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CARRIERA ACCADEMICA: 1998-2001: Professore associato non confermato; 2001-2006: Professore associato confermato; 2006- Professore Straordinario.

INSEGNAMENTI.
Corso di Laurea a ciclo unico in Medicina e Chirurgia:
- Radioterapia nel Corso integrato di Diagnostica per immagini (IV anno),
- Radioterapia nel Corso integrato di Oncologia (V anno),

Corso di Laurea Triennale in Tecniche di Diagnostica per Immagini e Radioterapia:
- Radiobiologia generale (I anno),
- Radiobiologia (II anno),
- Fondamenti di radioterapia (II anno),
- Radioterapia clinica (II anno),
- Applicazioni cliniche di radioterapia (II anno),
- Radioprotezione medica (III anno),

Corso di Laurea Triennale in Scienze Infermieristiche:
- Radioterapia (II anno),

Corso di Laurea Magistrale in Scienze infermieristiche e ostetriche:
- Radioterapia (I anno),

Corso di Laurea Triennale in Igienistica Dentale:
- Radioterapia (I anno),

Scuole di Specializzazione:
- Radiobiologia alla Scuola di Specializzazione in Radiodiagnostica,
- Radioterapia alla Scuola di Specializzazione in Chirurgia Generale,
- Radioterapia alla Scuola di Specializzazione in Ostetricia e Ginecologia,
- Radioterapia alla Scuola di Specializzazione in Urologia,
- Radioterapia alla Scuola di Specializzazione in Dermatologia,
- Radiobiologia, Radioterapia Clinica e Radioprotezione alla Scuola di Specializzazione in Radioterapia,

Presidente del Consiglio di Corso di Laurea Magistrale in Medicina e Chirurgia.
Presidente della Commissione Tecnica di Programmazione Didattico-Pedagogica.
Responsabile dell'attività didattica del Corso di Laurea Triennale per Tecniche di Radiologia Medica per Immagini e Radioterapia.
Direttore della Scuola di Specializzazione in Radioterapia.

CURRICULUM. Si laurea nel 1982 in Medicina e Chirurgia, presso l'Università degli studi di Torino. Nel 1985 si specializza in Oncologia presso l'Università degli studi di Pavia, nel 1989 in Radioterapia Oncologica, presso l'Università degli studi di Modena, nel 1992 in Radiodiagnostica, presso l'Università degli studi di Torino.
Nel 1995/96 ottiene la Fellowship, presso il Department of Radiation Oncology del Massachusetts General Hospital della Harvard Medical School di Boston, USA.
Tra i vari Stages e "visiting scientist" effettuati: nel 1993 Servizio di Radioterapia presso il "Centre G.F.Leclerc" di Digione, Francia; nel 1994 Servizio di Radio-Oncologia CHUV a Losanna, Svizzera; nel 1996/97 presso la Divisione di Radioterapia dell'Istituto Europeo di Oncologia di Milano; nel 2004 presso l'Hospital Gregorio Maranon di Madrid, Spagna.
È stato Assistente, presso la Divisione di Radioterapia dell'Ospedale Maggiore di Novara dal 1984 al 1996; Ricercatore presso l'Università degli studi di Torino, sede di Novara, dal 1996 al 1998; Professore Associato presso l'Università degli studi del Piemonte Orientale "Amedeo Avogadro" dal 1998 al 2006.

