Cone Beam Computed Tomography
(For Ohio Only)

Policy Number: CSDEN305OH.A
Effective Date: December 1, 2023

➲ Instructions for Use

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Related Dental Policies
None

Application

This Dental Policy only applies to the state of Ohio. Any requests for services that are stated as unproven or services for which there is a coverage or quantity limit will be evaluated for medical necessity using Ohio Administrative Code 5160-1-01.

Coverage Rationale

Cone beam computed tomography (CBCT) is proven and medically necessary as adjunctive advanced imaging for complex clinical conditions that pose greater risk of complication and for which additional detail beyond that of a traditional radiograph is necessary to safely render treatment.

Cone beam computed tomography (CBCT) is not medically necessary for routine dental diagnosis and treatment planning or for circumstances that can be appropriately managed with a conventional 2-dimensional radiograph, due to insufficient evidence of efficacy and/or safety.

Clinical scenarios for which CBCT imaging may be appropriate include:

- Implant planning and/or diagnoses of post-operative complications
- Visualization of abnormal teeth suspected to have pathology or causing damage to surrounding structures
- Evaluation of the position of teeth in relation to vital structures in conjunction with oral surgery
- Endodontics in the presence of contradictory/nonspecific clinical signs and symptoms in previously endodontically treated teeth, complex root/canal morphology
- Traumatic injuries

Detailed recommendations for initial and secondary imaging and Field of View (FOV) should be referenced as found under *"Clinical Practice Guidelines- Professional Societies"* beginning on page 8 of this document

Applicable Codes

The following list(s) of procedure and/or diagnosis codes is provided for reference purposes only and may not be all inclusive. Listing of a code in this policy does not imply that the service described by the code is a covered or non-covered health service. Benefit coverage for health services is determined by the member specific benefit plan document and applicable laws that may require coverage for a specific service. The inclusion of a code does not imply any right to reimbursement or guarantee claim payment. Other Policies and Guidelines may apply.

CDT Code	Description
D0364	Cone beam CT capture and interpretation with limited field of view - less than one whole jaw
D0365	Cone beam CT capture and interpretation with field of view of one full dental arch - mandible
D0366	Cone beam CT capture and interpretation with field of view of one full dental arch - maxilla, with or without cranium
D0367	Cone beam CT capture and interpretation with field of view of both jaws; with or without cranium
D0368	Cone beam CT capture and interpretation for TMJ series including two or more exposures
D0380	Cone beam CT image capture with limited field of view - less than one whole jaw
D0381	Cone beam CT image capture with field of view of one full dental arch - mandible
D0382	Cone beam CT image capture with field of view of one full dental arch - maxilla, with or without cranium
D0383	Cone beam CT image capture with field of view of both jaws; with or without cranium
D0384	Cone beam CT image capture for TMJ series including two or more exposures
D0391	Interpretation of diagnostic image by a practitioner not associated with capture of the image, including report
D0393	Treatment simulation using 3D image volume
D0394	Digital subtraction of two or more images or image volumes of the same modality
D0395	Fusion of two or more 3D image volumes of one or more modalities

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Description of Services

Cone-beam computed tomography (CBCT) is a variation of traditional computed tomography (CT). The CBCT systems used in dentistry rotate around the patient, capturing data using a cone-shaped X-ray beam. These data are used to reconstruct a three-dimensional (3D) image of the selected area. Dental CBCT is increasingly used for various clinical applications including dental implant planning, visualization of abnormal teeth, the position of teeth in relation to vital structures, endodontic (root canal) diagnoses, and dental trauma. These procedures may have a higher risk of complications without the level of detail CBCT imaging provides. The selected image field of view (FOV) should be no larger than necessary.

Although the radiation doses from dental CBCT exams are generally lower than other CT exams, dental CBCT exams deliver more radiation than conventional dental radiographic exams. Concerns about exposure are greater for younger patients as they are more sensitive to radiation. The FDA offers guidance on pediatric radiology and full information can be found here: https://www.fda.gov/radiation-emitting-products/medical-imaging/pediatric-x-ray-imaging. (Accessed February 21, 2023)

The International Atomic Energy Agency (IAEA) provides information on comparative radiation doses for dental imaging, and full information can be found here: https://www.iaea.org/resources/rpop/health-professionals/dentistry/radiation-doses#:~:text=intraoral%20dental%20X%20ray%20imaging,100%20%CE%BCSv%20for%20large%20volumes.
(Accessed February 21, 2023)

Incidental findings (IF) are not uncommon. These are radiographic or tomographic images in which there is a discovery unrelated to the original purpose of the examination. These can range from anatomical variations to benign and malignant lesions. Therefore, dental CBCT images must always be read and interpreted by an appropriately trained professional (Edwards et al. 2013; Lopes et al. 2017).

