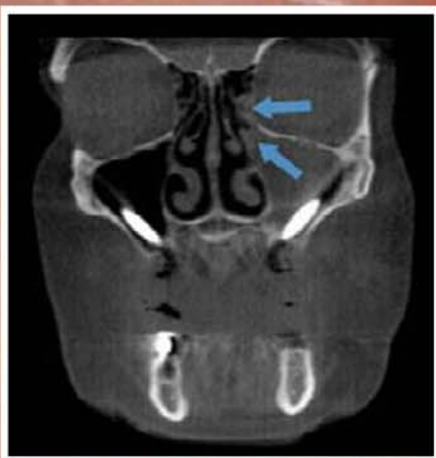


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Implants Following Extraction Site Preservation



Prevalence of Non-Dental
Pathology in CBCT Studies

Prevalence of Non-Dental Pathology in Cone Beam Computed Tomography Studies for Dental Implants

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Abstract

Background: Cone beam computed tomography (CBCT) technology is becoming increasingly useful in the treatment planning of surgical procedures in multiple dental specialties. These images not only simplify surgical planning, they also provide the practitioner with an opportunity to diagnose dental and non-dental pathology visible in the oromaxillofacial region.

Methods: This retrospective review analyzed 261 consecutive CBCT scans taken at a single private practice noting the prevalence of non-dental pathology in CBCT images for dental implants. All scans taken from November 2007 to September 2011 were included in this study. One Board Certified Oral-Maxillofacial Radiologist read all images.

Results: Of these CBCT scans, 28 non-dental pathologies were diagnosed. 95% (247 of 261) of patients studied were diagnosed with non-dental pathology and 78% (193 of 247) were diagnosed with multiple pathologies. Pathologies found ranged from the relatively innocuous chronic sinusitis, to potentially more serious findings such as intracranial calcifications, multiple myeloma, soft tissue masses, and proptosis.

Conclusion: These results suggest that the dental clinician using CBCT technology in a majority of cases will commonly image non-dental head and neck pathology.

KEY WORDS: Dental pathology, cone beam computed tomography, radiology

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INTRODUCTION

Cone beam computed tomography (CBCT) is currently being used in multiple fields of dentistry for pretreatment diagnosis and treatment planning as well as some postoperative follow-up care. The use of this technology in implantology, oral surgery, endodontics, and orthodontics has greatly improved surgical success.¹⁻³ The use of CBCT has been advocated due to the reduction in radiation, lower cost, and smaller size when compared to conventional medical CT methods.^{4,5} Failure to use 3-dimensional (3D) imaging systems has been described to result in inadequate treatment planning with greater anticipated failure.⁶ Studies have shown that CBCT technology more accurately depicts bone height, width, and important anatomic structures, such as the inferior alveolar canal and sinus floor, when compared to traditional radiography.⁷⁻⁹ Furthermore, 3D imaging for ideal implant orientation has been strongly advocated by many authors.¹⁰⁻¹⁴

Although many studies have illustrated the benefits of CBCT images in planning and evaluating dental treatment, few have examined the additional non-dental findings that are noted on radiographic evaluation of the image. Fewer still have advocated using these same images for the diagnosis of non-dental pathology.

The purpose of this study was to analyze the prevalence of non-dental pathology in routine CBCT scans taken for implant placement treatment planning and post placement evaluation. The authors hypothesized, based on anecdotal observation that a majority of these routine CBCT scans would present with radiographic signs consistent with non-dental pathology.

MATERIALS AND METHODS

CBCT Procedure

Images were taken using the iCAT imaging system (Imaging Sciences International, Hatfield, PA). The field of view was 22 cm in height and 16 cm in diameter. CBCT scans were taken for one of two reasons: 1) digital treatment planning for implant placement, or 2) further evaluation of a finding from conventional panoramic and cephalometric radiographs.