Dal 2006 è Professore di I fascia di Radioterapia dell'Università del Piemonte Orientale "Amedeo Avogadro" e, dal 1998, Direttore della Struttura Complessa a Direzione Universitaria di Radioterapia dell'Azienda Ospedaliero-Universitaria "Maggiore della Carità" di Novara.
Dal 2007 è Presidente del Consiglio di Corso di Laurea Magistrale in Medicina e Chirurgia e Presidente della Commissione Tecnica di Programmazione Didattico-Pedagogica. È inoltre Direttore della Scuola di Specializzazione in Radioterapia, e Responsabile dell'attività didattica per il corso di laurea triennale in tecniche di radiologia per immagini e radioterapia.
La sua attività di ricerca comprende: EORTC (tumori cerebrali e del distretto cervico-cefalico); protonterapia dei tumori della base cranica; integrazione di immagini TC-RM-SPECT e PET/TC-RM per radioterapia; integrazioni di radio-chemioterapia (distretto cervico-facciale e app. digerente); progetto ENLIGHT (European Network for Light Ion Therapy); collaborazione nel gruppo "Rare Cancer Network". Ha collaborazioni con le seguenti Istituzioni: MGH Boston, USA. DKFZ Heidelberg, Germania, PSI Villigen, Svizzera, IOSI Bellinzona, Svizzera, IGR Villejuif, Francia Progetto Etoile, Lyon, Francia. Fa parte del Comitato Tecnico-Scientifico della Fondazione CNAO (Centro Nazionale di Adroterapia Oncologica).
Tra le sue pubblicazioni maggiori figurano 85 articoli su riviste scientifiche, oltre 300 articoli e abstracts in Atti di Convegni e 12 capitoli di libri.
È affiliato alle seguenti associazioni: AIRO (Associazione Italiana di Radioterapia Oncologica), AIRB (Associazione Italiana di Radiobiologia), SIRM (Società Italiana di Radiologia Medica), AIOM (Associazione Italiana Oncologia Medica), ESTRO (European Society for Therapeutic Radiology and Oncology), ASTRO (American Society for Therapeutic Radiology and Oncology), EORTC (European Organization for Research and Treatment of Cancer), PTCOG (Proton Therapy COoperative Group), ISIORT (International Society for Intra-Operative Radiation Therapy).

CAMPI DI INDAGINE NELLA RICERCA. Radioterapia con particelle (adroterapia); integrazione di immagini TC, RM, SPECT e PET per radioterapia; radio-chemioterapia dei tumori del distretto cervico-cefalico; radioterapia intraoperatoria (IORT).

TEMI CORRENTI DI RICERCA.

Set-up verification for 3D conformal radiotherapy of prostate carcinoma by surface matching imaging.
The reproducibility of patient setup for radiotherapy is based on various methods including external markers, X-rays with planar or computerized image acquisition, and, more recently, surface matching imaging. We analyzed the setup reproducibility of 16 patients affected by prostate cancer who underwent conformal radiotherapy with curative intent by using a surface image registration system. We analyzed the setup reproducibility of 16 patients affected by prostate cancer candidates for conformal radiotherapy by using a surface image registration system. At the initial setup, EPID images were compared with DRRs and a reference 3D surface image was obtained by the AlignRT system (Vision RT, London, UK). Surface images were acquired prior to every subsequent setup procedure. EPID acquisition was repeated when errors > 5 mm were reported.
The mean random and systematic errors were 1.2±2.3 mm and 0.3±3.0 mm along the X axis, 0.0±1.4 mm and 0.5±2.0 mm along the Y axis, and 2.0±1.8 mm and -0.7±2.4 mm along the Z axis respectively. The positioning error detected by AlignRT along the 3 axes X, Y, and Z exceeded the value of 5 mm in 14.1%, 2.0%, and 5.1% measurements and the value of 3 mm in 36.9%, 13.6% and 27.8% measurements, respectively. Correlation factors calculated by linear regression between the errors measured by AlignRT and EPID ranged from 0.77 to 0.92 with a mean of 0.85 and SD of 0.13. The setup measurements by surface imaging are highly reproducible and correlate with the setup errors detected by EPID. Surface image registration system appears to be a simple, fast, non-invasive, and reproducible method to analyze the set-up alignment in 3DCRT of prostate cancer patients.

