Bourland85 (filed under Fuchs)

N2 Planning Stereotactic I-125 Implants of the Brain Using Interactive 2D and 3D Graphics+, D. Bourland, E. Chaney*, H. Fuchs, S. Mahaley, J. Naves, S. Pizer, J. Rosenman, G. Sherouse, E. Staab, M. Varia, R. Whaley, Univ. of North Carolina, Chapel Hill, NC 27514

The Brain Tumor Cooperative Group of the NCI has begun a Phase II study of new methods of therapy, including I-125 implants, for malignant gliomas. A fast interactive imaging system under development at UNC is being used to help evaluate the dosimetry and surgical placement. The system treats a sequence of CT scans as a single 3D image. Objects of interest, e.g., the tumor, normal brain, and isodose surfaces, are contoured or calculated slice by slice. Contours are processed to construct "tiled" representations and then shaded to produce 3D perspective representations. The user can interact in various ways, e.g., rotate, zoom, or clip, with any object or set of objects. True 3D representations can be viewed with a vibrating mirror display. The system overcomes limitations of conventional 2D displays for evaluating complex 3D shapes and relationships between objects, such as tumor coverage by isodose surfaces, and for studying the surgical approach to the implant.

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N3 Stereotaxic Brain Implant with a Single Row of Iridium Seeds, Ralph D. Reymond, M.D., and Debabrata Bhaduri, Ph.D.*, Capital Region Radiotherapy Center, St. Francis Hospital & Medical Center, Topeka, KS 66606

A patient with recurrent astrocytoma in his right occipital lobe was implanted with radioactive iridium seeds.

The recurrent tumor measured 3 x 2 x 2 cm. and was located at the edge of the tentorium, close to the midline structures such as the brain stem and the cerebellar vermis. Contrast enhanced CT scans and BRW stereotaxic device were utilized to determine the coordinates of the tumor. The four redundant angles and depth were then calculated for the track parallel to the tentorium along the long axis of the said tumor. Orthogonal radiographs with dummy sources confirmed the location of the implanted sources into the tumor target. A special iridium ribbon with four sources of 3.60 mCi each at a spacing of 0.5 cm. was designed to deliver 60 rads/hr. to the periphery of the contrast enhancing lesion. Another CT scan after the implant was taken to confirm the location of the iridium sources into the tumor. A total dose of 6,250 rads was delivered to the periphery of the tumor in 104.2 hrs. after which the Iridium 192 sources and the plastic tube were removed without difficulties.

N4 A Recursive Algorithm for More Rapid Location of Isodose(rate) Surfaces in 3 Dimensions. S.W.Brain* and R.S. Cox, Department of Radiology, Stanford University School of Medicine, Stanford, CA 94305, U.S.A.

For our work with interstitial implants, we have developed a recursive algorithm for calculating the volumes within a list of isodose(rate) surfaces. Briefly, the algorithm works as follows. It first obtains the dose (rate)s at the corners and center of a cube large enough to include the lowest dose(rate) surface sought. It then splits the cube into eight cubes of half the side length and calls itself to calculate the dose(rate) at the corners and centers. The splitting process continues as long as: a) individual cubes contain more than one seed, or b) an isodose surface passes through the cube and errors arising from curvature of the dose(rate)-position function are large. Thus, the recursive algorithm calculates a dense grid of points only at the locations of the isodose(rate) surfaces. It typically runs an order of magnitude faster than a uniform grid approach of comparable accuracy. The algorithm is sufficiently general to be applied to other 3-dimensional problems in which the position of surfaces must be determined.

N5 ^{125}I Implantation of Malignant Cranial Neoplasms: Pilot Study Results, M.S. Eddy, M.S.* and R.G. Selker, M.D., Depts. of Radiation Physics and Neurosurgery, Montefiore Hospital and Univ. of Pittsburgh, School of Medicine, Pittsburgh, PA 15213

A pilot study on the use of Iodine-125 seeds in the treatment of malignant cranial neoplasms has been conducted prior to implementation of a clinical trial. More than thirty patients, from 9-66 years of age who have been declared failures of conventional therapy, have been treated with permanent or temporary I-125 implants. Tumor volumes of 10-100 cm^3 have been implanted using 35-157 seeds of 0.4-2.0 mCi/seed for permanent implants and 2-15 seeds of 10-30 mCi/seed for temporary implants. Although implantation of glioblastoma multiforme tumors is the primary interest, lower grade gliomas and metastatic tumors have also been treated with this procedure. Several cases will be presented and the pilot study results summarized, including survival statistics to-date and considerations for future investigations.

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N6 Brachytherapy Image Matching Algorithm From Three Films, S.A. Ruff*, R.A. Cecil, N.A. Iverson, H.S. Gordon, F.C.Mailey, M.R. Sontag, Picker International, Highland, Hts., OH 44143

We have developed a computer automated Brachytherapy implant matching algorithm which uses up to three radiographic films taken at any clinically appropriate orientations. The matching algorithm combines a true divergent beam approach with geometrical modeling to derive 3D seed images. The technique greatly reduces the ambiguities associated with standard 2 film techniques and is fast enough to allow interactive entry and identification of implants. The algorithm assumes that each radiograph is in a plane perpendicular to the incident beam axis but the beam axis is not restricted to lie on the active film area. Provisions for simulator gantry angle, standard x-ray gantry offset and couch offset allow use of all possible clinically useful film plans. Film orientations can be entered directly or derived from known fiducial points. The matching process consists of finding the distance of closest approach of divergent rays drawn from each film coordinate to its respective source using an analytic formulation. Matching is concurrent with the entry of each film coordinate and allows up to 512 coordinate triplets to be entered.