Chapter 13
Imaging in Periodontology:
2D versus 3D Visualization Techniques

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ABSTRACT

Periodontal disease is the most common oral disorder in the elderly population. Early detection of bony and soft tissue support changes is therefore crucial in relation to the prevention of tooth loss and/or the patient’s general health. Unfortunately, the current diagnostic tools for accurate assessment of this periodontal status have shown several limitations. Most image analysis tools are based on 2D images, while bone remodelling is a 3D process. At present, Cone Beam Computed Tomography (CBCT) has become a powerful diagnostic tool in dentistry. This chapter will bring an overview of 2D and 3D visualization methods of the periodontal tissues and their pathologic manifestations like infrabony craters and furcation involvements. The diagnostic use of 2D radiographic projections, image filtering and subtraction will be compared to the use of 3D cross-sections and the image analysis tools for 3D visualization and/or follow-up of bony changes.

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this cone beam computed tomography (CBCT) will be complemented with more advanced applications where 3D volume rendering and image registration of clinical data may change the face of periodontal diagnosis.

INTRODUCTION TO PERIODONTAL DISEASES

Periodontal disease is the leading cause of tooth loss in the elderly population and shows an increasing incidence with age. It consists of several disorders of the periodontium, including gingivitis and periodontitis, which represent chronic infectious diseases. The presence of certain bacteria initiate plaque and calculus formation supra- and subgingival, affecting the soft tissues surrounding the teeth and causing inflammation. This gingivitis associated with bleeding of the gums, can progress to periodontitis when soft tissue attachment loss and/or supporting bone loss is seen. This results in pocket formation between the teeth and the remaining soft tissues or bone (see Figure 1) and may affect one to all teeth and eventually, when left untreated, lead to tooth loss.

Figure 1. The two main topographic manifestations of alveolar bone loss. (A) Incisor and premolar radiographs revealing an overall horizontal breakdown of bone. The distance from the CEJ (white line) to the actual bony crest (red line) is larger than 1.5mm (the green line should be the healthy bone level) and appears similar for all teeth. (B) The radiograph of the maxillary molars reveals a non-uniform pattern of bone loss. Note that actual bone levels are difficult to assess because of radiographic superposition of the bony structures.