Clinical Evidence

Endodontics

In a 2022 systematic review, Tay et al. evaluated how endodontic treatment plans change when CBCT imaging is used in decision making. Studies examining changes in clinicians' treatment plans with and without the use of CBCT were included. After searching, 16 studies met the inclusion criteria and were assessed. The results showed that 15 studies showed a change in treatment plan when CBCT was used. Studies were divided into 2 groups: the first group (5/16 studies) reported changes in treatment plan without reporting changes in treatment options, and the second group (11/16 studies) specified the changes in treatment options. In this second group, 9 studies recommended further intervention including surgical and non- surgical endodontic treatment and extractions after CBCT was used. Only 2 studies reported no change in treatment plan. There was an increased in recommended extraction reported in 6 out of 7 studies that included this as a treatment option, and 8 studies that included endodontic treatment and no treatment as possible treatment options, increases were reported in the recommendation for non-surgical or surgical endodontic treatment, and with decreases in 'no treatment' were described in 4 of these studies. Increases in the recommendation for endodontic retreatment options were observed in 2 studies that used CBCT to evaluate treatment outcome. CBCT imaging influences endodontic treatment decision-making towards further intervention in the following situations: high difficulty cases, diagnosis of symptomatic teeth after failed root canal treatment, evaluation of periapical healing, pre-surgical treatment planning, and management of traumatized immature teeth and external cervical resorption.

Aminoshariae et al. (2018) conducted a systematic review that compared and quantified endodontic outcomes using cone-beam computed tomographic (CBCT) imaging with intraoral periapical radiography. Six articles met the inclusion criteria with low to moderate risk of bias. The odds of the CBCT imaging locating a lesion are twice as good as the odds of traditional radiography locating the same lesion. This may not be of concern for an obvious lesion, but when clinically challenged with a difficult diagnosis and/or decision making, CBCT imaging might provide a greater amount of information needed to establish an accurate diagnosis. Although CBCT imaging can overcome several limitations of 2-dimensional radiography, there are other issues to consider such as radiation, high levels of scatter and noise, variations in dose distribution within a volume of interest, and cost. For these reasons, CBCT imaging should be used when the history and clinical examination clearly show that the benefits outweigh the potential risks. In other words, not every patient should be unnecessarily exposed to unwarranted radiation and as always, the ALARA (As Low As Reasonably Achievable) principle should be used. The authors identified a limitation of a subgroup analyses not being included since the studies were somewhat consistent because of the overall low heterogeneity among the studies. Although intraoral radiographs are the imaging modality of choice, when 2-dimensional intraoral radiography is inconclusive, the authors found CBCT imaging was reported to have twice the odds of detecting a periapical lesion than traditional periapical radiography in endodontic outcome studies.

Al-Salehi and Horner (2016) evaluated the impact of limited volume CBCT upon diagnosis as part of endodontic management of posterior teeth. Eligible patients were all adults aged 18 years or over who were referred to a specialist endodontic unit. Inclusion criteria were cases that were either re-treatment or de novo root canal treatment where the anatomy was judged to be complex. Exclusion criteria included vulnerable groups and de novo endodontic treatment with uncomplicated root canal anatomy. For each patient, a full history and clinical examination was performed, a high-quality color photographic intraoral image, two paralleling technique periapical radiographs and limited volume CBCT examination were carried out. CBT is being increasingly used in field of endodontics. The benefits gained from the use of CBCT must be carefully balanced against the increased radiation dosage. It was concluded that the routine use of CBCT could not be justified.

Rosen et al. (2015) evaluated the diagnostic efficacy of cone-beam computed tomographic (CBCT) imaging in endodontics based on a systematic search and analysis of the literature using an efficacy model. A systematic literature search identified 58 articles that met the inclusion criteria. 90% of the articles evaluated technical characteristics or the accuracy of CBCT imaging, which was defined in this model as low levels of efficacy. The author's identified only 6 articles that supported the practitioner's decision making, treatment planning and treatment outcome which was defined as higher levels of efficacy. The expected ultimate benefit of CBCT imaging to the endodontic patient as evaluated by its level of diagnostic efficacy is unclear and is mainly limited to its technical and diagnostic accuracy efficacies. The author's concluded that even for these low levels of efficacy, current knowledge is limited and therefore, a cautious and rational approach is advised when considering CBCT imaging for endodontic purposes.

