# Cone Beam Computed Tomography

**Policy Number**: DCP044.08
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Instructions for Use

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| Related Dental Policies |
|---|
| None |

## Coverage Rationale

**Cone beam computed tomography (CBCT) is proven and medically necessary as adjunctive advanced imaging for clinical conditions when additional detail is needed to effectively render treatment.**

**Cone beam computed tomography (CBCT) is unproven and not medically necessary for routine dental diagnosis due to insufficient evidence of superiority to standard radiographs.**

**Note**: Requests for CBCT will be evaluated using the Clinical Practice Guidelines below.

## 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 |

| CDT Code | Description |
|---|---|
| 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 |



# 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. This 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 to view the region of interest and using low dose protocols when appropriate.

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 5, 2025)

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 5, 2025)

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

Chugal et al. (2024) conducted a review of patient data to examine the impact of applying the evidence-based AAE/AAOMR CBCT guidelines in endodontic diagnosis and treatment decisions in patients referred to a post graduate endodontic clinic during a consecutive 36-month period. Each case was examined for the ability of standard diagnostic modalities and when periapical diagnosis and provisional treatment plan could not be determined, CBCT imaging was requested. A total of 442 CBCT scans were prescribed to evaluate 526 teeth of which over 50% were molars. Less than 1% of scans were prescribed for outcome assessment. The results showed for periapical disease diagnosis, CBCT imaging resulted in a change in 21% of teeth, and for treatment decisions, imaging led to changes in approximately 62%. The authors concluded that these results validate appropriateness of the AAE/AAOMR guidelines and offer benefits in appropriately selected patients.

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.

## 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

In a 2024 randomized clinical study, Hung et al. compared low-dose CBCT to standard dose for visualizing the mandibular canal (MC) and its proximity to mandibular third molars (M3Ms), and the impact on clinical decisions. One hundred and fifty-four M3Ms from 90 patients were randomly assigned to three groups to receive 2 CBCT scans: one using standard dose (333 mGy×cm2), and one of three low dose protocols (78-131 mGy×cm2). Images were assessed blindly by general dentists and oral maxillofacial surgeons. The results showed that there were significant differences between standard and low dose scans only in regard to MC visibility, but not M3M/MC proximity affecting surgical approach or referral decisions. It was concluded that low dose protocols for CBCT scans could be a viable option to lower radiation exposure without compromising anatomy visibility.

Mubarek et al. (2024) conducted a systematic review to determine whether CBCT and panoramic radiography (PR) show consistency in showing the degree of third molar impaction based on the current classification definitions for treatment planning (Winter and Pell & Gregory). Four studies met the inclusion criteria, and the results showed that when assessing tooth angulation, the differences for assessing degree of impaction were not significant, but that CBCT has greater accuracy in evaluating root morphology. Furthermore, PR often underestimates the available space to accommodate third molar eruption, as well as mandibular ramus impactions. For these scenarios, CBCT is advantageous. The authors concluded that the differences in agreement show a need for more research on impaction visualization.

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.

## Clinical Practice Guidelines

### *American Dental Association (ADA)/American Academy of Oral and Maxillofacial Radiology (AAOMR)*

In 2026, the American Dental Association Council on Scientific Affairs convened an expert panel (6 members along with an expert consultant group of 18 members) to conduct a systematic review of the literature and develop evidence-based guidance on dental imaging (Benavides et al., 2026). As there was limited evidence available, the following consensus recommendations rather than formal guidelines were developed:

- **Imaging Recommendations for Caries Indications**
  - CBCT is not indicated for caries detection.
- **Imaging Recommendations for Periodontal Disease**
  - For evaluating periodontal structures after comprehensive clinical examination, 2D full-mouth radiographic series, including vertical bite-wing radiographs as necessary, is recommended.
  - Management of periodontal disease, in general, does not warrant use of CBCT, although CBCT may be indicated for treatment planning of complex cases.
  - For patients with history of, or with active, periodontal disease, vertical bite-wing radiographs are recommended to assess bone levels in the permanent dentition.
- **Imaging Recommendations for Orthodontic Indications**
  - For assessing facial asymmetry, low-dose CBCT is recommended. When low-dose CBCT is not available, posteroanterior cephalometric radiograph may be used.
  - For interradicular mini-implants, CBCT can aid in optimal site selection and has been found to improve the mini-implant success rate compared with 2D radiographs alone. However, the benefits of CBCT should be weighed against the increased radiation dose on a case-by-case basis.
- **Imaging Recommendations for Third Molars, Supernumerary Teeth, and Supplemental Teeth**
  - Routine radiographic screening for third molars, supernumerary teeth, and supplemental teeth without a clinical indication is not recommended.
  - CBCT should only be used if radiographic findings affect risk assessment or treatment decisions (e.g., an increased risk of developing an inferior alveolar nerve injury, darkening of the roots, loss of the cortical outline of the canal, or diversion of the canal).
- **Imaging Recommendations for Head and Neck Lesions**
  - The oral and maxillofacial pathology, oral medicine, and orofacial pain disciplines use various imaging modalities, depending on clinical parameters, such as manifestation, history, symptomatology, examination findings, laboratory or test results, and therapeutics as relevant to each case. Such imaging modalities include, but are not limited to, 2D radiography, CBCT, MDCT, positron emission tomography, MRI, magnetic resonance angiography, and ultrasonography, all of which must be determined using a benefit-to-risk decision-making process.
- **Imaging Recommendations for TMD and Orofacial Pain**
  - CBCT is the preferred imaging modality to assess bony components of the TMJ, such as degenerative joint disease, idiopathic condylar resorption, systemic arthritides, or developmental anomalies.
  - When there is a suspected condylar fracture or trauma to the TMJ region, MDCT or CBCT is preferred to characterize fracture location, displacement, and associated hard-tissue injury, such as ankyloses.
- **Imaging Recommendations for Dental Implants**
  - Initial assessment before dental implants, panoramic radiography may be performed. However, for presurgical planning and placement of dental implants, CBCT is recommended.
- **Applications of CBCT in Implant Therapy**
  - When results of clinical examination indicate bone grafting or reconstruction will be needed, 3-dimensional assessment of the implant site is recommended.
  - The relation of relevant anatomic structures to the implant site should be assessed using CBCT.
  - Dimensional assessment of bone volume of the edentulous sites receiving dental implants is recommended.
  - The maxillary sinus and alveolar ridge before augmentation procedure should be assessed with CBCT.
  - The autogenous bone donor site should be evaluated with CBCT.
  - Fabrication of surgical guides that are static or those used during dynamic navigation implant placement necessitates the need for CBCT.
  - Implant sites that have been augmented previously should be assessed using CBCT.
  - CBCT should be used to assess complications in implants placed previously.