Analysis

All consecutive patients in a single private practice (PI Dental Center, Fort Washington, PA) that had a CBCT scan taken from November 2007 to September 2011 were included in this study. Patients excluded were those not requiring a CBCT for appropriate treatment. The data from the scans were read by a Board Certified Oral-Maxillofacial Radiologist and the co-authors for evaluation. A standardized report was generated by the Radiologist with an analysis of visible head and neck pathology. From these radiology reports, data was reviewed for this report. Cases with serious pathology needing medical attention were referred to the appropriate medical specialist. None of the reports from the radiologist were excluded from this study.

RESULTS

Two hundred sixty-one CBCT scan reports were reviewed between November 2007 and September 2011. The mean age of the patients in the reports was 57.9 ± 15.3 (range 13 to 101). One hundred fifty-eight (60.5%) female reports and 103 (39.5%) male reports were analyzed. Twenty-nine different non-dental related pathologies were noted in these reports,

Table 1: List of Non-Dental Pathologies Observed

Pathology	Total Count	Percent of Total Cases
Chronic sinusitis	92	35.2
Mucous retention pseudocyst in sinus	30	11.5
Narrowing of the osteomeatal complex	23	8.8
Antral polyposis	11	4.2
Pneumatization of sinus	7	2.7
Mucositis	1	0.4
Nasoepital deviation	51	19.5
Concha Bullosa	9	3.4
Osteoarthritis of the TMJ	85	32.6
Remodeling of the TMJ	14	5.3
Internal Derangement of the TMJ	1	0.4
Calcification of carotid arteries	17	6.5
Airway narrowing	18	6.9
Tonsillolith	4	1.5
Adenoidal hyperplasia	1	0.4
Vallecula fullness	1	0.4
Maxillary Hypoplasia	1	0.4
Degenerative cervical spine	33	12.6
Herniation of an intervertebral disc	1	0.4
Cholesteatoma	3	1.1
Proptosis	1	0.4
Frontal Bossing	1	0.4
Soft Tissue Mass	1	0.4
Endostosis	7	2.7
Idiopathic Osteosclerosis	2	0.8
Florid Osseous Dysplasia	1	0.4
Multiple Myeloma	1	0.4

the details of which are reported in Table 1.

Two hundred forty-seven (94.6%) of patients in this series had non-dental related pathology, while 14 (5.4%) had no additional pathology. Of the patients with pathology, 78.1% of patients had more than one detectable non-dental pathology. The most commonly observed pathology was chronic sinusitis, present in 92 patients (35.2%).

CASE STUDIES

Case 1

A 48-year-old male patient returned after implant placement with drooping of the right eye and persistent headaches. A CBCT scan was taken as follow-up care and the images were referred to a Board Certified Oral-Maxillofacial Radiologist for evaluation (Figures 1a-b). The images revealed a small intracranial calcification and the patient was referred to an ENT physician for evaluation.

Case 2

A 57-year-old female patient presented for post-op implant evaluation with a clinical swelling of the left orbital region. A CBCT scan was taken to evaluate the integrity of the implants and adjacent tissues. These images were evaluated by a Board Certified Oral-Maxillofacial Radiologist (Figures 2a-b). The scans findings were suggestive of proptosis of the left orbit and chronic sinusitis. The patient was referred to an ophthalmologist and an ENT physician for appropriate evaluation and treatment.

DISCUSSION

Cone beam computed tomography is becoming an essential device for treatment planning oral and maxillofacial surgical procedures.¹⁻³ Along with

allowing images to be evaluated in three dimensions, studies have shown that computed tomography more accurately depicts anatomic structures when compared to traditional radiography.⁷⁻⁹

In this study, 94.6% (247 of 261) of CBCT's taken revealed non-dental pathology and 78.1% (193 of 247) of those patients had multiple pathologies. It therefore behooves the dental practitioner using CBCT technology to perform a comprehensive review of these images as a general service to their patients. If the clinician is uncomfortable making these diagnoses, then these images must be referred to a Board Certified Oral-Maxillofacial Radiologist for appropriate interpretation and subsequent appropriate referral.