Long et al. (2014) conducted a meta-analysis to determine the diagnostic accuracy of cone-beam computed tomography (CBCT) for tooth fractures in vivo. A total of 12 studies were included in the meta-analysis. The pooled sensitivity, specificity, positive likelihood ratio, negative likelihood ratio and summary receiver operating characteristic were 0.92, 0.85, 5.68, 0.13 and 0.94, respectively. The pooled prevalence of tooth fractures in patients with clinically-suspected but periapical-radiography-undetected tooth fractures was 91%. Positive and negative predictive values were 0.98 and 0.43. The authors concluded that CBCT has a high diagnostic accuracy for tooth fractures and could be used in clinical settings. The authors stated that they were very confident with positive test results, but negative test results should be interpreted cautiously, especially for endodontically treated teeth. The limitations of this meta-analysis were small sample sizes in some studies, no applying reference standard test for all patients in some studies, and unavailability of data for subgroup analysis for horizontal and oblique tooth fractures. Moreover, CBCT devices and exposure protocols differed among included studies. According to the authors, since image quality may vary among different CBCT devices and exposure protocols, the results in this meta-analysis should be interpreted with caution and may not be applied to all CBCT devices.

Implant Dentistry

Caetano et al. (2022) conducted a review of four studies to compare two-dimensional radiographs and cone beam computed tomography (CBCT) images for palatal mini-implant planning. The results showed that lateral imaging showed approximately the same measurements of bone quantity as CBCT, however determining suitability for interradicular mini-implants, the available space as underestimated. The authors concluded that lateral radiography is sufficient to quantify the available bone for planning mini-implants installed on the palate, in the median region of upper first premolars. As for interradicular mini-implant planning, CBCT assists in selecting the implantation site, and improves the success rate.

In a retrospective study, Özalp et al. (2018) studied and evaluated the correlations between measurements made using panoramic radiography and cone-beam computed tomography (CBCT) based on certain anatomical landmarks of the jaws with the goal of preventing complications due to inaccurate measurements in the pre-surgical planning phase of dental implant placement. 56 patients (30 male, 26 female) underwent panoramic radiography and a CBCT evaluation before dental implant surgery. Measurements were performed to identify the shortest vertical distance between the alveolar crest and neighboring anatomical structures, including the maxillary sinus, nasal floor, mandibular canal, and foramen mentale. The differences between the measurements on panoramic radiography and CBCT images were statistically analyzed. The statistically significant differences were observed between the measurements on panoramic radiography and CBCT for all anatomical structures. The author's conclusions supported the idea that panoramic radiography might provide sufficient information on bone height for preoperative implant planning in routine cases or when CBCT is unavailable. However, an additional CBCT evaluation might be helpful in cases where a safety margin cannot be respected due to insufficient bone height.

In a systematic review, Bornstein et al. (2014) reviewed, analyzed, and summarized the available evidence on the use of cross-sectional imaging, specifically maxillofacial cone beam computed tomography (CBCT) in pre- and postoperative dental implant therapy. According to the authors, on the basis of the data found in the literature, the following can be concluded:

- Most published national and international guidelines on implant dentistry do not offer evidence based action statements developed from a rigorous systematic review approach.
- Most publications on guidelines for CBCT use in implant dentistry provide recommendations that are consensus-based or derived from a limited methodological approach with only partial retrieval and/or analysis of the literature or contain even generalized or non-case-specific statements.
- Indications or contraindications reported for CBCT use in implant dentistry are based on nonrandomized clinical trials, either cohort or case-controlled studies.
- The reported indications for CBCT use in implant dentistry vary from preoperative analysis regarding specific anatomic considerations, site development using grafts, and computer-assisted treatment planning to postoperative evaluation focusing on complications due to damage of neurovascular structures.
- It will be difficult to prove a clear and statistically significant benefit of cross-sectional imaging (with special emphasis on CBCT) over conventional two dimensional imaging such as panoramic radiography with respect to damage of the IAN or other vital neurovascular structures in the arches resulting in dysesthesia or pain in comparative prospective studies due to the high number of cases needed for such an evaluation (power).

Shelley et al. (2014) completed a systematic review to determine if the pre-operative availability of cross-sectional imaging, such as cone beam CT, has a diagnostic impact, therapeutic impact or impact on patients' outcome when placing two dental implants in the anterior mandible to support an overdenture. Studies were considered eligible for inclusion if they compared the impact of conventional and cross-sectional imaging when placing dental implants in sites including the anterior mandible. An adapted quality assessment tool was used for the assessment of the risk of bias in included studies. Pooled quantitative analysis was not possible and, therefore, synthesis was qualitative. Of 2374 potentially eligible papers, 5 studies were included. The authors stated that little could be determined from a synthesis of these studies because of their small number, clinical diversity and high risks of bias. The authors concluded that there is no evidence to support any specific imaging modality when planning dental implant placement in any region of the mouth. Therefore, those who argue that cross-sectional imaging should be used for the assessment of all dental implant sites are unsupported by evidence.

