Evaluation of Inflammatory Diseases of Jaw Bones with Three-dimensional CT Imaging:

Comparison with Conventional Radiography and High-resolution CT

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The diagnostic value of three-dimensional (3-D) CT imaging in various inflammatory conditions of the jaw bones was assessed in 6 patients and was compared together with high-resolution CT imaging and conventional radiographs. Though 3-D CT imaging provides no new information when viewing a series of axial high-resolution CT, 3-D CT could provide the enhanced perception of the changes of the bone surface topographically. With 3-D CT the defects on the bone surface and the spread of periosteal new bone formation were easier to interpret and more accessible, these could be overlooked even by high-resolution CT. 3-D CT images were variable up to the conditions of the threshold selection for 3-D reconstruction. Therefore, it was thought that it is very important to interpret the high-resolution CT used properly before the reconstruction procedure of 3-D CT imaging.

3-D reconstruction is especially valuable for the examination of complex anatomical structures. Therefore, one of the most prevalent applications of this advanced CT method is in the field of various diseases of the maxillo-facial region14. Clinical and roentgenological aspects of inflammatory diseases of the jaw bones show considerably varied manifestations and it is not always possible to assess the exact range of the invasion and the infiltration of the lesions by conventional roentgenological techniques. The purpose of this paper is to evaluate inflammatory diseases of the jaw bones with
3-D CT imaging compared with high-resolution CT (HRCT) and conventional radiography.

Materials and Methods

The material used in this study was taken from six patients with various inflammatory diseases of the jaw bones (one case with an acute alveolar abscess of the maxilla and five cases with chronic osteomyelitis of the mandible) at the Okayama University Dental School Hospital. Their medical records were reviewed, together with 3-D CT imaging, HRCT and the results of the conventional radiographic findings, and the diagnostic value of these images was compared.

All patients were examined with a fourth-generation instrument (Toshiba TCT-900S Scanner) with exposure factors of 120 kVp, 100 mA, and a 2 sec exposure time. Slices were obtained at 2 mm or 5 mm thickness and 2 mm or 5 mm spacing using a bone algorithm. A 512×512 reconstruction matrix was used. A threshold value is used to generate surface contours from a sequence of CT image. This CT scanner has very fast 3-D image reconstructions software and the time required to reconstruct ordinal 3-D images is a few minutes. The 3-D CT image can be rotated in space and dissected by on-screen manipulation.

Case Reports

Case 1

A 56-year-old woman came to the Out-Patient clinic of the Dental Hospital with a chief complaint of pain and swelling of the right side of the face. The dental radiograph showed a diffuse radiolucent area at the periapex region of the maxillary right cuspid (Fig.1.A). But exact bone changes were not recognized by the dental and panoramic views. HRCT of this patient showed the discontinuity and localized destruction of the cortical bone of the right maxilla which was not recognized by the conventional radiography (Fig.1.B). Abscess formation was also recognized on the surface of the cortex near the lateral side of the right nasal cavity. The 3-D CT image showed an uneven irregular surface of the cortical bone just under the area of abscess formation (Fig.1.C). Clinical diagnosis was perimaxillar inflammation caused by acute alveolar abscess of the maxillary right canine.

Case 2

Fig. 1 (Case 1). A: Dental radiograph shows slight diffuse radiolucent area at maxillary right cuspid periapical region (arrow).
B: Axial HRCT shows the localized destruction of the cortical bone (arrow) and abscess formation (arrow head).
C: 3-D CT shows the uneven irregular surface of the cortical bone (arrow).