

# The good, the bad and the ugly!

Dale Miles looks at Cone Beam Scanning and poses the questions we all want the answers to

### Introduction

Nothing in radiology for our dental practices has captured the dentists' attention like cone beam CT technology. Impacting decision-making across almost all dental disciplines and specialties, the adoption of cone beam imaging has grown far faster than digital intraoral or even digital panoramic imaging techniques. This is good for the profession and even better for the patient as dentists and dental specialists now can visualize anatomy and pathology like our medical colleagues. Radiographic 'interpretation' is becoming outdated as we now look at dental problems in 3 planes of section and in 3D color (Figures 1-4). Our patients can actually see their problems in 'life-like' reality instead of peering at gray shadows they don't really understand. Cone beam imaging IS GOOD! The following cases prove this.

On the other hand, the cost of the scan, the increased exposure dose for 'stand-alone' machines and the reticence of third party payers to reimburse dentists for better imaging data from the scans IS BAD!

However, the reluctance of some dentists to review or have reviewed all the data in a cone beam scan is just UGLY!

Why, you ask? I'll give you my opinion as well as present cases to support my opinion.

### Case 1

This 11 year-old white male was referred as part of an orthodontic assessment for cone beam examination because of anterior crowding and an impacted maxillary left permanent canine with retained primary canine. Following radiographic evaluation of this large volume scan, a severe pan-sinusitis was recorded as part of the findings, and the following recommendation made:

'Recommendation: This patient should be referred to his primary care physician and/or an otolaryngologist for clinical and endoscopic examination of the paranasal sinus disease if clinically symptomatic.'

This finding and recommendation is quite commonly made by oral and maxillofacial radiologists as part of the routine and systematic radiographic evaluation of the large cone beam volumes. Would the patient die or be harmed if this were missed by a dentist? Probably not. Can the

treatment of this occult finding, the pan-sinusitis, improve the patient's life? Definitely yes. Is this the way 'healthcare' is supposed to work? Undeniably yes! BUT, before you get too comfortable with my answer to the question of 'will the patient be harmed?', consider the following information below, provided for patients, published online for the American Rhinologic Society by J.M. Dutton, MD1.

### Complications of Sinusitis

1. Intracranial Complications - The frontal, ethmoid and sphenoid sinuses are separated from the intracranial cavity by a layer of bone (Figure 1). If the infection passes through this bone it may infect the tissue and fluid that lines the brain, causing 'meningitis'. In even more severe cases the infection may spread to the brain itself causing an 'abscess', or collection of pus. These problems are life threatening and require prompt and aggressive treatment.
  2. Orbital Complications - The frontal, maxillary, ethmoid and sphenoid sinuses sit immediately above, below, between and behind the eyes, respectively (Figure 2). For this reason, infections of any of the sinuses may spread to the orbit, causing a wide spectrum of complications from mild inflammation of the eyelid to abscesses with possible blindness.
  3. Vascular Complications - The carotid artery and cavernous sinus are two large vascular structures that border the sphenoid sinus. Infections that involve either of these structures may lead to aneurysms or infected blood clots in the intracranial cavity, both of which are potentially fatal.
  4. Asthma - A number of patients suffer from both asthma and chronic sinusitis and, for these individuals, flare-ups of the sinusitis can lead to asthma attacks. Many studies have shown that resolving the sinus condition will result in dramatic improvement of the asthma.
  5. Loss of Smell and Taste - Sinusitis may diminish the senses of smell and taste, since the two are interconnected. This may be either temporary or permanent, depending on the nature of the injury. In most cases, the cause is poor airflow to the olfactory nerve (which detects odors) and by improving the nasal airway the senses of smell and taste improve. This is particularly true in patients who suffer from nasal polyps. However, in some cases chronic sinusitis may permanently injure these nerve endings.
  6. Osteomyelitis - Some recent studies suggest that bone becomes actively involved during a chronic sinus infection, making the infection more difficult to treat. This may even cause the destruction of bone that leads to the intracranial and intraorbital complications discussed above.
- If you are requesting/ordering a cone beam scan that includes the maxillary sinus and there are changes in that airspace, remember that ALL of the paranasal sinus spaces communicate with each other. Even a partial view of the antrum which demonstrates complete opacification mandates review of the remainder of the spaces.