Oral Surgery

Reia et al. (2021) conducted a study is to verify whether the diagnostic accuracy of CBCT is superior to panoramic radiography (PR) in predicting inferior alveolar nerve (IAN) exposure during lower third molar extraction. Three studies that evaluated the accuracy (sensitivity, specificity, positive-predictive value, and negative predictive value) of both imaging methods were included. The gold standard was the visualization of the IAN exposure during the extraction of lower third molars. The results showed that the accuracy values for CBCT were 95.1% for sensitivity and 64.4% for specificity. For PR sensitivity and specificity, was 73.9% and 24.8% respectively. The authors concluded that while both exams are reliable, CBCT performed better for predicting IAN exposure during surgery.

In a randomized controlled multicenter trial Guerrero et al. (2014) compared the postoperative complications following surgical removal of impacted third molars using panoramic radiography (PAN) images- and cone-beam computed tomography (CBCT)-based surgeries for "moderate-risk" cases of impacted third mandibular molars. The secondary objective of the study was to compare the reliability of CBCT with that of PAN in preoperative radiographic determination of the position of the third molar, number of roots, and apical divergence. The sample consisted of impacted third molars from 256 patients with a close relation to the inferior alveolar nerve (IAN). Patients were divided into two groups: the CBCT group (n = 126) and the PAN group (n = 130). The incidences of IAN sensory disturbance and other postoperative complications were recorded for each group at 7 days after surgery. Statistical analysis was used to compare the diagnoses of five trained dentomaxillofacial radiologists and to relate radiologic diagnoses to perioperative findings. Logistic regression was used to determine whether the imaging modality influenced occurrence of postoperative complications. Two extractions (1.5%) in the CBCT group and five (3.8%) in the PAN group resulted in IAN sensory disturbance. Logistic regression models did not show that CBCT modality decreased postoperative complications following surgical removal of impacted third molars. Yet, CBCT revealed the number of roots and apical divergence of the roots more reliably than panoramic radiographs however, the authors concluded that CBCT was not better than panoramic radiography in predicting postoperative complications for moderate-risk cases of impacted third mandibular molars.

Matzen et al. (2013a) assessed the influence of cone beam CT (CBCT) on treatment planning before surgical intervention of mandibular third molars and identified radiographic factors with an impact on deciding on coronectomy. A total of 186 mandibular third molars with an indication for surgical intervention underwent a radiographic examination with two methods: (1) panoramic imaging in combination with stereo-scanography and (2) CBCT. After the radiographic examination a treatment plan (TP) was established: either surgical removal (Sr) or coronectomy (Co). The first TP was based on the panoramic image and stereo-scanogram, while the second TP was established after CBCT was available. Logistic regression analyses were used to identify factors predisposing for Co after CBCT. Treatment was performed according to the second TP. Agreement between the first and second TP was seen in 164 cases (88%), while the TP changed for 22 teeth (12%) after CBCT. Direct contact between the third molar and the mandibular canal had the highest impact on deciding on Co. Direct contact was not a sufficient factor, however; thus, lumen narrowing of the canal and canal positioned in a bending or a groove in the root complex were additional canal-related factors for deciding on Co. The authors concluded that CBCT influenced the treatment plan for 12%. Direct contact in combination with narrowing of the canal lumen and canal positioned in a bending or a groove in the root complex observed in CBCT images were significant factors for deciding on coronectomy. The study did not confirm the utility of such findings in improving care and outcome of patients.

Matzen et al. (2013b) compared the diagnostic accuracy of panoramic imaging, stereo-scanography and cone beam computed tomography (CBCT) for assessment of mandibular third molars. One hundred and twelve patients (147 third molars) underwent radiographic examination by panoramic imaging, stereo-scanography and CBCT. There were no significant differences between the modalities regarding tooth angulation, root morphology and number of roots. However, CBCT was more accurate than stereo-scanography for determining root bending in the bucco-lingual plane. Moreover, sensitivity for direct contact to the mandibular canal was higher for CBCT than for panoramic images and specificity for no direct contact to the mandibular canal was higher for panoramic images and CBCT than for scanograms. The authors concluded that panoramic imaging, stereo-scanography and CBCT seem equally valuable for examination of tooth angulation and number and morphology of roots of mandibular third molars. However, CBCT was more accurate for assessment of root bending in the bucco-lingual plane and more accurate than panoramic images to identify direct contact to the mandibular canal. There is no evidence from this study that this information will affect patient management.

Orthodontics

Signorelli et al. (2016) studied radiation doses of different cone-beam computed tomography (CBCT) scan modes and compared them to conventional orthodontic radiographs (CORs) by means of phantom dosimetry. Thermoluminescent dosimeter (TLD) chips (3 × 1 × 1 mm) were used on adult male tissue-equivalent phantoms to record the distribution of the absorbed radiation dose. Three different scanning modes (i.e., portrait, normal landscape, and fast scan landscape) were compared to conventional orthodontic radiographs. Although one CBCT scan may replace all conventional orthodontic radiographs, one set of CORs still entails 2-4 times less radiation than one CBCT. Depending on the scan mode, the radiation dose of a CBCT is about 3-6 times that of a digital panoramic radiograph, 8-14 times a posteroanterior cephalograms, and 15-26 times a conventional lateral. The authors concluded CBCT should not be recommended for use in all orthodontic patients as a substitute for a conventional set of radiographs.

