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Artigos científicos

O CDROM reservou para você uma seleção de artigos (abstracts) com assuntos relevantes a cerca da qualidade de imagens e doses de radiação produzidas pelas técnicas tomográficas contemporâneas.

Conventional spiral and low-dose computed mandibular tomography for dental implant planning.

Swed Dent J Suppl. 1999;138:1-82.

Ekestubbe A.

Department of Oral Diagnostic Radiology, Faculty of Odontology, Goteborg University, Sweden.

Absorbed doses to radiosensitive organs in the head and neck from pre-implant conventional hypocycloidal, conventional spiral and computed tomography (CT) were measured with thermoluminescent dosimeters in an anthropomorphic phantom head. From conventional tomography organ doses, except to the major salivary glands, were below 0.2 mGy. They were considerably higher with CT than conventional tomography. Tomographic images of posterior lower jaw regions were evaluated regarding measurement reliability in conventional spiral tomograms. Observers measured the distance marginal crest-mandibular canal, marked their measuring points and estimated the length of an intended Branemark implant. The variability between observers, mainly due to the intra-observer variation, decreased with multiple readings and optimized image quality. The suggested implant length was the same as the one inserted in 70% of the cases. Tomographic images from mandibular body segments were used to test the influence of radiation exposure and scanning mode on image quality in CT and compare the quality of the CT images with that in conventional spiral tomograms. Mandibular canal and marginal bone crest visibility was unaffected by radiation dose in CT examinations. Differences among CT scanning modes and between CT and conventional spiral tomography were highly significant. Frontal CT scans or conventional spiral tomograms were preferred. In cross-sectional images of the posterior lower jaw image quality in conventional spiral and reformatted CT at 40 mAs and 80 mAs was compared. Observers graded the acceptability of images for implant planning and traced the contours of the mandibular body and canal. Conventional, spiral tomograms were subjectively preferred over reformatted CT images. Differences between CT images at different mAs settings were not statistically significant. The mandibular canal was more frequently untraceable in high-dose CT. The use of tomography for dental implant planning was studied by means of a survey among oral radiology clinics in Sweden and implantology clinics in other countries. It was used by 93.4% but varied markedly between and within anatomic regions. CT was used by 73%. Radiation doses varied considerably within and between different CT brands. The availability rather than the clinical need strongly influenced the choice of technique. From the point of view of radiation dose and information necessary for implant planning conventional spiral tomography is to be preferred over reformatted CT. However, when CT is the only technique at hand, it can be performed with a lower than standard mA-setting.

PMID: 10635103 [PubMed - indexed for MEDLINE]

Comparative dose measurements by spiral tomography for preimplant diagnosis: the Scanora machine versus the Cranex Tome radiography unit.

Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001 Jun;91(6):735-42.

Dula K, Mini R, van der Stelt PF, Sanderink GC, Schneeberger P, Buser D.

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Objective. The purpose of this study was to determine the dose profile of the Cranex Tome radiography unit and compare it with that of the Scanora machine. **Study design.** The radiation dose delivered by the Cranex Tome radiography unit during the cross-sectional mode was determined. Single tooth gaps in regions 3 (16) and 30 (46) were simulated. Dosimetry was carried out with 2 phantoms, a head and neck phantom and a full-body phantom loaded with 142 thermoluminescent dosimeters (TLD) and 280 TLD, respectively; all locations corresponded to radiosensitive organs or tissues. The recorded local mean organ doses were compared with those measured in another study evaluating the Scanora machine. **Results.** Generally, dose values from the Cranex Tome radiography unit reached only 50% to 60% of the values measured for the Scanora machine. The effective dose was calculated as 0.061 mSv and 0.04 mSv for tooth regions 3 (16) and 30 (46), respectively. Corresponding values for the Scanora machine were 0.117 mSv and 0.084 mSv. **Conclusion.** Cross-sectional imaging in the molar region of the upper and the lower jaw can be performed with the Cranex Tome unit, which delivers only approximately half of the dose that the Scanora machine delivers.

PMID: 11402291 [PubMed - indexed for MEDLINE]

The use of tomography for dental implant planning.

Dentomaxillofac Radiol 1997 Jul;26(4):206-13

Ekestubbe A, Grondahl K, Grondahl HG.