Target volume delineation for preoperative radiotherapy of rectal cancer by using CT or PET/CT: influence of the imaging approach on multiple observers variability
To assess observer variability in target volume delineation for preoperative radiotherapy of rectal cancer by using computed tomography (CT) or positron emission tomography (PET)/CT images. Two cases (A and B) of rectal cancer candidates for preoperative radiotherapy were studied by PET/CT with patient in treatment set-up. Ten radiation oncologists from different centers contoured the volumes of interest, gross tumor volume (GTV), clinical target volume (CTV), and organs at risk (ORs): 5 contoured on CT and 5 on PET/CT images. CT-GTV, CT-CTV, PET/CT-GTV, and PET/CT-CTV were analyzed and compared. Variability across observers was estimated by coefficient of variation (CV), defined as the ratio between standard deviation (SD) and the mean and by concordance index (CI), defined as the ratio between intersection and envelop of all volumes. Mean GTV was 120 cc (range 74-142 ± 20.4 cc) in case A and 119 cc (range 67-179 ± 35.7 cc) in case B. Mean CTV was 723 cc (range 450-1003 ± 147.5 cc) in case A and 739 cc (range 460-1062 ± 195.6 cc) in case B. CV value was lower and CI was similar or higher across the observers contouring GTV on PET/CT compared with those contouring on CT. CTV variability was influenced more by the inclusion or not of lymph nodal areas than by the use of PET/CT. PET/CT may allow reducing observer variability at the level of GTV. This finding can be of great interest when using boost dose with highly conformal techniques.

Conformal radiotherapy of clinically localized prostate cancer: analysis of rectal and urinary toxicity and correlation with dose-volume parameters.
Rectal and urinary toxicities are the principal limiting factors in delivering high target dose to the patients affected by prostate cancer. The verification of such toxicity is an important step before starting a dose escalation program. The present observational study reports on the acute and late rectal and urinary toxicity in relation with dose-volume parameters in 104 patients with localized prostate cancer treated with 3 dimension conformal radiation therapy (3D-CRT). One hundred four patients with stage T1b-T3b prostate cancer were treated with 3D-CRT by to a total dose of 74 Gy, 2 Gy per fraction. Rigid dose constraints were applied for rectum and bladder. Acute and late rectal and urinary toxicities were analyzed by the reference standard Radiation Therapy Oncology Group (RTOG) morbidity score also in relation with dose-volume histograms. Biochemical relapse free survival was defined according to the American Society of Therapeutic Radiation Oncology (ASTRO) criteria and to the RTOG-ASTRO Phoenix Consensus Conference Recommendations using the Kaplan-Meyer method. No grade 3 toxicity was observed. Acute and late rectal G2 toxicity rates were 5.8% and 9.0% respectively; acute and late urinary G2 toxicity rates were 12.5% and 2.0% respectively. Rectal V70 influenced the development of late G2 toxicity. A relationship between acute and late urinary toxicity was also found. After a median follow up of 30 months (range 20-50), the actuarial overall and biochemical relapse-free survival rates were 84% and 77% respectively with a significant difference between low-intermediate and high risk patients. Conformal radiotherapy to the dose of 74 Gy was

conducted with a good compliance. The incidence of acute and late toxicity was relatively low in accord with quite restrictive dose-constraints. The rectal V70 showed to be a reliable prognosticator of late toxicity. OS and BRFS rates were more favourable for low and intermediate risk and significantly less favourable for high risk patients.

