

# Multidetector Row Computed Tomography in Maxillofacial Imaging



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## KEYWORDS

- Multidetector row CT • Maxillofacial • Imaging • Dual-energy CT • Perfusion CT
- Texture analysis

## KEY POINTS

- Multidetector row CT (MDCT) is useful for the diagnosis of odontogenic and nonodontogenic cysts and tumors, fibro-osseous lesions, inflammation, malignancy, metastatic lesions, developmental abnormalities, and maxillofacial trauma.
- Perfusion MDCT aids in lesion characterization, staging, and tumor prognosis based on vascularity and also helps in monitoring the response of various treatment regimens.
- Dual-energy CT imaging allows for material differentiation and characterization by creating monochromatic energy images and can minimize metal artifacts.
- CT texture analysis is a postprocessing technique that can provide a quantitative means of extracting image features that are useful for comparative analyses.

CT has proved an invaluable diagnostic imaging modality for many maxillofacial clinical applications. Since its introduction in 1972, several improvements have occurred as decreased acquisition time and enhanced image quality.<sup>1,2</sup> Shorter acquisition time reduces motion artifacts caused by breathing, swallowing and patient movements. In the mid-1990s, the introduction of multidetector row CT (MDCT) led to submillimeter spatial

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Disclosure Statement: None (A. Gohel, M. Oda and A.S. Katkar); Consultant, Boston Imaging Core Lab, LLC (unrelated to this article) (O. Sakai).

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Dent Clin N Am 62 (2018) 453–465

<https://doi.org/10.1016/j.cden.2018.03.005>

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resolution scans. MDCT has transformed CT from transaxial cross-sectional imaging into a truly 3-D imaging. The images are obtained at a high resolution and thinner sections as volume data, leading to multiplanar reformation and near isotropic images at a high acquisition rate.<sup>3-5</sup> One of the other major advantages of MDCT over single-detector row CT is the increase in efficiency and flexibility of the use of contrast medium.<sup>4</sup>

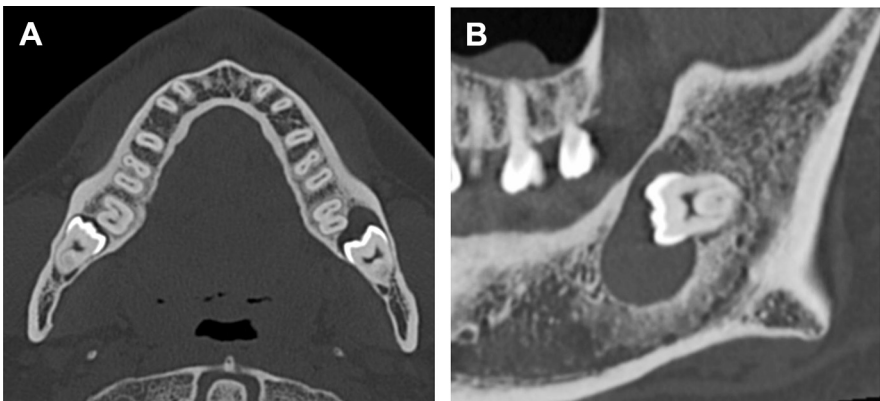
Nonenhanced MDCT scan can delineate bony, soft tissue, and air space abnormalities as well as calcifications. Contrast-enhanced scans may be added to demonstrate vascular lesions or abnormal vascular permeability in inflammatory or neoplastic neovascularity.<sup>4</sup> The contrast agent can be used more efficiently in an MDCT scan. Compared with 120 mL of the standard contrast (300 mg iodine/mL), a 90 mL of higher concentration contrast (400 mg iodine/mL) may produce better contrast enhancement in tumors and increase contrast between normal soft tissue and the tumor. The shorter image acquisition time enables image acquisition at a high spatial resolution at multiple and exactly defined phases of contrast enhancement.<sup>4,6</sup>

In the maxillofacial region, MDCT offers superior soft tissue characterization compared with cone-beam CT images and is useful for the diagnosis of odontogenic and nonodontogenic cysts and tumors, fibro-osseous lesions, inflammation, malignancy, metastatic lesions, developmental abnormalities, and maxillofacial trauma.<sup>4,7,8</sup>

#### MULTIDETECTOR ROW CT IN THE DIAGNOSIS OF BENIGN ODONTOGENIC AND NONODONTOGENIC LESIONS

MDCT scans can demonstrate the extent of the lesions, expansion in all 3 planes and the boundary of these benign lesions. The expansile lesion as well as water-density within a cyst with no extraosseous lesion is noted in a dentigerous cyst (**Fig. 1**). Low-density cystic areas with few isodensity regions representing soft tissue in a CT image is seen in an ameloblastoma (**Fig. 2**). The aggressiveness of the lesion can be appreciated by erosion of the cortical plate or tooth root. Contrast-enhanced CT depicts the enhanced soft tissue within the lesion.<sup>9</sup>

Odontogenic myxoma is also an aggressive multilocular expansile lesion. The straight septa, a distinctive finding, can be seen in CT images (**Fig. 3**). Odontogenic keratocysts are unilocular or multilocular lesions most commonly located in the



**Fig. 1.** Dentigerous cyst in a 32-year-old man. Axial (A) and sagittal (B) CT images show a unilocular lucent lesion associated with the crown of the left mandibular third molar. There is no aggressive expansile change or destruction of the buccal or lingual cortex adjacent to the lesion. Note the sclerosis of surrounding bone indicative of an inflammatory response.

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