensional grafts involving the maxillary sinus. Accurate placement of the dental implants can be ensured by using a surgical guide at the time of the scan and subsequent surgery.

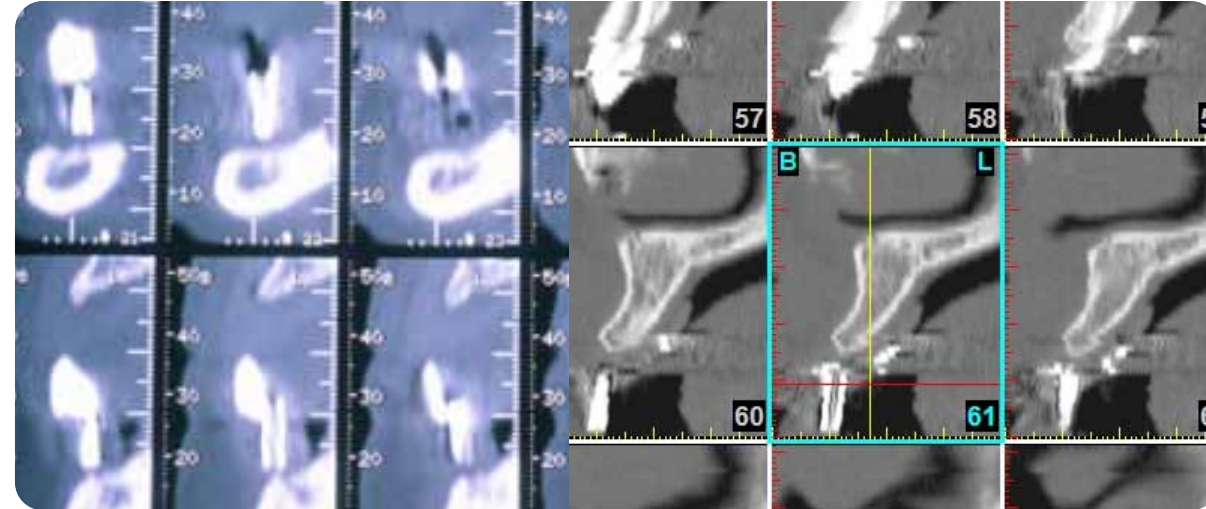
Mandibular Atrophy

Severe mandibular atrophy presents the perfect indication for 3-D dental imaging. 3-D cone CT dental imaging can be used to accurately determine the amount of bone remaining for dental implant reconstruction. 3-D dental imaging is used to guide the placement of the implants to their predetermined position in the bone. The result is a predictable post-operative outcome even in the most atrophied mandible.



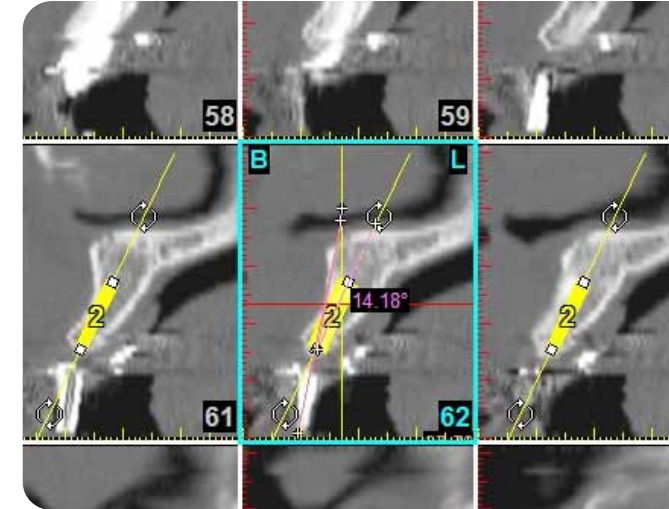


A surgical template is fabricated and worn by the patient at the time of CT scanning.



