Preoperative evaluation for the dental implanting normally starts with a thorough physical examination of the oral cavity and dental arches to determine the potential sites for the implant placement. Spiral dental CT plays a very important role in preoperative evaluation and postoperative follow up. It provides both 2 and 3-dimensional images, showing soft tissues and alveolar bone in each area, and it can be used to select the sites of implantation and to evaluate the angulations, the density and the contour of the alveolar bone, as well as the width and depth of the edentulous ridge.

Key word: Dental implantation, Spiral dental Computed tomography (CT).

Loss of the natural dentition may have a significant impact on the quality of life. Edentulous or partially edentulous individuals are often limited to have diets of soft-consistency foods, frequently develop facial pain syndromes, and can have problems with their self-image [1]. Furthermore, everyone would like to have healthy and beautiful teeth. However, it appears that the serious caries rate in our nation has prevented reaching this goal. In the last decade, implantation technology has progressed and tooth implantation has become more popular. Precision and reliability are the important factors in determining the success of this operation. What preoperative data do dentists need to know to assure success? Dentists must know the alveolar bone structure and be able to infer the relationship between its position and the tooth’s angular position. In addition, they must study the structure of maxillary sinus, nasal cavity, nasopalatal duct and determine the safe location for implantation. For this reason, the position of inferior alveolar canal and mental foramen must be evaluated prior to lower jaw procedures. Spiral dental CT generates a 3-dimensional view that enables comparison of the jawbone multipolyhedron including axial, paraxial and panoramic views. As it is used in the preoperative evaluation of the head and neck for dental implantation, spiral dental CT constructs an equally-sized 3-dimensional view of the upper and lower jaw. It improves, compared with plain radiography, in the image clarity of the lesion area permitting a more precise assessment. This technology can also be used to position the stent (a device for guiding dental implant into place) in the patient’s mouth more easily.
MATERIALS AND METHODS

From July 1996 to October 2000, twenty patients (age: 20–82 years with a mean of 51 years; 11 males and 9 females) received the spiral dental CT examination. All patients need dental implantations.

CT examinations were performed on a spiral dental CT-Siemens Somatom plus 4A. Software: 3-dimensional process dental CT scanner. The transaxial jaw region tomograms produced a lateral topogram of the skull base. The scanning protocol on axial section was that the thickness of the section, 1 mm; table feed 1.5 mm; pitch, 1.5; rotation time, 1/s; filter kernel, AH 70 and at the voltage and the current of 120 kV and 90 mA, respectively. The contiguous scan covered the entire jaw area (Fig.1). Because the patient does not move or swallow (mainly to avoid image distortion) during this procedure, there was no angle scanning and no gantry angle. In order to position the dental implant, a line was projected either 1 parallel to the alveolar bone of the upper jaw, 2 parallel to tooth bed of the lower jaw, or

Figure 1. Lateral topogram of the skull base. Contiguous scan was performed and covers the entire jaw area.

Figure 2. a. Panoramic topogram reconstruction with defined multiplanar sectional planes. b, c, d. Panoramic images. The marks at the horizontal edge of the image indicate the position of the multiplanar reconstructed images.
3parallel to upper and lower occlusal planes of both jaws. A reconstruction of a 1 mm-thick image was reviewed. Then spiral dental software was used for reconstruction of the jaw.

A panoramic reconstruction was done. CT is a multilayer image, different from the traditional Pano-X ray. This kind of image cannot view the entire natural structure of the jaw bone, but its quality is clearer. (Fig. 2).

Paraaxial reconstruction was done. It is a

Figure 3. a. Reference image with multiplanar sectional planes (paraxial reconstruction). b. c. d. e. Image reformation from multiple sagittal planes.
sagittal plane image. Estimation of the distance depends on the site of implantation (Fig. 3). The same image might be obtained when the gantry was not angled and the table height was fixed.

RESULTS

There are some problems that relate to the use of the upper jaw for dental implantation. Dentists should know the type of the bone before implantation [1,2]. They should know the alveolar bone structure, preoperative dental status of the upper jaw [5], the depth of the vertical alveolar bone, the width of the horizontal plane and the anatomy of nerves and blood vessels in the region. To predict the relationship between implanting position and 3-dimensional appearance of horizontal jaw bone, they must study the structure of the maxillary sinus, nasal cavity, nasopalatal duct and determine the location that is safe for implantation [2,5]. For the same reason, the lower jaw procedure emphasizes imaging the inferior alveolar canal and mental foramen (4). Axial scans reveal the exterior of the horizontal jaw bone, whereas panoramic scans show the width of bucco-lingual cavity, the height and width [3] of the alveolar jaw bone. Teeth implantation is not indicated for the patients who wear removable dental prostheses for a long time or who have thin and narrow alveolar bone (<0.8 cm in thickness, < 0.4 cm in width).

DISCUSSION

Previously, periapical radiography, panoramic radiography and cephalometric radiography were the only means available to image dental deficiencies. Owing to the limitations of 2-dimensional views, the data of alveolar jaw construction might be incomplete and incorrect. Dentists can only determine the height of upper and lower alveolar jawbone and the dimensions of the missing tooth area. However, they still cannot know the type of alveolar jawbone, the height of body that can be used in implantation, and whether bone must be implanted [3,5]. Instead, spiral dental CT provides advantages. It is noninvasive and easy to operate. It requires little transformation, i.e., we just take a set of spiral axial images, use the software to measure, and reconstruct into the panoramic multiple and segmental views. The two views have little distortion and correspond almost equally to the real structure at the same proportion. Therefore, we can read numerical scale directly from the view [3,5]; and this data can be used to locate the implanting site and determine its dimensions. Dentists can save their time on sizing the tooth implant, preparing the bone implant material or other preoperative preparations and spend less time on the surgery. Because that it is easy to understand, spiral dental CT scans are also convenient for dentists to explain surgical procedures to their patients, who as a result have more confidence in their dentists [3]. In addition, spiral dental CT may be used in searching for lesions and in deciding the size of cutting area.

Spiral dental CT is the key technology that will help not only dentists to perform tooth implantation, but also plastic surgeons to perform head and neck operations. It saves time and improves medical quality [3]. In addition, oral cavity and face view reconstruction can be utilized for postoperative follow up [1,2].

CONCLUSION

With the advance of medical technology, the development of spiral dental CT improves the quality of dental images. A precise preoperation evaluation will prevent injury to nerves and other important anatomical structures in maxillofacial region. The spiral dental CT method saves time in comparison with the to conventional tomography.

REFERENCE

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隨著科技的進步，醫療影像品質不斷提升，因此在手術前收集資料是非常重要的。螺旋式電
腦斷層攝影可提供二度和三度空間影像，另外也可收集到每一區域軟組織及齒槽骨影像，並且
可測量理想的植體種植位置、高度、齒槽骨的骨質密度、豐隆度及缺牙區前後寬度和深度。
我們從1996年7月至2000年10月共有20例(11男9女)準備接受植牙病例，年齡由20歲至
82歲，平均年齡為51歲。這些病人都接受螺旋式電腦斷層攝影，我們將其變化提出討論，並
供給大家參考指教。

關鍵詞：植牙，螺旋式牙用電腦斷層攝影