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Figure 1a: This is an axial view at the level of the condyles demonstrating almost total obstruction of the antral spaces at this level



Figure 1c: A coronal section showing communication of the right antrum inflammation with the right ethmoid air cells



Figure 1b: An axial slice at the mid-orbit level showing opacification of a large portion of the ethmoid air cell complex bilaterally. Fortunately for this patient, the sphenoid sinus region is spared for now

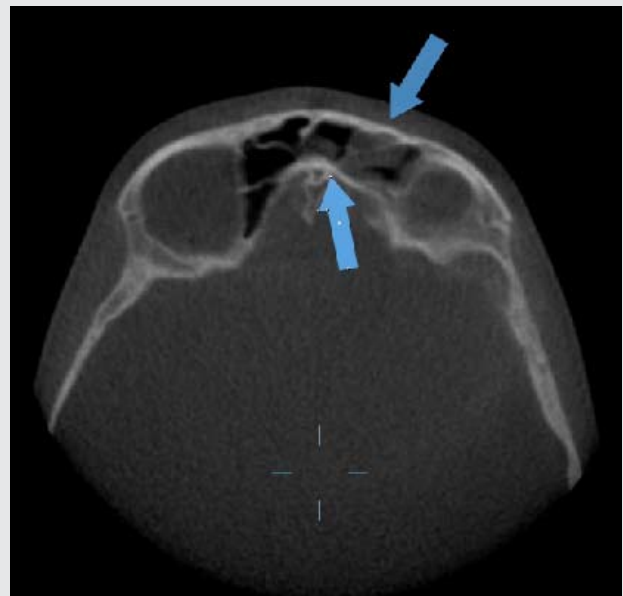


Figure 1d: Frontal sinus involvement

Figure 2: Case 2

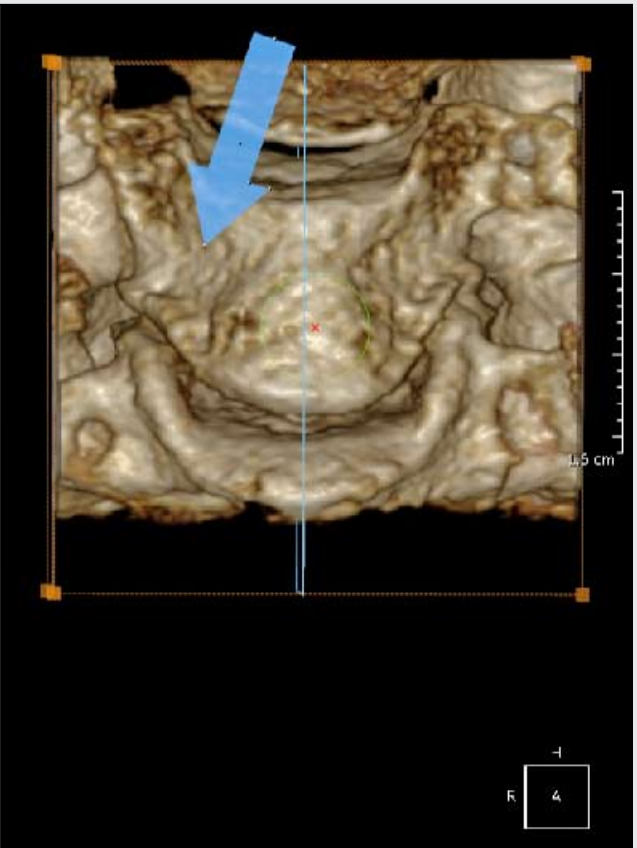
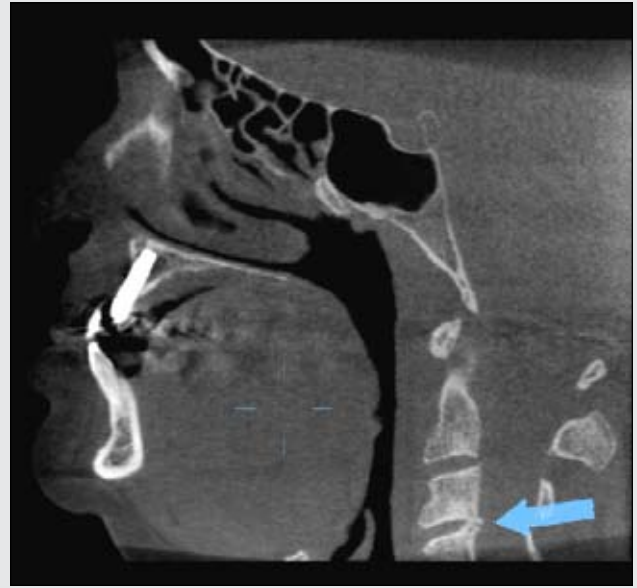
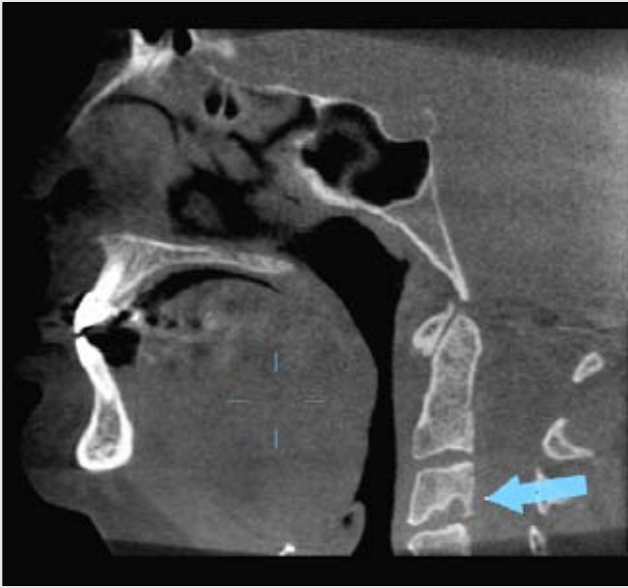
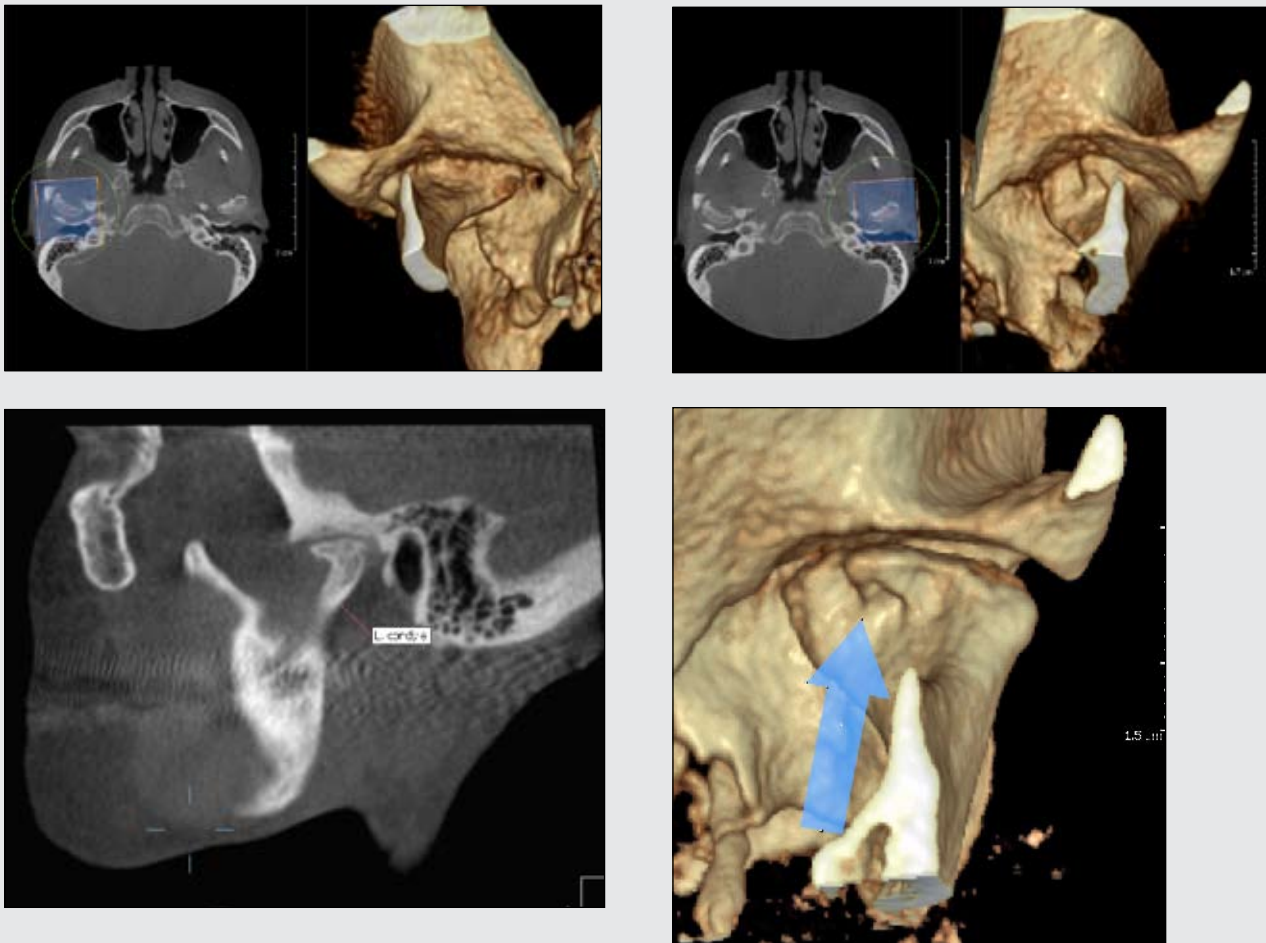