In a prospective study, Alqerban et al. (2013) compared the impact of using two-dimensional (2D) panoramic radiographs and three-dimensional (3D) cone beam CT for the surgical treatment planning of impacted maxillary canines. The study included of 32 subjects (19 females, 13 males) with a mean age of 25 years, referred for surgical intervention of 39 maxillary impacted canines. Initial 2D panoramic radiography was available, and 3D cone beam CT imaging was obtained upon clinical indication. Both 2D and 3D pre-operative radiographic diagnostic sets were subsequently analyzed by six observers. Perioperative evaluations were conducted by the treating surgeon. McNemar tests, hierarchical logistic regression and linear mixed models were used to explore the differences in evaluations between imaging modalities. Significantly higher confidence levels were observed for 3D image-based treatment plans than for 2D image-based plans. The evaluations of canine crown position, contact relationship and lateral incisor root resorption were significantly different between the 2D and 3D images. By contrast, pre- and perioperative evaluations were not significantly different between the two image modalities. The authors concluded that surgical treatment planning of impacted maxillary canines was not significantly different between panoramic and cone beam CT images.

Van Vlijmen et al. (2012) conducted a systematic review of (CBCT) applications in orthodontics and evaluated the level of evidence to determine whether the use of CBCT is justified in orthodontics. The authors identified 550 articles, and 50 met the inclusion criteria. The authors found no high-quality evidence regarding the benefits of CBCT use in orthodontics. Limited evidence shows that CBCT offers better diagnostic potential, leads to better treatment planning or results in better treatment outcome than do conventional imaging modalities. Only the results of studies on airway diagnostics provided sound scientific data suggesting that CBCT use has added value. The additional radiation exposure should be weighed against possible benefits of CBCT, which have not been supported in the literature. The authors suggested that future studies should evaluate the effects of CBCT on treatment procedures, progression and outcome quantitatively.

Rossini et al. (2012) analyzed the literature focused on cone- beam computed tomography (CBCT) diagnostic accuracy and efficacy in detecting impacted maxillary canines and evaluated the possible advantages in using CBCT technique compared with traditional radiographs. The literature search yielded 94 titles, of which 5 were included in the review. Three studies used CBCT technique to 3D localize maxillary impacted canines and assess root resorption of adjacent teeth. The other two publications compared traditional radiographs with CBCT images in the diagnosis of maxillary impacted canines. Only three studies presented the results using statistical analysis. The authors concluded that CBCT has a potential diagnostic effect and may influence the outcome of treatment when compared with traditional panoramic radiography for the assessment of impacted maxillary canines. According to the authors, there is a need of future studies performed according with high level methodological standards, investigating diagnostic accuracy and effectiveness of CBCT in the diagnosis of maxillary impacted teeth. The authors stated that the methodological differences among selected studies (i.e., study sample, materials and methods) revealed the lack of studies performed using methodological standards for diagnostic accuracy and effectiveness of CBCT in the diagnosis of maxillary impacted teeth.

Botticelli et al. (2011) evaluated whether there is any difference in the diagnostic information provided by conventional two-dimensional (2D) images or by three-dimensional (3D) cone beam computed tomography (CBCT) in subjects with unerupted maxillary canines. Twenty-seven patients (17 females and 10 males, mean age 11.8 years) undergoing orthodontic treatment with 39 impacted or retained maxillary canines were included. For each canine, two different digital image sets were obtained: (1) A 2D image set including a panoramic radiograph, a lateral cephalogram, and the available periapical radiographs with different projections and (2) A 3D image set obtained with CBCT. Both sets of images were submitted, in a single-blind randomized order, to eight dentists. A questionnaire was used to assess the position of the canine, the presence of root resorption, the difficulty of the case, treatment choice options, and the quality of the images. Data analysis was performed using the McNemar-Bowker test for paired data, Kappa statistics, and paired t-tests. The findings demonstrated a difference in the localization of the impacted canines between the two techniques, which can be explained by factors affecting the conventional 2D radiographs such as distortion, magnification, and superimposition of anatomical structures situated in different planes of space. According to the authors, the increased precision in the localization of the canines and the improved estimation of the space conditions in the arch obtained with CBCT resulted in a difference in diagnosis and treatment planning towards a more clinically orientated approach. The study did not confirm the utility of such findings in improving care and outcome of patients.

