

Utility of 3DX Multi-Image Micro CT[®] in Endodontics

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Abstract: Radiography by computed tomography for dental and jaw use (dental CT) has recently attracted attention as a new diagnostic imaging technique in dentistry. The 3DX Multi-Image Micro CT[®] (3DX, Morita) is the first exclusively registered dental CT in Japan. A high-definition 3-dimensional image of a cylindrical imaging area, 40 mm in diameter and 30 mm in height, can be taken by using a small-type conical beam X-ray CT. An arbitrary part can be sliced and observed from 3 different directions by using a 3DX-exclusive integrated image processing software, and it can be re-sliced repeatedly at arbitrary angles to reconstruct other images. Pictures of 3DX can be taken by a low dose of irradiation equal to that used for panoramic radiography. Therefore, this device is very effective for the examination and diagnosis of hard tissues of the maxillofacial region.

This study evaluated the effectiveness of the 3DX for examining and diagnosing various clinical cases in endodontic therapy.

The image obtained by 3DX clearly revealed the presence and expansion of periapical lesions of roots, the presence and position of root fracture, and perforations, as well as afforded prognosis.

In conclusion, the 3DX, a newly developed dental CT, is very useful to examine cases of the above-mentioned disorders that can not be easily identified by the usual intraoral radiography or panoramic radiography, and it thus allows proper diagnosis of such cases.

Key word: Dental Computed Tomography, Diagnostic Imaging, Perforation

Introduction

In endodontic therapy, the quality and quantity of the information obtained from radiographic examinations is very important because it affects the diagnosis, treatment planning, and prognostic stability. Sometimes in daily clinical practice, there are some cases where the conventional intraoral radiography or panoramic radiography alone does not provide enough information for diagnosis. Computed tomography (CT) can provide detailed 3-dimensional observation and thus is useful in the diagnosis of endodontic problems requiring therapy.

However, the radiation dose of a single CT session is much higher than that used for intraoral radiography or panoramic radiography. Recently, the 3DX Multi-Image Micro CT[®] (3DX) (J. Morita Mfg. Co., Kyoto, Japan), a new X ray photography apparatus that can provide very suitable images and was first produced in Japan, has attracted much attention. A high-resolution 3-dimensional image of a cylindrical imaging area, 40 mm in diameter and 30 mm in height, can be taken. An image can be sliced in an optional part. By using 3DX-exclusive integrated image-processing software (i-VIEW[®]), the device can produce an image from 3 different directions and re-slice the image repeatedly at arbitrary angles.

Since the 3DX was just recently introduced, there are few reports about its usefulness in endodontic therapy. In the present study, therefore, we evaluated the effectiveness of the 3DX for examining and diagnosing various clinical cases in endodontic therapy.

Case Report

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The image obtained by 3DX clearly revealed the presence and expansion of periapical lesions of roots (Fig. 1), the presence and position of root fractures (Fig. 2), perforation (Fig. 3), and instrument separation (Fig. 4), as well as afforded prognosis (Fig. 5).

Discussion

The 3DX is especially excellent in generating an informative image database at a low irradiation dose, which is equivalent to that of about 2 exposures by intraoral radiography, that of about the same by panoramic radiography, and that of about 1/100 -1/30 by the medical X-ray CT in as little as 17 seconds of exposure time. Also, this dental CT has about 8 times higher resolution than the medical CT. Therefore, this device is thought to be useful for the examination and diagnosis of hard tissues of the maxillofacial region, including teeth, alveolar bone, and the jaws.

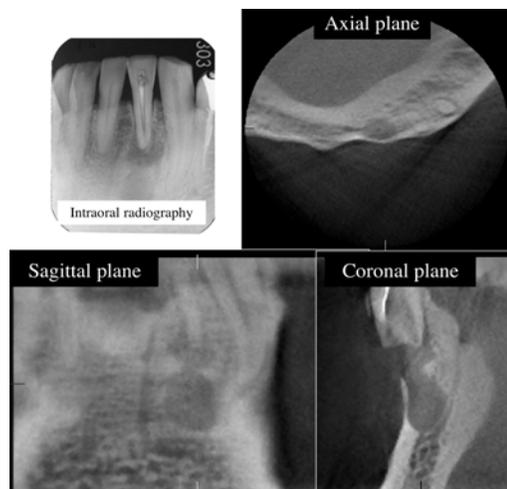


Fig.1 3DX-CT image of a periapical lesion

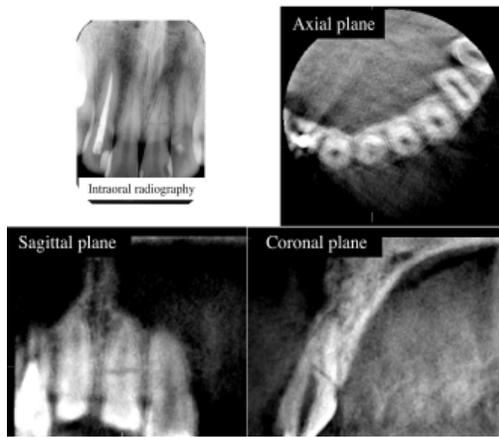


Fig. 2: 3DX-CT image of a root fracture



Fig. 3: 3DX-CT image of a perforation

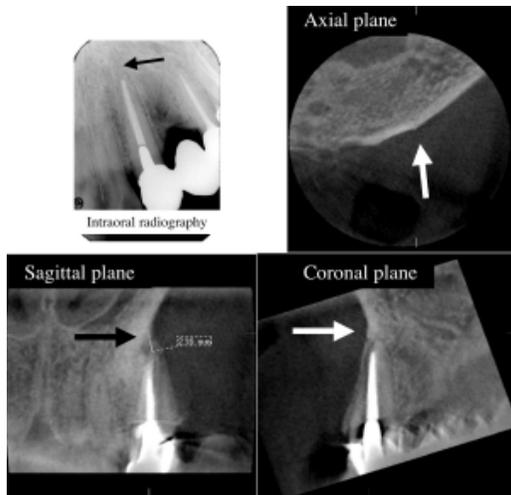


Fig. 4: 3DX-CT image of a protruding instrument separation)

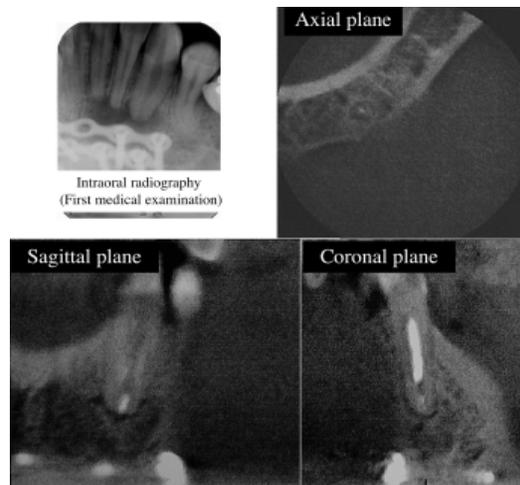


Fig. 5: 3DX-CT image used for prognosis of a periapical lesion (Taken 2 years and 6 months after first medical examination by intraoral radiography.)