- **Restoration**
  - At the time of restoration delivery, 2D intraoral radiographs (e.g., bite-wing) perpendicular to the implant should be obtained to provide baseline peri-implant bone level information for long-term follow-up.
- **Maintenance**
  - Periodic 2D intraoral radiographic evaluation of implants should be performed as an adjunct to recall visit or maintenance examinations on the basis of the clinical judgment of the dental care professional.
  - To assess peri-implant bone, 2D intraoral radiography is the imaging modality of choice.
  - To assess complications likely due to improper anatomic location of the implant, CBCT is the imaging modality of choice.
- **Applications of CBCT in Autotransplantation**
  - To assess the integrity of the donor tooth and the recipient site, CBCT is recommended.
  - For the fabrication of the replica donor tooth to be used for try-in, CBCT is recommended.
  - Survival of the autotransplanted tooth should be assessed using 2D imaging.
- **Pediatric Recommendations**
  - General Recommendations for Pediatric Dentistry:
    - Children and young adults are more susceptible to the effects of radiation, so radiographs should be ordered judiciously.
    - The evidence does not support CBCT for caries detection.
    - When 2-dimensional imaging does not provide adequate information, such as during suspected pathosis, trauma, or localization of impacted teeth, CBCT may be considered.
    - The patient's ability to follow instructions and hold still should be considered when ordering radiographs, especially for longer exposure time modalities, like panoramic radiography or CBCT.
- **Endodontic Recommendations**
  - CBCT should be considered if the additional information is likely to aid in diagnosis and treatment planning or enhance clinical management, particularly when 2D radiography is inconclusive. CBCT should be considered in the following clinical scenarios:
    - Clinical signs and symptoms and other diagnostic imaging are inconclusive.
    - Teeth with a history of traumatic dental injuries.
    - Suspicion of horizontal or longitudinal cracks or fractures.
    - Suspicion or evidence of root resorptive defects, including cervical, inflammatory, replacement, or internal root resorption.
    - Suspicion of maxillary sinusitis of endodontic origin.
    - Suspicion or evidence of nonendodontic pathoses that mimics endodontic disease.
    - Planning root canal treatment on teeth with suspected additional canals that are obscured because of overlapping on 2D images.
    - Management of teeth with secondary, persistent, or recurrent endodontic disease.
    - Presence of congenital dental anomalies, such as dens in dente or palatal groove defect.
    - Procedural mishaps, when enhanced imaging would facilitate management.
    - Midtreatment in calcified cases when root canals cannot be located with conventional methods.
    - Preoperative planning in surgical endodontic cases or in surgical or nonsurgical cases when guided technologies will be used.
    - Inability to obtain intraoral radiographs, such as in cases of trismus, severe trauma, or for patients with disabilities.
    - In cases of uncertainty, for definitive endodontic posttreatment evaluation, especially after surgical endodontic treatment.

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

In a 2025 update to the 2015 joint position statement, the AAE and AAOMR states that the use of CBCT imaging should be guided by a case-by-case assessment, considering the risks and benefits of ionizing radiation, the patient's medical and dental history, clinical findings, and any existing radiographs. Dental practitioners must exercise independent judgment to ensure that CBCT is applied judiciously, optimizing patient care while adhering to the principles of responsible imaging. They make the following recommendations for **limited field of view** CBCT:

- **Diagnosis and Preoperative Treatment**
  - The preferred imaging modality for preoperative diagnosis in patients who present with contradictory or nonspecific clinical symptoms and/or radiographic signs associated with untreated or previously endodontically treated teeth. Bitewings and/or periapical radiographs may be utilized to complement CBCT imaging when there are limitations in caries detection and/or extent due to image artifact. Preoperative radiographs are an essential part of the diagnostic phase of endodontic therapy.

- **Intraoperative Treatment**
  - The preferred imaging modality for intraoperative identification and localization of calcified canals and management of iatrogenic errors.
- **Postoperative Treatment**
  - Intraoral radiographs should be the preferred imaging modality for immediate postoperative imaging. However, in cases with complications, a limited FOV CBCT is considered the preferred imaging modality.
- **Nonsurgical Retreatment**
  - The preferred imaging modality if clinical examination and 2D intraoral radiography are inconclusive in the detection of vertical root fracture.
  - The preferred imaging modality when evaluating the nonhealing of previous endodontic treatment to help determine the need for further treatment, such as nonsurgical, surgical, or extraction.
  - The preferred imaging modality for nonsurgical retreatment to assess endodontic treatment complications, such as overextended root canal obturation material, separated endodontic instruments, and localization of perforations.
- **Surgical Retreatment**
  - The preferred imaging modality for presurgical treatment planning to localize the root apex/apices and evaluate the proximity of adjacent anatomical structures.
- **Implant Placement**
  - The preferred imaging modality for surgical placement of implants.
- **Traumatic Injuries**
  - The preferred imaging modality for diagnosis and management of localized dento-alveolar trauma, root fractures, luxation, and/or displacement of teeth in the absence of other extensive maxillofacial or soft tissue injuries that may require other appropriate advanced imaging modalities.
- **Resorptive Defects**
  - The preferred imaging modality for the localization and differentiation of external and internal resorptive defects and the determination of appropriate treatment and prognosis.
- **Outcome Assessment**
  - In the absence of clinical signs or symptoms, intraoral radiographs should be the preferred imaging modality for the evaluation of healing following nonsurgical and surgical endodontic treatment.
  - In the absence of clinical signs and symptoms, limited FOV CBCT may be the most appropriate modality for follow-up evaluation if it was indicated for the initial evaluation. In the presence of signs and symptoms, limited FOV CBCT should be the preferred imaging modality when evaluating the nonhealing of previous endodontic treatment.