Department of Oral Diagnostic Radiology, Faculty of Odontology, Goteborg University, Sweden.

OBJECTIVES: To examine the use of tomography for dental implant planning.

METHODS: A questionnaire was sent to oral radiology clinics in Sweden and to implantology clinics in different parts of the world with questions on selection criteria and techniques for, and frequency of, pre-implant tomography. Differences between mean values were assessed by t-test. A new method developed by the Swedish Radiation Protection Institute was used to assess radiation absorbed dose from CT.

RESULTS: Tomography was used by 93.4% of the clinics, but there was marked variation both between and within different clinical situations. It was performed in all cases by 21% and the majority used it for the evaluation of the maxilla, the posterior mandible and in single implant cases. Small clinics (< 100 patients per year) used tomography frequently and clinics in Sweden significantly more often than those in other countries. The majority had changed their policy recently, using tomography more often. CT was used by 73% of respondents, mainly the small clinics. The majority of the large clinics (> 500 patients per year) used conventional tomography. The mean absorbed dose for CT scanning protocols was 65 mGy. The variation within and between different makes of CT was considerable. **CONCLUSIONS:** There are large variations in frequency of use of both conventional and computed tomography for dental implant planning by different clinics who also vary in the indications for their choice. A substantial factor influencing the technique chosen was its availability rather than clinical need.

PMID: 9442610 [PubMed - indexed for MEDLINE]

Dosimetry and cost of imaging osseointegrated implants with film-based and computed tomography.

Scaf G, Lurie AG, Mosier KM, Kantor ML, Ramsby GR, Freedman ML.

Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1997 Jan;83(1):41-8
Faculdade de Odontologia de Araraquara-UNESP, School of Dental Medicine,
Barzil.

Thermoluminescent dosimeters were used to measure radiation doses at craniofacial sites in a tissue-equivalent phantom during film-based multidirectional tomography with the Tomax Ultrascan (Incubation Industries, Ivyland, Pa.) and during computed tomography with the Elscint Excel 2400 (Elscint Corp., Tel Aviv, Israel). Mean absorbed doses for presurgical mandibular and maxillary canine and molar implant assessments were converted to equivalent doses, which were then multiplied by published weighting factors and summed to give effective doses. The computed tomography device consistently delivered higher doses than the Tomax Ultrascan to all anatomic locations; the differences were most pronounced when only one or two implant sites were evaluated. The reasons for the dose disparities are considered both anatomically and procedurally. A survey of examination cost revealed film-based multidirectional tomography to be less expensive than computed tomography.

PMID: 9007922 [PubMed - indexed for MEDLINE]

The radiographic assessment of implant patients: decision-making criteria.

Dula K, Mini R, van der Stelt PF, Buser D.

Int J Oral Maxillofac Implants 2001 Jan-Feb;16(1):80-9

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Indications for the most frequently used imaging modalities in implant dentistry are proposed based on clinical need and biologic risk for the patient. To calculate the biologic risk, the authors carried out dose measurements. They demonstrated that the risk from a periapical radiograph is 20% of that from a panoramic radiograph. A panoramic radiograph and a series of 4 conventional tomographs of a single-tooth gap in the molar region carry 5% and 13% of the risk from computed tomography of the maxilla, respectively. Panoramic radiography is considered the standard radiographic examination for treatment planning of implant patients, because it imparts a low dose while giving the best radiographic survey. Periapical radiographs are used to elucidate details or to complete the findings obtained from the panoramic radiograph. Other radiographic methods, such as conventional film tomography or computed tomography, are applied only in special circumstances, film tomography being preferred for smaller regions of interest and computed tomography being justified for the complete maxilla or mandible when methods for dose reduction are followed. During follow-up, intraoral radiography is considered the standard radiographic examination, particularly for implants in the anterior region of the maxilla or for scientific studies. In patients requiring more than 5 periapical images, panoramic radiography is preferred.

PMID: 11280366 [PubMed - indexed for MEDLINE]

Validation of spiral computed tomography for dental implants.

Cavalcanti MG, Yang J, Ruprecht A, Vannier MW.

Dentomaxillofac Radiol 1998 Nov;27(6):329-33

Department of Radiology, Faculty of Odontology, University of Sao Paulo, Brazil.