A recent publication by Pette et. al reported the incidental findings observed in 318 CBCT reports.¹⁵ Pette et. al observed 93.42% of reports with non-dental pathology, similar to the present finding of 94.6%. The most common pathology in their study was pathology of the maxillary sinus, found in 61.95% of patients. Similarly, the present study observed chronic sinusitis to be the most prevalent finding (35.2%) and found maxillary sinus pathology to be present in 62.5% of all reports. The second most common pathology in the Pette et. al study involved pathology of the vertebrae (47.8%). In the present population, however, osteoarthritic changes of the TMJ (32.6%) were more common than degenerative changes of the spine (12.6%).

Some consequences of CBCT imaging include a higher radiation dosage compared to conventional radiography. One study has shown that CBCT can produce 2 to 15 times more radiation than traditional radiography.¹⁶ However, the use of CBCT to restrict field, greatly reduces the amount of exposure

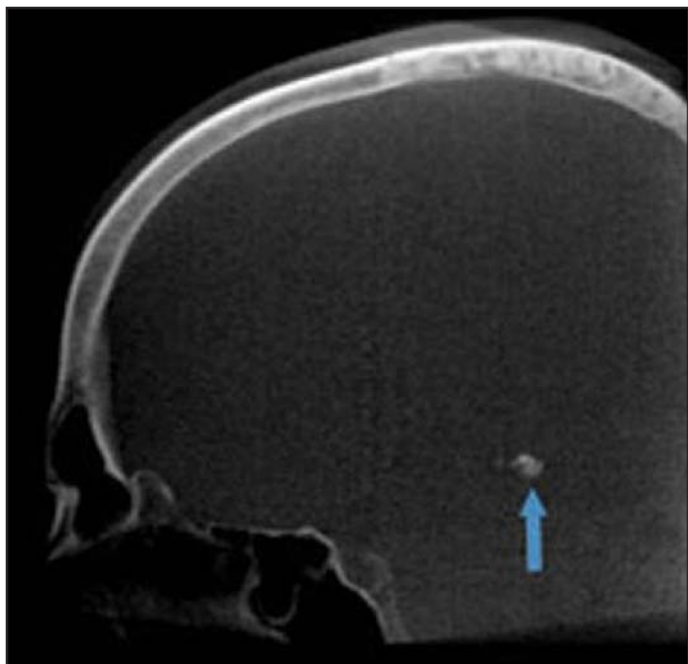


Figure 1a: CBCT images taken post-placement illustrating a small intracranial calcification from sagittal view requiring referral to an ENT physician for evaluation.

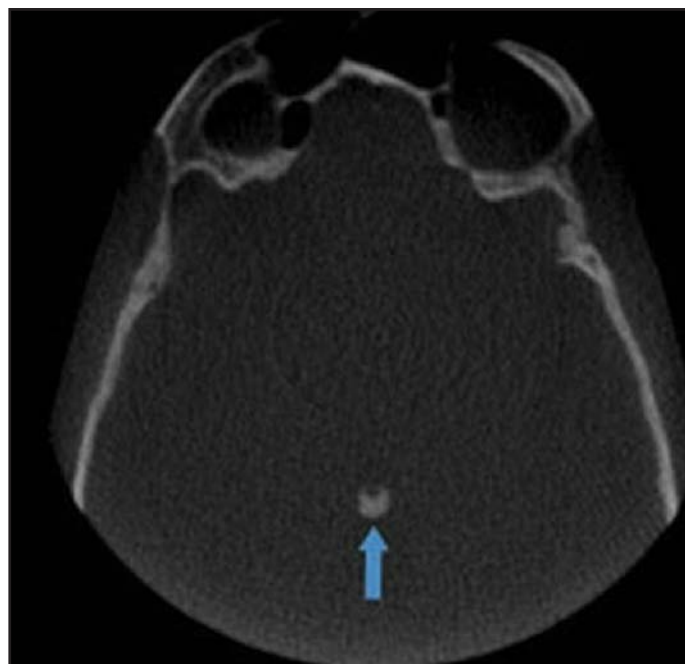


Figure 1b: CBCT images taken post-placement illustrating a small intracranial calcification from transverse view requiring referral to an ENT physician for evaluation.