The titanium tubes accurately mark the position for placement of the dental implant fixtures. These cross sectional images show 10mm of vertical bone height for implant placement.

Cross section of alveolar housing #7



Simplant™ software used in conjunction with 3-D dental imaging to simulate the placement of an implant in the lateral incisor position.

Enhancing Dental Implant Treatment Planning with 3-D Dental Imaging

3-D dental imaging can demonstrate the restorative options for patients who are congenitally missing lateral incisors. Agenesis of the alveolar housing is common when lateral incisors are congenitally missing. Traditional radiographs and clinical examination cannot accurately determine the availability of bone for dental implant reconstruction. The use of 3-D dental imaging confirms the availability of bone for implant

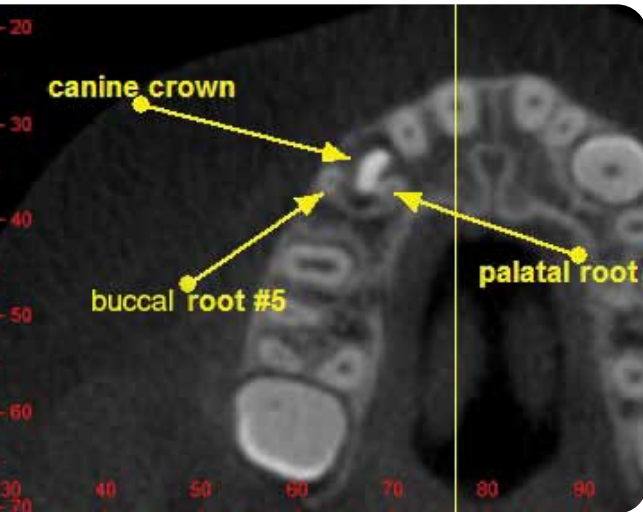
reconstruction. Additionally, the simultaneous use of Siplant™ software to simulate implant placement confirms the restorability of the proposed implant prior to its placement. There is no need for bone grafting in this case, and the use of 3-D dental imaging confirms this. Three-dimensional CT scanning allows the oral surgeon to treatment plan the patient and confidently predict the outcome.

Surgical Management of Orthodontic Patients

3-D dental imaging has the potential to significantly impact orthodontic treatment planning and case management. From the surgical management of impacted canines to the diagnosis and treatment planning of dento-facial deformities, 3-D dental imaging arms the orthodontist with additional critical diagnostic information. The following examples demonstrate clinical settings in which 3-D dental imaging

can enhance the diagnosis and treatment planning of patients. The following cases also demonstrate the versatility of three dimensional cone CT scanning. Limiting the scanning field coupled with the technological advances of cone CT scanning significantly reduces the amount of radiation exposure to the patient making this office technique safe, efficient and cost-effective.