## *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 rhinosinusitis, and implant mobility.

### *American Dental Association Council on Scientific Affairs (ADACSA)*

In a 2024 update to the advisory statement in 2012 (previously included in this policy), the American Dental Association Council on Scientific Affairs (Benavides et al.) makes the following best practice recommendations that should be followed by oral health care providers to optimize radiation safety in dentistry for adults and pediatric patients:

- Providers must have familiarity with and adhere to all state, local, and federal laws.
- Before conducting any type of radiographic examination, clinicians should complete a comprehensive clinical examination and patient assessment.
- CBCT imaging must not be used routinely.
- CBCT examinations must not be used as the primary or initial imaging modality.
    - Use the smallest field of view necessary for imaging the specific anatomical area of interest consistent with the diagnostic and treatment planning needs.
    - CBCT must be conducted using techniques and imaging protocols that are optimized to produce diagnostically acceptable images with the lowest radiation dose to the patient.
- Radiographs, including CBCT, should be ordered based on diagnostic and treatment planning needs, and dentists should attempt to obtain radiographs from previous providers.
    - Clinicians must prescribe dental radiographs, including CBCT, only when they expect that the diagnostic yield will benefit patient care, enhance patient safety, or substantially improve clinical outcomes.
- The imaging equipment must be configured to optimize imaging and dosimetric performance specific to the size and age of the patient.

## 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 5, 2026)

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 5, 2026)

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# Policy History/Revision Information

| Date | Summary of Changes |
|---|---|
| 06/01/2026 | **Coverage Rationale**<br>• Replaced language stating:<br>  ○ "Cone beam computed tomography (CBCT) is proven and medically necessary as adjunctive advanced imaging for *complex* clinical conditions when additional detail is needed to *safely* render treatment" with "CBCT is proven and medically necessary as adjunctive advanced imaging for clinical conditions when additional detail is needed to *effectively* render treatment"<br>  ○ "CBCT is unproven and not medically necessary for routine dental diagnosis *and/or treatment planning* due to insufficient evidence of *efficacy and/or safety*" with "CBCT is unproven and not medically necessary for routine dental diagnosis due to insufficient evidence of *superiority to standard radiographs*" |

| Date | Summary of Changes |
|---|---|
| | • Added notation stating requests for CBCT will be evaluated using the Clinical Practice Guidelines listed in the *Clinical Evidence* section of the policy<br>**Supporting Information**<br>• Updated *Clinical Evidence* and *References* sections to reflect the most current information<br>• Archived previous policy version DCP044.07 |

# Instructions for Use

This Dental Clinical Policy provides assistance in interpreting UnitedHealthcare standard and Medicare Advantage dental benefit plans. When deciding coverage, the member specific benefit plan document must be referenced as the terms of the member specific benefit plan may differ from the standard dental plan. In the event of a conflict, the member specific benefit plan document governs. Before using this policy, 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 Clinical Policy is provided for informational purposes. It does not constitute medical advice.