EDITORIAL

Comparison of techniques of dental radiological diagnostics: Cone Beam 3D vs traditional CT

The CBCT (Cone Beam Computed Tomography) method, recently defined as CB3D, has revolutionized the dental and maxillofacial radiological diagnostics making available some 3D reconstructions of the examined anatomical structures. The CB3D is a radiological technique based on tomography scanning used for acquiring data and images of a specific volume of the maxillofacial or of the skull. Thanks to the processing software, that technique offers diagnostic images on the three plans of the space and on the Volume Rendering (that is to say volumetric images), so that the patient is exposed to relatively low radiant doses. The CB3D represents the last generation device for the radiological imaging in the dentistry field and it collects, in addition to its specific positive features, also those belonging to other different methods which are now consolidated such as the OPT (orthopantomography or panoramic radiography) and the latero-lateral and posterior-anterior radiographs of the skull, with a cephalometric measurements purpose; those representations are realized thanks to dedicated application software. The method is not replaceable in the planning of interventions of dental extraction of included dental elements both in adulthood and in the pediatric age. In implantology, that method permits the qualitative and quantitative evaluation of the available bone, allowing the realization of implant rehabilitations which are prosthetically guided, and, at the same time, avoiding any possible damages to anatomical structures, such as for example the inferior alveolar nerve or the maxillary sinus. In orthodontistry that method allows a better clinic planning, and in oncologic field it allows to define the extension of expansive processes and the impairments of vital anatomical sites. Additionally that method offers numerous advantages in comparison to the traditional CT because of the reduced costs, accuracy, practicalness of performance.

The application fields of the CB3D present every day new perspectives and indications, becoming more and more a necessary instrument for dentists and maxillofacial surgeons.

The technical differences in comparison to a multislice CT are based on the fact that the CB3D uses a conic radiant beam and a wide area detector, so allowing the acquisition of the volume studied with one only rotation. The traditional CT, on the contrary uses a subtle beam of X di rays which rotates more than one time around the head of the patient and hits a series of detectors, while the body of the patient is continuously brought ahead. In the CB3D

applications the FOV (Field of View), meaning the wideness of the area exposed to the X rays, is minor in comparison to that one of multislice CT in relation to the intrinsic features of the device and it is limited to the only area of clinic interest.
Those methodology differences clearly indicate that there are different possible expositions for the patients: numerous clinical and experimental studies have shown that, with a multislice CT, in a study on mandibula or on the maxillary the exposition of the patient is respectively 200-500 microsieverts and 100-300 microsievert, according to the devices and techniques used. On the contrary by using the CB3D device, those value decrease to a total of 30-100 microsivierts in case of double and simultaneous exposition of mandibula and maxillary.
Moreover, the technical artifacts due to the presence of metal in the bridge prosthesis or in the implants, are particularly evident in the traditional CT, and sometimes they damage in a unrepairable way the quality of the exam. On the contrary, by using the Cone Beam 3D technique – thanks to its intrinsic features – the problem connected to the technical artifacts is reduced.
In relation to the applications in dentistry and maxillofacial field, the Cone Beam 3D technique shows to be superior to the traditional CT because of a minor exposition to the radiant doses, because of the short execution time of the exam, and because of the possibility to evaluate the patient in a more comfortable position.
The technical evolution of those devices has allowed a progressive reduction of their dimensions: in fact, currently, many CT "Cone Beam" have an aspect and a volume similar to those of a common orthopantomograph.

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