Managing Impacted Canines through 3-D Dental Imaging

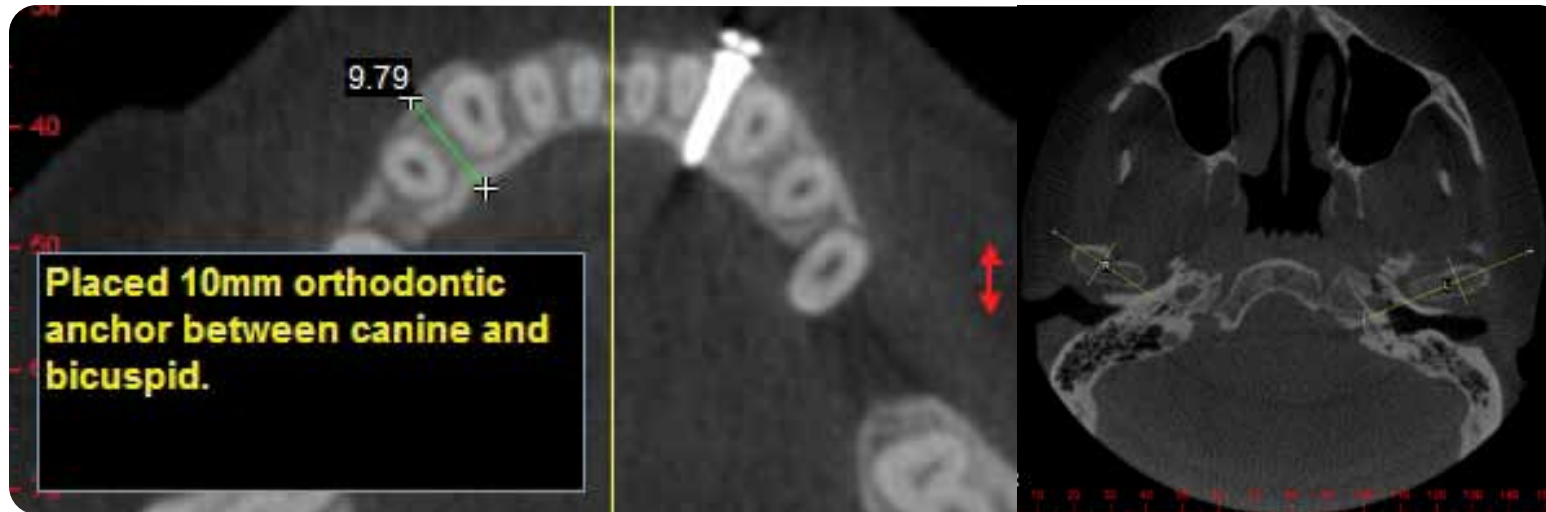


Three-dimensional CT image of impacted canine #6 juxtaposed between buccal and palatal root of tooth #5.

Standard shift sketch of tooth #6 does not reveal the involvement of tooth #5. Three-dimensional scanning, however, plainly demonstrates the intimate relationship between the bifurcated root of the bicuspid #5, and the crown of tooth #6. Both the axial and coronal three-dimensional images obtained clearly demonstrate the precarious position of tooth #6. These images demonstrate the diagnostic value of determining the three-dimensional position of this impacted canine prior to initiating surgical or orthodontic therapy.

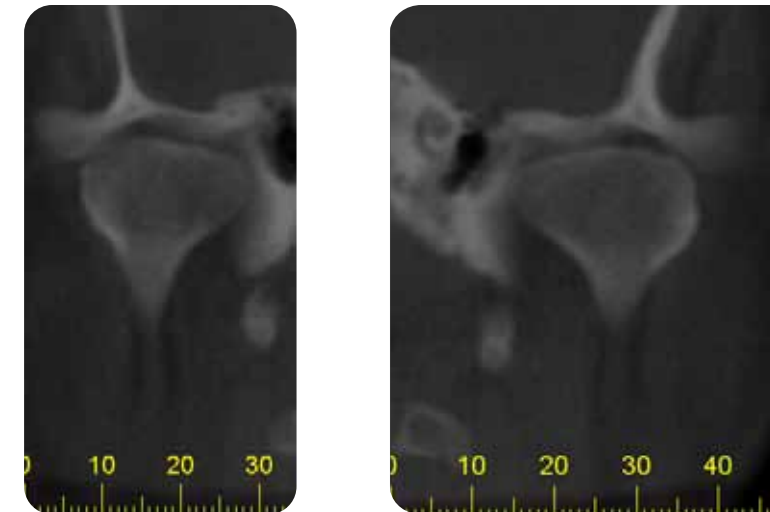
Utilizing 3-D Dental Imaging to Facilitate Orthodontic Anchor Placement

After obtaining a three-dimensional scan of the mandible, the appropriate sized orthodontic anchor can be placed to engage both the buccal and lingual cortical plate. Additionally, the position of the root systems of the teeth adjacent to the site for the orthodontic anchor can be visualized and measured.