OBJECTIVES: To investigate the accuracy of 2DCT orthoradial reformatted images from spiral computed tomography (CT) for pre-surgical planning of dental implants in proximity to the mental foramen. **METHODS:** Eight cadaver heads were imaged by spiral CT (S/Xpress, Toshiba-America, Tustin, CA) with 1 mm thick axial slices by 1 mm/sec of table feed. The image data set was transferred to a networked computer workstation. Using computer graphics the data was analysed with 2D orthoradial reformatting using the ToothPix (Cemax, Fremont, CA, USA) protocol. Linear measurements were made by two oral radiologists independently from the superior border of the mental foramen to the crest of the alveolar process and from the inferior border of the mental foramen to the mandibular inferior border. The soft tissues were removed and physical measurements made using a 3 Space (Polhemus, Colchester, VT) electromagnetic digitizer with a personal computer running Windows 95. **RESULTS:** The differences between the measurements on orthoradial 2DCT images and the physical measurements were not statistically significant ($P > 0.05$). **CONCLUSIONS:** Two-dimensional spiral CT imaging allows highly accurate measurements for dental implant placement in proximity to the mental foramen. Computer graphics software, using reformatted reconstruction, is suitable for implant planning.

PMID: 10895630 [PubMed - indexed for MEDLINE]

Quantitative analysis of spiral computed tomography for craniofacial clinical applications.

Cavalcanti MG, Vannier MW.

Dentomaxillofac Radiol 1998 Nov;27(6):344-50

Department of Radiology, Faculty of Odontology, University of Sao Paulo, Brazil.

OBJECTIVE: To determine the relative accuracy of craniofacial measurements obtained from volumetric spiral computed tomography (CT) in two-dimensional (2D) and three-dimensional (3D) reconstructions. **MATERIALS AND METHODS:** Nine cadaver heads were examined with spiral CT at 3 mm collimation with 2 mm/s table feed. The CT data, stored on optical disks to allow full retrospective review of any image, were transferred to a networked computer workstation for off-line visualization, measurement and analysis. Three-dimensional surface images (3DCT) were generated from spiral CT scans (2DCT). Measurements ($n = 28$) were made from (both unique and conventional craniometric anatomical) landmarks ($n = 23$) identified in 2DCT and 3DCT images by two observers twice. The soft tissues were then removed from the cadavers and the measurements performed with an electromagnetic digitizer. **RESULTS:** The accuracy for 3DCT was higher than 2DCT images for seven of 28 measurements. Twenty five per cent of the 2DCT measurements were found to be significantly different from the physical measurements. All measurements with 3DCT were found to have satisfactory accuracy in comparison with physical measurements. **CONCLUSIONS:** Three-dimensional spiral CT can distinguish craniofacial anatomy more accurately with some measurements.

PMID: 10895633 [PubMed - indexed for MEDLINE]

Development of a compact computed tomographic apparatus for dental use.

Arai Y, Tammisalo E, Iwai K, Hashimoto K, Shinoda K.

Dentomaxillofac Radiol 1999 Jul;28(4):245-8

Department of Radiology, Nihon University School of Dentistry, Tokyo, Japan.

OBJECTIVE: To describe a compact computed tomographic apparatus (Ortho-CT) for use in dental practice. **METHODS:** Ortho-CT is a cone-beam-type of CT apparatus consisting of a multifunctional maxillofacial imaging machine (Scanora, Soredex, Helsinki, Finland) in which the film is replaced with an X-ray imaging intensifier (Hamamatsu Photonics, Hamamatsu, Japan). The region of image reconstruction is a cylinder 32 mm in height and 38 mm in diameter and the voxel is a 0.136-mm cube. Scanning is at 85 kV and 10 mA with a 1 mm Cu filter. The scan time is 17 s comparable with that required for rotational panoramic radiography. A single scan collects 512 sets of projection data through 360 degrees and the image is reconstructed by a personal computer. The time required for image reconstruction is about 10 min. **RESULTS:** The resolution limit was about 2.0 lp mm⁻¹ and the skin entrance dose 0.62 mGy. Excellent image quality was obtained with a tissue-equivalent skull phantom: roots, periodontal ligament space, lamina dura, and cancellous bone were clearly visualized. **CONCLUSION:** Ortho-CT provides three-dimensional images of excellent quality for dental use at a low entrance dose.