Periodontics

Yang et al. (2019) evaluated the performance of cone-beam computed tomography (CBCT) in assessment of periodontal bone loss. If effective, CBCT could potentially be a more comfortable and accurate way to evaluate this disease. One hundred and eighty tooth sites from 13 patients were included. Clinical attachment level (CAL) was measured, CBCT images were then acquired prior to periodontal surgery. The distance between the cemento-enamel junction and alveolar bone crest at the mesio-buccal, mid-buccal, distobuccal, mesio-lingual/palatal, mid-lingual/palatal, and disto-lingual/palatal sites were all measured and comparisons of the measurements were made by three methods. Statistically significant differences were found between CBCT and CAL + 2.04 mm, as well as intra-surgical evaluation. All sites showed differences in CBCT versus intra-surgical measurement and versus CAL + 2.04 comparisons, except the buccal sites. The authors found the results of CBCT do not agree with results of intra-surgical measurement and therefore CBCT should be used with caution and only when necessary, to avoid radiation hazards.

In this systematic review and meta-analysis, Haas et al. (2018) evaluated the diagnostic validity of cone beam computed tomography (CBCT) in measuring periodontal bone defects. Four databases were searched, and the studies were selected by two independent reviewers. The methodology of selected studies was assessed using the 14-item Quality Assessment Tool for Diagnostic Accuracy Studies. Using a selection process in two phases, 16 studies were identified and meta-analysis was performed in seven articles. The results from these meta-analyses showed that no difference between the measurements of CBCT and in situ for alveolar bone loss and demonstrated a concordance of 82.82% between CBCT and in situ for the classification of the degree of furcation involvement. The main limitations identified by the authors were the heterogeneity between the examiners of the studies and the protocols for the acquisition of the 3D images. The authors concluded based on a moderate level of evidence, CBCT could be useful for furcation involvement periodontal cases, but it should only be used in cases where clinical evaluation and conventional radiographic imaging do not provide the information necessary for an adequate diagnosis and proper periodontal treatment planning.

Leonardi et al. (2016) conducted a systematic review and meta-analysis assessed the diagnostic accuracy of conventional radiography and cone-beam computed tomographic (CBCT) imaging on the discrimination of apical periodontitis (AP) from no lesion. A meta-analysis was conducted on 6 of the 9 articles. All the articles studied artificial AP with induced bone defects. Periapical radiographs (digital and conventional) reported good diagnostic accuracy on the discrimination of artificial AP from no lesions, whereas CBCT imaging showed excellent accuracy values.

Walter et al. (2009) investigated the use of cone beam computed tomography (CBCT) in assessing furcation involvement (FI) and concomitant treatment decisions in maxillary molars. Twelve patients with generalized chronic periodontitis were consecutively recruited and CBCT was performed in maxillary molars (n = 22) with clinical FI and increased probing pocket depths. CBCT images were analyzed and FI, root length supported by bone and anatomical features were evaluated. FI and treatment recommendations based on clinical examinations and periapical radiographs were compared with data derived from CBCT images. The estimated degree of FI based on clinical findings was confirmed in 27% of the sites, while 29% were overestimated and 44% revealed an underestimation according to CBCT analyses. Among degree I FI, 25% were underestimated, among degree II and II-III, the underestimation was as high as 75%, while all sites with degree III FI were confirmed in the CBCT. Discrepancies between clinically and CBCT-based therapeutic treatment approaches were found in 59-82% of the teeth, depending on whether the less invasive or the most invasive treatment recommendation was selected for comparison. The authors concluded that CBCT images of maxillary molars may provide detailed information of FI and a reliable basis for treatment decision. There is no evidence from this study that this information will affect patient management.

Grimard et al. (2009) compared the measurements from digital intraoral radiograph (IR) and cone-beam volumetric tomography (CBVT) images to direct surgical measurements for the evaluation of regenerative treatment outcomes. Digital IR and CBVT images were taken prior to initial bone grafting and at the 6-month reentry surgery for 35 intrabony defects. After defect debridement, direct bony defect measurements were made with a periodontal probe. These same measurements were made on the IR and CBVT images and then compared to the direct surgical values. CBVT correlated strongly with surgical measurements, whereas IRs correlated less favorably. IR measurements were significantly less accurate compared to CBVT for all parameters investigated and underestimated surgical measurements from 0.6 +/- 2.3 mm to 1.5 +/- 2.3 mm. No significant difference for the distance from the cemento-enamel junction (CEJ) to the alveolar crest, defect fill, or defect resolution was seen between CBVT and surgical measurements; however, there was a significant difference for the distance from the CEJ to the base of the defect, with CBVT measurements underestimating the surgical measurements by 0.5 +/- 1.1 mm for reentry and 0.9 +/- 0.8 mm for the initial measurement. The authors concluded that compared to direct surgical measurement, CBVT was significantly more precise and accurate than IRs. The study did not confirm the utility of such findings in improving care and outcome of patients.