A second orthodontic anchor was necessary in this case. 3-D dental imaging was utilized to locate this anchor without damage to the roots of adjacent teeth or perforation of the lingual cortical plate.

Now, patients can be safely and conveniently scanned to determine temporomandibular joint health either prior to or during treatment. Axially corrected views are obtained as illustrated above.

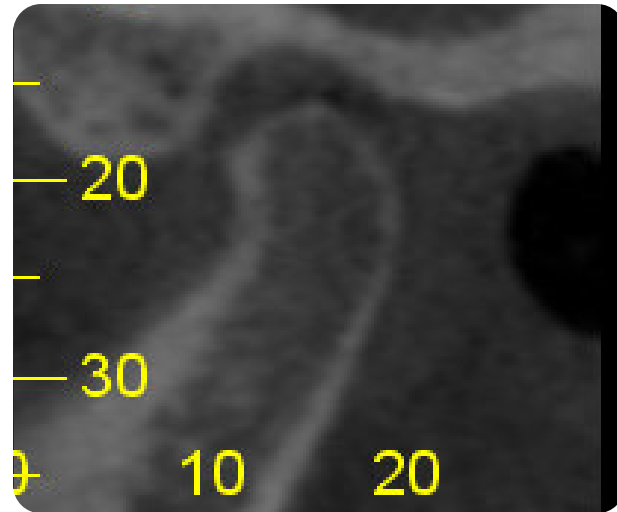


(above) Right coronal sectioning is obtained by reformatting the scan. Note the detail of the entire condylar head.
 (far right) Left coronal section displays healthy TMJ.

3-D Dental Imaging for Temporomandibular Joint Disease



Right sagittal view of the TMJ in closed position. Condylar head position in the fossae is accurately determined with I-CAT 3-D imaging.



This sagittal view of the left joint demonstrates normal TMJ anatomy. Multiple sections from lateral to medial through the long axis of the condylar head are available from the 3-D dental image.

Enhancing Orthodontic Treatment Planning

How can 3-D dental imaging enhance orthodontic treatment planning? The availability of in office 3-D cone CT scanning will allow imaging of the maxilla and mandible to determine lateral cortical plate thickness, root position and sutural development. The thickness and sutural development of the maxillary midline suture may impact the case selection for MEA versus surgically assisted rapid palatal expansion procedures.



Midline suture in this example is closed but thin. Lateral cortical plate of maxilla and mandible is easily visualized.

3-D Dental Imaging Benefits for You



Note the thickness of the maxillary midline suture in this surgically assisted rapid palatal expansion patient. Prior attempts at non-surgical expansion were unsuccessful, most likely secondary to the thickness of the midline sutural bone.

Lateral cortical plate and root position is well visualized as is separation of maxillary midline suture.

- Superior diagnostic information as compared to pans and cephs
- Distortion-free measurements
- Surgical predictability
- Save surgery time/reduce costs
- Significantly less patient radiation – most scans deliver a radiation dose equal to panoramic x-rays
- Easy to use previewing software for the referring dentist
- An open environment scan increasing the patient's comfort level
- Significant cost savings to the patient versus medical CT scanning
- In-office scanning capabilities thereby avoiding hospital visits and multiple appointments
- 3-D scanning provides the ability to find buccal/lingual cortical plate width and the sutural line closure
- Visualize impaction within the alveolar bone location relative to adjacent teeth and proximity to vital structures
- More accurate information resulting in less invasive surgery/decreased surgical procedure time
- Diagnosis of bone morphology, joint space and function for mandibular joint analysis
- More accurate determination of critical anatomy i.e. mandibular nerve, mental foramen, lingual cortical plate concavity, maxillary sinus pneumatization, nasal palatine duct position
- Optimize location and extent of bony pathology
- Optimize locations and angulations for implant procedures
- Select the most suitable implant size and type
- Determine necessity and size of bone grafts necessary for dental implant reconstruction