Types of Referrals for Cone Beam Tomography Imaging in Kathmandu, Nepal

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ABSTRACT

There are various radiographic techniques for the evaluation of dentomaxillofacial structures. The conventional two dimensional radiographs include intraoral periapical radiograph, panoramic radiograph and lateral oblique. Although two dimensional (2D) imaging have been the standard of care, their diagnostic information can leave some questions unanswered in most cases. Cone Beam Tomography (CBCT) imaging is a three dimensional radiography and is used in various field of dentistry. CBCT unveils the hidden 3D structures, and aids in narrowing the differential diagnosis which in turn helps in better treatment planning. The objectives of the current study were to elaborate the uses of CBCT in dentistry and to evaluate the incidence of cases sent for CBCT imaging in the capital city of a South Asian Country. The results of statistical analysis showed that more number of cases were sent for non pathological than compared to pathological cases. Of all the pathological cases, maximum cases comprised of analysis of cysts and impaction cases with the minimum being fibrosseous cases. CBCT has advanced to become an indispensable and integral component of routine work in clinics and dental practices. Many cases which otherwise could not be assessed by two dimensional techniques have proven to be diagnostic and useful by using CBCT.

Keywords: CBCT, Cysts, Tumors , Indications

INTRODUCTION

Ever since the discovery of x-rays, dental radiology has played a critical diagnostic role in dentistry with a rapidly expanding array of imaging modalities. There are various radiographic techniques for evaluation of dento maxillofacial structures. The conventional two dimensional radiographs include intraoral periapical radiograph, panoramic radiograph and other less commonly used extraoral views like lateral oblique view and anteroposterior view. Although two dimensional (2D) imaging has been the standard of care, their diagnostic information can leave some questions unanswered in most cases. With the advances in the field of imaging sciences, new methods have been developed in dental imaging. These include digital radiography, density analyzing methods, cone beam computed tomography (CBCT), magnetic resonance imaging, ultrasound, and nuclear imaging techniques, which provide better diagnostic values. Three dimensional radiography include Computerized Tomography, Cone beam computed tomography (CT/CBCT) .[2] Conventional two dimensional (2D) radiography is a shadowgraph of a three dimensional object, and information in depths and volume can be obtained observing the object with several orientations (angle). CBCT imaging is a routinely used method of dentomaxillofacial radiography and is used in various field of dentistry. CBCT unveils the hidden 3D structures, and aids in narrowing the differential diagnosis which in turn helps in better treatment planning. The indications of CBCT in dentistry include localization of impacted tooth, visualization of oral and maxillofacial pathologic entities, TMJ related problems, craniofacial fractures, endodontics, periodontal assessments and oral implantology.[3,4,5]

MATERIAL AND METHODS

The current study aims to elaborate the uses of CBCT in dentistry and to evaluate the incidence of cases sent for CBCT imaging in the capital city of a South Asian Country. In this retrospective study, the samples were taken from patients who visited dental imaging center in Kathmandu, Nepal and underwent CBCT from Jan 2015-Jan 2016. The patients were included after obtaining informed consent. The demographic data of patients were recorded based on individual patient data in an image file. All CBCT images were taken by a CBCT scanner (Planmeca Company, Helsinki, Finland). The cases were then categorized as those sent for pathological and non pathological assessment. Cases like cysts, impacted teeth, tumors, maxillary antrum pathology, fractures, fibrosseous lesions and inflammatory lesions

were catergorised as pathological cases and cases requested for dental implant planning were catergorised as non pathological.Descriptive Statistical Analysis was applied to the data. Next, the CBCT images were evaluated by dento maxillofacial radiologists, who were familiar with CBCT.

RESULTS

Our sample size consisted of 932 patients that included 500 males and 432 females. Their mean age was 42.39 ± 13.75 years. The results of statistical analysis showed that more number of cases were sent for non pathological than compared to pathological cases.

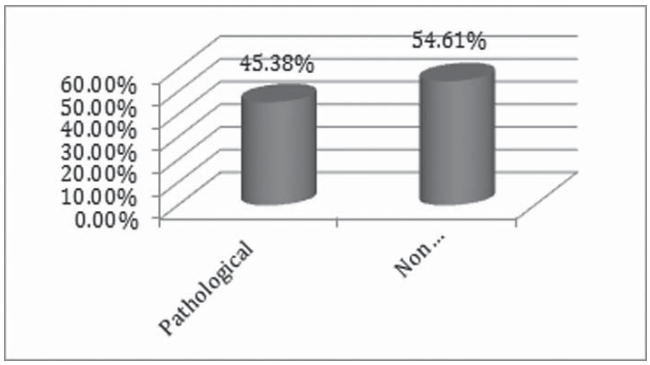

Figure 1. Distribution of Pathological and Non pathological cases

Of all the pathological cases, maximum cases comprised of analysis of cysts and impaction cases with the minimum being fibrosseous cases. Table 1. shows distribution of the commonest pathological cases. The pathological cases were more common in males compared to females except for periapical abscess and degenerative diseases of TMJ which were more common in females. It was seen that odontogenic cysts were more frequent than odontogenic tumors.