PMID: 10455389 [PubMed - indexed for MEDLINE]

Diagnostic imaging with newly developed ortho cubic super-high resolution computed tomography (Ortho-CT).

Terakado M, Hashimoto K, Arai Y, Honda M, Sekiwa T, Sato H.

Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000 Apr;89(4):509-18
Nihon University, Department of Oral and Maxillofacial Surgery, School of Dentistry,
Japan.

OBJECTIVE: Ortho cubic super-high resolution computed tomography (Ortho-CT), which we have developed, is characterized by the small size of the unit and the ability to produce 3-dimensional images of high resolution with low-radiation doses. The purpose of this study was to investigate the clinical usefulness of Ortho-CT for the diagnosis of diseases in the oral and maxillofacial region. **STUDY DESIGN:** Ortho-CT has been used for the imaging diagnosis of a radicular cyst of the upper first molar, mesiodense, tooth fractures in the upper anterior region, a fracture of the condylar process, or presurgical evaluation for a dental implant. The usefulness of 3-dimensional images obtained by Ortho-CT was investigated in this study. **RESULTS:** Ortho-CT produced images of high resolution, enabling identification of the extent of the lesions and the fracture line, the condition of the impacted tooth, and the relationship with the maxillary sinus, mandibular canal, and adjacent teeth. **CONCLUSION:** Because Ortho-CT can take high-resolution 3-dimensional images at any tomographic layer with only 1 exposure, it is useful for the diagnosis of diseases in the oral and maxillofacial region.

PMID: 10760735 [PubMed - indexed for MEDLINE]

Advanced single-slice rebinning in cone-beam spiral CT.

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Med Phys 2000 Apr;27(4):754-72

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To achieve higher volume coverage at improved z-resolution in computed tomography (CT), systems with a large number of detector rows are demanded. However, handling an increased number of detector rows, as compared to today's four-slice scanners, requires to accounting for the cone geometry of the beams. Many so-called cone-beam reconstruction algorithms have been proposed during the last decade. None met all the requirements of the medical spiral cone-beam CT in regard to the need for high image quality, low patient dose and low reconstruction times. We therefore propose an approximate cone-beam algorithm which uses virtual reconstruction planes tilted to optimally fit 180 degrees spiral segments, i.e., the advanced single-slice rebinning (ASSR) algorithm. Our algorithm is a modification of the single-slice rebinning algorithm proposed by Noo et al. [Phys. Med. Biol. 44, 561-570 (1999)] since we use tilted reconstruction slices instead of transaxial slices to approximate the spiral path. Theoretical considerations as well as the reconstruction of simulated phantom data in comparison to the gold standard 180 degrees LI (single-slice spiral CT) were carried out. Image artifacts, z-resolution as well as noise levels were evaluated for all simulated scanners. Even for a high number of detector rows the artifact level in the reconstructed images remains comparable to that of 180 degrees LI. Multiplanar reformations of the Defrise phantom show none of the typical cone-beam artifacts usually appearing when going to larger cone angles. Image noise as well as the shape of the respective slice sensitivity profiles are equivalent to the single-slice spiral reconstruction, z-resolution is slightly decreased. The ASSR has the potential to become a practical tool for medical spiral cone-beam CT. Its computational complexity lies in the order of standard single-slice CT and it allows to use available 2D backprojection hardware.

PMID: 10798698 [PubMed - indexed for MEDLINE]

12539 Autor: Guedes, Aureliano Machado Lima; Faria, Marcelo Daniel Brito; Montebelo Filho, Agenor.

Título: Imagem multiplanar dos maxilares para o planejamento de implantes osteointegrados / Multiplanar image for planning osteointegration implants of the jaw

Fonte: Rev. bras. odontol;57(3):192-4, maio-jun. 2000. Ilus

Resumo: Atualmente, com a grande incidência de pacientes edêntulos e parcialmente edêntulos, que são candidatos aos implantes osteointegrados em sua reabilitação, faz-se necessária a utilização de exames radiográficos complementares, cuja finalidade é demonstrar as estruturas anatômicas dos maxilares em diferentes planos, demonstrar também nas regiões de interesse a quantidade e a qualidade óssea, LEKHOLM E ZARB (1). O trabalho teve por objetivo mostrar as imagens do exame DENTAL CT, que é um software compatível com o aparelho de Tomografia Computadorizada de Alta Resolução SOMATOM HiQS, que viabilizou sua aplicação não só na implantodontia como em outras especialidades odontológicas (AU).