Figure 3: Case 3



## Lack of confidence?

In my humble opinion, dentists have two primary reasons for ignoring the responsibility they incur when ordering or performing a cone beam scan. The first reason is a lack of confidence in their ability to interpret regions in the scan with which they are not familiar. For example, many dentists do not want to be responsible for missing pathology in the following areas:

1. The vertebral column
2. The airway
3. The paranasal sinuses (maxillary, sphenoid and frontal as well as the ethmoids)
4. The nasal cavity
5. Soft tissue structures like muscles, glands, tonsils and adenoids
6. Anything in the 'brain cavity'

Unfortunately for us dentists, teeth do cause sinus symptoms in some cases, sinus problems are NOT restricted to the maxillary sinus in many cases but can involve all of the other spaces as they communicate with each other, osteoarthritis can affect the C-spine and the TMJ condyles simultaneously, and we do get training in soft tissue problems like salivary gland disorders. So, in effect, we dentists ARE responsible for much more than the teeth and gums. There is a patient attached to the tooth! Dentists can acquire sufficient knowledge in cone beam imaging to be able to interpret certainly the limited volume scans of the dental bases. If they are going to employ this technology or the images from it, they should seek additional education about the modality.

The second reason dentists elect to ignore the remainder of the scan outside their region of interest is financial, pure and simple. Some den-

tists do not want to charge the patient 'extra' for an interpretation by a specialist. They feel that this extra fee may reduce the acceptance of the proposed treatment; that is, cost them the revenue for the proposed elective procedure. This reason is absurd and dangerous in my opinion, and borders on malpractice. I, and others, have already addressed this 'position' in other articles.<sup>1,2</sup>

Some dentists think they can have a patient sign a waiver or document refusing to have the scan reviewed to protect themselves from any liability. This practice is indefensible. Patients are not skilled enough in the art and science of dentistry to make the decision to refuse to have the volume read. They cannot diagnose their conditions or potential conditions. If a diagnosis was 'missed' because no one looked at the scan, someone will be liable – the dentist or lab who owns the equipment and performed the image acquisition and the referring dentist or dental specialist who ordered the image(s). Friedland<sup>3</sup> recently cited literature and state law that demonstrated these 'waivers of liability' adopted by dentists 'carries no weight and would be null and void in any legal proceeding'.

Even the major malpractice insurer, Fortress Guardian, who indemnifies members of the American Association of Oral and Maxillofacial Surgery, has written that they will not honor any such waiver<sup>4</sup>. Dentists and dental specialists may have heard that such waivers can be used, information usually delivered by some cone beam company or some 'legal expert' on behalf of the company at a 'manufacture-sponsored cone beam event', and come away thinking they are absolved of any responsibility to look at the entire scan or refer it for professional interpretation. This is a very dangerous position. One which probably WILL be decided in a court of law – and not in favor of the dental professional I'm afraid. **I**