Table 1. Distribution of Commonest Pathological Cases

Cysts	Radicular cyst, males
Impacted teeth	Third molar>Maxillary canine, Males
Tumors	Ameloblastoma,Males
Maxillary antrum Pathology	Antral Polyp, Males
Fractures	Mandibular body, Males
Fibrosseous lesions	Maxillary, Males
Inflammatory	Periapical Abscess, Females

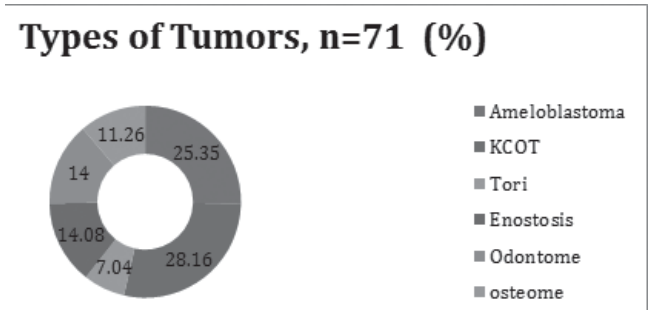

Figure 3. Distribution of Tumors

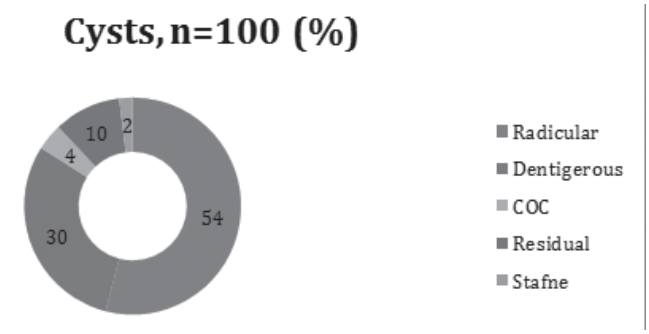

Figure 4. Distribution of Cysts

The most frequent odontogenic tumor and odontogenic cyst were ameloblastoma and radicular cyst respectively (Figure 3 and 4). Periapical abscess was the commonest inflammatory lesion with osteomyelitis being the least common (Figure 5). Impacted third molars were seen to be more commonly impacted teeth (Figure 6).

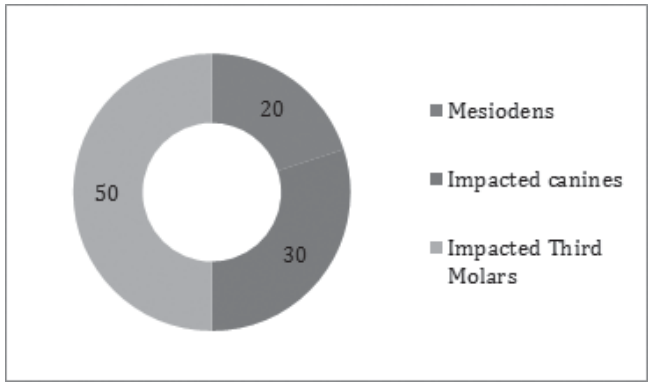

Figure 5. Distribution of Inflammatory Lesions, n=83 (%)

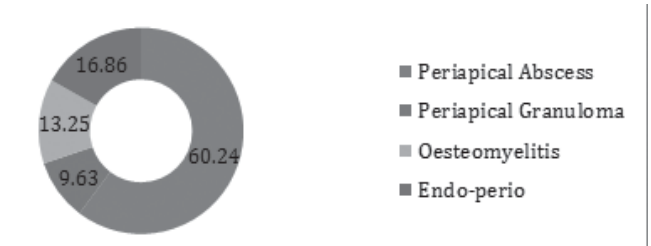

Figure 6. Distribution of Impactions, n=100 (%)

Of the maxillary sinus pathologies, antral-polyp was seen to be more common (Figure 7). Degenerative diseases of TMJ were found to be commonly occurring pathology of TMJ (Figure 8).