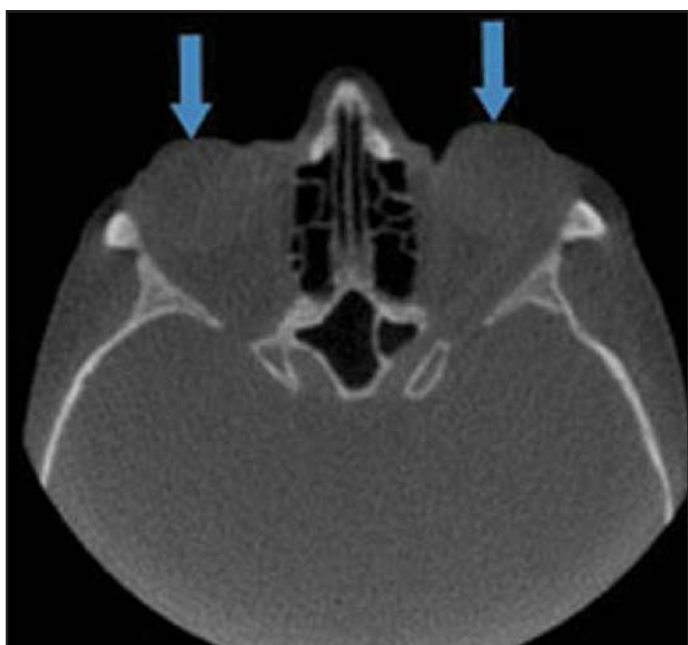


Figure 2a: CBCT Image taken for follow-up evaluation. Image reveals proptosis of the left eye.

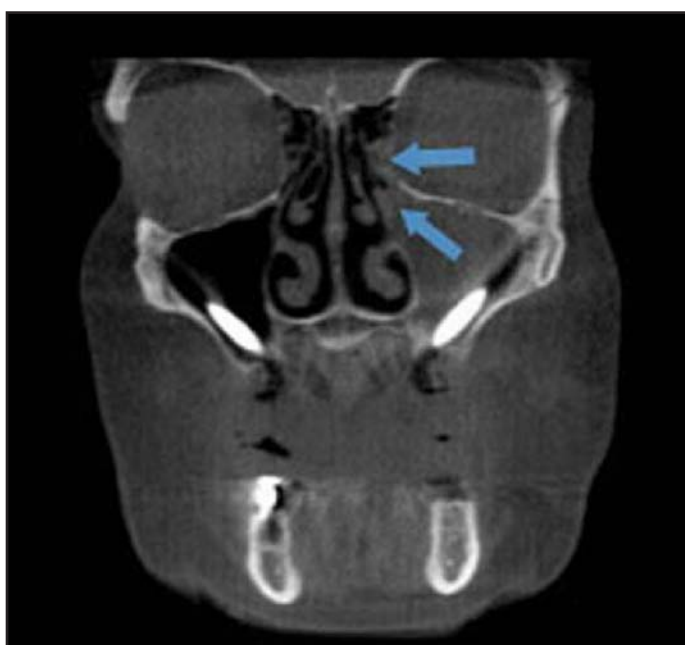


Figure 2b: CBCT Image taken for follow-up evaluation. Image reveals opacification of the left maxillary sinus suggestive of chronic sinusitis of the left maxillary and ethmoidal sinuses.

to around 15 times less than that associated with traditional computed tomographic imaging.³ Another potential drawback is the financial cost to the patient to have these images taken.

One limitation of this study is that although these pathoses are detectable through imaging, they may not manifest clinically, or symptoms may have presented post-treatment. Nevertheless, it is important to document these radiographic findings and notify the patient even in the absence of clinical presentation for medical, legal and ethical reasons.

CONCLUSION

CBCT imaging greatly enhances the success and predictability of oral-maxillofacial surgery. This current study showed that these routine scans also detect a variety of head and neck pathology. The dental clinician performing these scans is therefore obligated to look for common head and neck pathology or refer these scans to a Board Certified Radiologist for appropriate diagnosis. ●

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Disclosure

The authors report no conflicts of interest with anything mentioned in this article.

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