Clinical Practice Guidelines- Professional Societies

American Association of Endodontists (AAE) and American Academy of Oral and Maxillofacial Radiography (AAOMR)

In 2016, a position statement was prepared by the AAE Special Committee on Cone-Beam-Computed Tomography in conjunction with members of the AAOMR, and makes the following recommendations for the use cone-beam-computed tomography in endodontics:

- Diagnosis
  - Recommendation 1: Intraoral radiographs should be considered the imaging modality of choice in the evaluation of the endodontic patient.
  - Recommendation 2: Limited FOV CBCT should be considered the imaging modality of choice for diagnosis in patients who present with contradictory or nonspecific clinical signs and symptoms associated with untreated or previously endodontically treated teeth.
- Initial Treatment
  - Preoperative
    - Recommendation 3: Limited FOV CBCT should be considered the imaging modality of choice for initial treatment of teeth with the potential for extra canals and suspected complex morphology, such as mandibular anterior teeth, and maxillary and mandibular premolars and molars, and dental anomalies.
  - Intraoperative
    - Recommendation 4: If a preoperative CBCT has not been taken, limited FOV CBCT should be considered as the imaging modality of choice for intra-appointment identification and localization of calcified canals.
- Non-Surgical Retreatment
  - Recommendation 6: Limited FOV CBCT should be considered the imaging modality of choice if clinical examination and 2-D intraoral radiography are inconclusive in the detection of vertical root fracture.
  - Recommendation 7: Limited FOV CBCT should be the imaging modality of choice when evaluating the nonhealing of previous endodontic treatment to help determine the need for further treatment, such as non-surgical, surgical or extraction.
  - Recommendation 8: Limited FOV CBCT should be the imaging modality of choice for non-surgical retreatment to assess endodontic treatment complications, such as overextended root canal obturation material, separated endodontic instruments, and localization of perforations.
- Surgical Retreatment
  - Recommendation 9: Limited FOV CBCT should be considered as the imaging modality of choice for presurgical treatment planning to localize root apex/apices and to evaluate the proximity to adjacent anatomical structures.
- Special Conditions
  - Implant Placement
    - Recommendation 10: Limited FOV CBCT should be considered as the imaging modality of choice for surgical placement of implants.
  - Traumatic Injuries

        - Recommendation 11: Limited FOV CBCT should be considered the imaging modality of choice for diagnosis and management of limited dento-alveolar trauma, root fractures, luxation, and/or displacement of teeth and localized alveolar fractures, in the absence of other maxillofacial or soft tissue injury that may require other advanced imaging modalities.
    - Resorptive Defects
        - Recommendation 12: Limited FOV CBCT is the imaging modality of choice in the localization and differentiation of external and internal resorptive defects and the determination of appropriate treatment and prognosis.
    - Outcome Assessment
        - Recommendation 13: In the absence of clinical signs or symptoms, intraoral radiographs should be considered the imaging modality of choice for the evaluation of healing following nonsurgical and surgical endodontic treatment.
        - Recommendation 14: In the absence of signs and symptoms, if limited FOV CBCT was the imaging modality of choice at the time of evaluation and treatment, it may be the modality of choice for follow-up evaluation. In the presence of signs and symptoms, refer to Recommendation #7.

American Academy of Periodontology (AAP)

In a 2017 best evidence review, the AAP states that cone beam computed tomography continues to be considered an advanced point-of-care imaging modality and should be used selectively as an adjunct to two-dimensional dental radiography. As with other ionizing radiation imaging modalities, CBCT imaging should be used only when the potential benefits to the patient outweigh the risks. Dental health care professionals should consider CBCT imaging only when they expect the diagnostic information yielded will lead to better patient care, enhanced patient safety, and ultimately facilitate a more predictable, optimal treatment outcome (Rios et al.; 2017).

American Academy of Oral and Maxillofacial Radiology (AAOMR)

A position statement developed by consensus agreement by a panel convened by the AAOMR summarized the potential benefits and risks of maxillofacial cone beam computed tomography (CBCT) use in orthodontic diagnosis, treatment and outcomes. The panel reviewed literature on the clinical efficacy of and radiation dose concepts associated with CBCT in all aspects of orthodontic practice and concluded that the use of CBCT in orthodontic treatment should be justified on an individual basis, based on clinical presentation. Despite the number of publications on the use of CBCT for specific orthodontic applications, most are observational studies of diagnostic performance and efficacy with wide ranging methodological soundness. According to the panel, few authors have presented higher levels of evidence and measured the impact of CBCT on orthodontic diagnosis and treatment planning decisions (AAOMR, 2013).