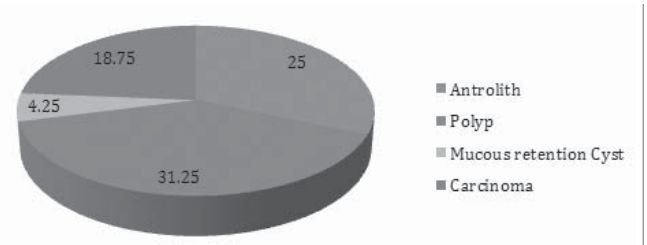

Figure 7. Distribution of Pathology of the Maxillary Antrum,n=15(%)

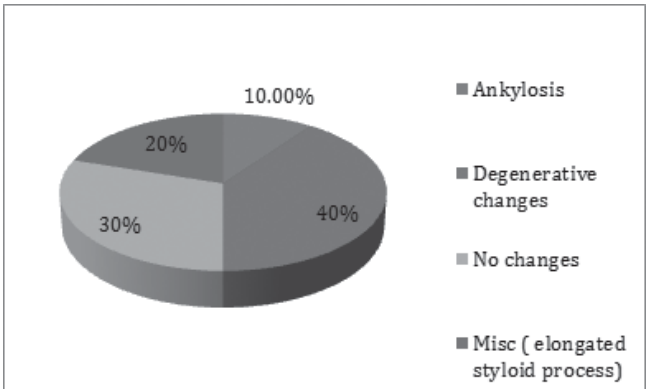

Figure 8. TMJ Pathologies in Percent (n=50)

DISCUSSION

Radiographs in dentistry help in a proper diagnosis, correct treatment planning, and are an important tool in intraoperative procedures and outcome assessments.[6] The need for three-dimensional imaging is increasing in dentistry. CBCT has been a promising tool in all countries including a developing country like Nepal.[5] It was seen from this study that of all the cases sent for CBCT scans, maximum number was sent for Implant imaging followed by assessment of dentomaxillofacial cysts and tumors, evaluation of impacted teeth/third molars, endodontic purposes and assessment of fractures. The use of CBCT for implant planning was seen to be in large number which justifies the popularity of CBCT in implant planning, a finding similar to that reported by other investigators.[2,6] In pathologic cases, radicular cyst, which commonly arises as a result of dental infection spreading to apex and adjacent bone was found to be the most frequently occurring cyst which was similar to a study conducted by Deepthi *et al* in 2014.[8] Similarly, ameloblastoma is a rare, benign, slow-growing but locally invasive neoplasm of the odontogenic origin involving the mandible (80%) and maxilla was found to be more common than other tumors.[9] Antral polyps were the most common pathology in maxillary sinus which was observed as incidental findings. CBCT volume tomography (DVT) is an extraoral imaging system, which can produce three-dimensional scans of the maxillofacial hard tissues.[10]CBCT images are attained with the help of rotating gantry to which an X-ray source and detector are attached. A divergent beam of cone-shaped ionizing radiation is then passed through the area of interest to an X-ray detector on the other side of the patient. The X-ray source and detector revolve around a fixed fulcrum that is immovable within the region of interest (ROI). At the time of exposure sequence, hundreds of planar projection images are generated of the field of view (FOV) in an arc of at least 180°. In a single rotation, CBCT can generate accurate, instant three-dimensional radiographic images. Because CBCT exposure involves the entire FOV, one rotational sequence of the gantry is sufficient to acquire adequate data for the purpose of image reconstruction.[11,12]Its major advantage over conventional CT is the marked reduction in radiation exposure. This is due to rapid scan times, pulsed X-ray beams and state of the art image receptor sensors. CBCT scanners are very simple to use and are approximately the same size of the panoramic radiographic machines, which make them a practical choice for dental practice. Images can be displayed in the three orthogonal planes, axial, sagittal, and coronal simultaneously and allows an area to be investigated three-dimensionally in "real time." [12,13] The quality of images from CBCT scans is better and far superior to helical CT in the assessment of important structures such as cancellous bone, periodontal ligament, lamina dura, enamel, dentine, and pulp.[14] Cone beam CT scanners are simple to use, less complicated, and therefore less expensive than CT scanners.[14,15]CBCT has been developed as a technique to provide 3D data specifically for dento maxillofacial imaging at a lower cost and with lower radiation doses than the conventional CT used in medical radiology.[3] The first CBCT center in Nepal was Dental Imaging Center, established in Kathmandu in March 2013. Ever since the establishment of the centre, CBCT has advanced to become an indispensable and integral component of routine work in clinics and dental practices. Many cases which otherwise could not be assessed by two dimensional techniques have proven to be diagnostic and useful by using CBCT. Therefore, CBCT represents a perfectly natural and established technology in the field of dento-maxillofacial radiology.

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Disclaimer: None

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