Localização: BR1141.

8268 Autor: Arita, Emiko Saito.

Título: Estudo comparativo e qualitativo das imagens radiográficas obtidas por meio de técnicas convencionais, tomografias computadorizadas e imagens tridimensionais / Radiographic conventional techniques, computerized tomography and third dimensional imaging: a comparative and qualitative study.

Fonte: São Paulo; s.n; 1998. 107 p. ilus, tab. **Tese:** Apresentada a Universidade de São Paulo. Faculdade de Odontologia para obtenção do grau de Livre-Docente.

Resumo: A complexidade das técnicas modernas de diagnóstico por imagem está se tornando cada vez mais acentuada, sendo até difícil, por vezes, indicar qual o melhor exame para cada caso específico, pelo que justifica-se uma análise mais profunda para esclarecer os novos preceitos científicos. O propósito deste trabalho é apresentar os resultados de um estudo comparativo e qualitativo das imagens radiográficas obtidas por meio de técnicas convencionais, tomografias computadorizadas (CT) e imagens tridimensionais (3-D). Foram utilizados, no total, 17 (dezesete) casos clínicos do arquivo hospitalar do University Hospital of Department of Oral Radiology, Okayama Dental School, Japão; compondo uma seleção de material de diferentes entidades patológicas, não se levando em consideração o sexo masculino ou feminino dos pacientes...(AU).

Localização: BR97.1; tD622, A717e

5989 Autor: Scaf, Gulnara; Lurie, Alan G; Mosier, Kristine M; Kantor, Mel L; Ramsby, Gale R; Freedman, Michael L.

Título: Dosimetry and cost of imaging for osseointegrated implants with film-based and computed tomography / Dosimetria e custo de imagem para implante ósseo integrado com filme e tomografia computadorizada

Fonte: Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod;83(1):41-8, Jan. 1997. ilus, tab

Resumo: Thermoluminescent dosimeters were used to measure radiation doses at craniofacial sites in a tissue-equivalent phantom during film-based multidirectional tomography with the Tomax Ultrascan (Incubation Industries, Ivyland, Pa.) and during computed tomography with the Elscint Excel 2400 (Elscint Corp., Tel Aviv, Israel). Mean absorbed doses for presurgical mandibular and maxillary canine and molar implant assessments were converted to equivalent doses, which were then multiplied by published weighting factors and summed to give effective doses. The computed tomography device consistently delivered higher doses than the Tomax Ultrascan to all anatomic locations; the differences were most pronounced when only one or two implant sites were evaluated. The reasons for the dose disparities are considered both anatomically and procedurally. A survey of examination cost revealed film-based multidirectional tomography to be less expensive than computed tomography (AU).

Localização: BR97.1

Absorbed doses and energy imparted from tomography for dental implant installation. Spiral tomography using the Scanora technique compared with hypocycloidal tomography.

Ekestubbe A, Thilander A, Grondahl HG.

Dentomaxillofac Radiol 1992 May;21(2):65-9

University of Goteborg, Sweden.

Tomography is sometimes needed to obtain information on the amount of bone available in the maxilla and in the posterior parts of the mandible prior to implant surgery. Both conventional and computed tomography can be employed. Recently a new imaging device, the Scanora, has been introduced which can be used for spiral tomography. The aim of this study was to compare absorbed doses and energy imparted from this new unit with those from conventional hypocycloidal tomography using the Philips Universal Polytome. A multi-film cassette with five pairs of calcium tungstate screens was used in the latter while a single film technique was used with the Scanora. The absorbed dose measurements were made on an anthropomorphic phantom. Most absorbed doses were found to be below 0.2 mGy except those to the major salivary glands. The absorbed doses with the Scanora were higher than with the Polytome. The beam direction and shorter focus-object distance in the Scanora influenced the absorbed dose distribution. The energy imparted was found to be low for both techniques, 1.8-1.9 mJ with the Scanora for both jaws, and for hypocycloidal tomography 0.78 mJ in the maxilla and 1.3 mJ in the mandible.