(18)F-FDG-PET/TC Imaging for Staging and Radiotherapy Treatment Planning of Patients affected by Carcinoma of the Anal Canal.
(18)F-fluorodeoxyglucose positron emission tomography fused with computed tomography (FDG-PET/CT) imaging has an emerging role in the staging and treatment planning of various tumor locations. This prospective study aims to evaluate the potential impact of FDG-PET/CT in the staging and tumour volume delineation for the patients affected by carcinoma of the anal canal candidates for curative radiotherapy combined whenever possible with concomitant chemotherapy. From January 2005 to February 2008, 21 patients, 8 males and 13 females, aged from 36 to 90 years (mean and median 63) with biopsy proved anal carcinoma were enrolled in the present study. Work-up included physical examination, endoscopy, and CT-scan of the upper and lower abdomen. Pathology was squamous cell carcinoma in 15 cases, cloacogenic carcinoma in 3, adenocarcinoma in 2 and basal cell carcinoma in 1. All patients were candidates for curative radiotherapy combined or not with concomitant chemotherapy. Simulation was performed by CT and PET/CT imaging with patient in supine position and knee-ankle fixation device. Treatment volumes including CTV1 and CTV2, PTV1 and PTV2, and organs at risk were drawn on CT and PET/CT fused images and a 3-dimension treatment plan was performed to a total dose of 56-60 Gy to PTV1 and 45 Gy to PTV2 with conventional fractionation. CT-based staging for the whole series was as follows: 9 cT3 N0 M0, 3 cT2 N2 M0, 3 cT2 N0 M0, 2 cT1 N0 M0, 1 cT3 N3 M0, 1 cT3 N2 M1, and 1 cT4 N0 M0. PET/CT fused images lead to a change of stage in 5/21 cases (23.8%). Two out of 21 patients (9.5%) staged N0 at CT changed to N2 (inguinal lymph nodes) and a patients (4.7%,) changed from N0 to N1 (precoccygeal lymph node). In other 2 patients (9.5%), PET/CT detected distant metastases, in external iliac lymph nodes in a case and in the liver in the other one. In the case with liver multiple metastases, the treatment intent changed from curative to palliative. PET/CT lead to a change of the CTV1 and consequently the PTV1 in 3 cases (14.3%): 2 cases detected with positive inguinal lymph nodes and a case detected with positive external iliac lymph node. In these patients a boost dose was applied. The present study showed that FDG-PET/CT has a potential impact in staging and treatment planning of anal carcinoma. Clinical stage variation was observed in 23.8% of cases with a change of treatment intent in 5% whereas CTV and PTV changed in 14.3% of cases.

Intra-operative radiotherapy (IORT) during radical prostatectomy for locally advanced prstate cancer: technical and dosimetrical aspects
The aim was to analyze the feasibility of intra-operative radiotherapy (IORT) in patients with high risk prostate cancer and candidates for radical prostatectomy. Thirty eight patients with locally advanced prostate cancer were enrolled. No patients had evidence of lymph node or distant metastases, probability of organ-confined disease >25%, and risk of lymph node involvement >15% according to the Memorial Sloan Kettering Cancer Center Nomogram. IORT was delivered after exposure of the prostate by a dedicated linear accelerator with beveled collimators using electrons of 9-12 MeV to a total dose of 10-12 Gy. Rectal dose was measured “in vivo” by radio-chromic films placed on a rectal probe. IORT was followed by completion of radical prostatectomy and regional lymph node dissection. All cases with extracapsular extension and/or positive margins were scheduled for postoperative radiotherapy. Patients with pT3-4 disease or positive nodes received adjuvant hormone therapy. Mean dose detected by radio-chromic films was 3.9 Gy (range 0.4-8.9 Gy) to the anterior rectal wall. IORT procedure lasted 31 minutes on average (range 15-45 minutes). No major intra- or post-operative complications occurred. Minor complications were observed in 10/33 (30%) of cases. In the 27/31 patients who completed the postoperative external beam radiotherapy, 3/27 experienced grade 2 rectal and 1/27 grade 2 urinary toxicity. IORT during radical prostatectomy is a feasible procedure and allowed to safely deliver postoperative external beam radiotherapy to a total dose of 50 Gy to the tumor bed without relevant acute rectal toxicity.

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Orario di Ricevimento

SCDU Radioterapia “Azienda Ospedaliero-Universitaria “Maggiore della Carità”, Padiglione C, 4° piano

Venerdì ore 12:00

Contatto preliminare via e-mail: krengli@med.unipmn.it