A Position Paper Subcommittee of the AAOMR reviewed the literature on selection criteria for radiology in dental implantology (Tyndall, 2012). All current planar modalities, including intraoral, panoramic, and cephalometric, as well as cone beam computed tomography (CBCT) are discussed, along with radiation dosimetry and anatomy considerations. The AAOMR made the following recommendations:

- Do not use cross-sectional imaging, including CBCT, as an initial diagnostic imaging examination.
- CBCT should be considered as the imaging modality of choice for preoperative cross-sectional imaging of potential implant sites.
- CBCT should be considered when clinical conditions indicate a need for augmentation procedures or site development before placement of dental implants: (1) sinus augmentation, (2) block or particulate bone grafting, (3) ramus or symphysis grafting, (4) assessment of impacted teeth in the field of interest, and (5) evaluation of prior traumatic injury.
- CBCT imaging should be considered if bone reconstruction and augmentation procedures (e.g., ridge preservation or bone grafting) have been performed to treat bone volume deficiencies before implant placement.
- Use cross-sectional imaging (particularly CBCT) immediately postoperatively only if the patient presents with implant mobility or altered sensation, especially if the fixture is in the posterior mandible.
- Do not use CBCT imaging for periodic review of clinically asymptomatic implants.
- Cross-sectional imaging, optimally CBCT, should be considered if implant retrieval is anticipated.

American College of Prosthodontists (ACP)

A 2019 ACP position statement makes the following recommendations based on current literature and existing guidelines on the role of diagnostic imaging:

- Conventional panoramic and/or intraoral periapical imaging is recommended for initial diagnostic evaluation. CBCT is not recommended for routine initial examination.

- Cross-sectional imaging (CBCT is preferable over CT due to its significantly lower radiation dose) is recommended for preoperative implant assessment.
- The rationale for CBCT imaging must be justified based on clinical evaluation.
- CBCT imaging should be used for the esthetic zone, pre- and post-bone grafting, sinus augmentation, pterygoid plate, and zygomatic implants.
- The region of interest (ROI) should be imaged using a field of view (FOV) no larger than necessary.
- CBCT is recommended to be used for the evaluation of postoperative complications such as postoperative neurosensory impairment, acute rhino-sinusitis, and implant mobility.

American Dental Association Council on Scientific Affairs (ADACSA)

In an advisory statement for the use of cone-beam computed tomography (CBCT) in dentistry, the ADACSA recommends that no radiographic examinations, including CBCT, should be performed for screening purposes and that CBCT should only be considered as an adjunct to standard oral imaging modalities. The ADACSA states that the clinician should prescribe traditional dental radiographs and CBCT scans only when he or she expects that the diagnostic yield will benefit patient care, enhance patient safety, and significantly improve clinical outcomes or all of these. The ADACSA also states that CBCT should be considered as an adjunct to standard oral imaging modalities and may supplement or replace conventional (two-dimensional or panoramic) dental radiography for the diagnosis, monitoring and treatment of oral disease or the management of oral conditions when, in the clinician's decision-making process, he or she determines that oral anatomical structures of interest may not be captured adequately by means of conventional radiography (ADACSA, 2012).

U.S. Food and Drug Administration (FDA)

This section is to be used for informational purposes only. FDA approval alone is not a basis for coverage.

Devices used for computed tomography are classified under the following product codes:
- JAK (system, X-ray tomography, computed)
- MUH (system, X-ray, extraoral source, digital)
- OAS (X-ray, tomography, computed, dental)

There are many 510(k) approvals for these codes, not all of which are for cone-beam computed tomography devices or for devices used for craniofacial imaging. For information on a specific device or manufacturer, search the Center for Devices and Radiological Health (CDRH) 510(k) database by product and/or manufacturer name then check for the appropriate indication in the Summary section of the results: http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfPMN/pmn.cfm.
(Accessed February 22, 2023)

In a document for radiation-emitting products: dental cone-beam computed tomography, the FDA states that dental CBCT should be performed only when necessary to provide clinical information that cannot be provided using other imaging modalities. Refer to the following for more information:
http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm315011.htm.
(Accessed February 22, 2023)

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Policy History/Revision Information

Date	Summary of Changes
12/01/2023	New dental policy

Instructions for Use

This Dental Policy provides assistance in interpreting the UnitedHealthcare Community Plan of Ohio dental benefit plans. When deciding coverage, the member specific benefit plan document must be referenced as the terms of the member specific benefit plans may differ. In the event of a conflict, the member specific benefit plan document governs. Before using this policy, please check the member specific benefit plan document and any applicable federal or state mandates. UnitedHealthcare reserves the right to modify its Policies and Guidelines as necessary. This Dental Policy is provided for informational purposes. It does not constitute the practice of medicine or medical advice.

Archived Policy Versions

Effective Date	Guideline Number	Guideline Title
N/A	N/A	N/A