IMRT on the basis of FDG-PET/CT.

Results: All the pts presented and increased uptake of FDG and ATSM, showing highly proliferative and hypoxic tumours. The following table shows the results of imaging procedures.64Cu ATSM presented a biodistribution equivalent or inferior to FDG and the SUV max tended to increase in late acquisitions. After a median follow-up of 10 months (range 1-15 months) 4 pts are in complete remission, 1 pt died after 1 month for persistence of disease and 2 pts currently undergoing to radiotherapy treatment.

PT	GENDER	AGE	PRIMARY TUMOUR	FDG-PET/CT	SUVmax FDG	ATSM PET/CT	SUVmax ATSM early	SUV max ATSM late
1	M	72	Laterocervical with unknown primary	2 left laterocervical lymphnodes	15	1 left laterocervical lymphnodes	2	2
2	M	54	Left oropharynx	Left oropharynx and left laterocervical lymphnodes	9	Left oropharynx and left laterocervical lymphnodes	2.3	2.3
3	F	64	Left tonsil	Left tonsil	25	Left tonsil	1.7	3.9
4	M	57	Left tonsil	Left tonsil and multiple left lymphnodes	9	Left tonsil and 2 lymphnodes	6.8	6.1
5	F	45	Left tonsil	Left tonsil	12	Left tonsil	1.7	2
6	M	66	Larynx	Larynx	22	Larynx	24.9	31
7	M	57	Larynx	Larynx	13	Larynx	10	11
Mean		59.3			15.6		8.1	8.6
median		57			15		2.3	3.9

Conclusions: 64Cu ATSM PET/CT did not change the radiotherapy plan. A wider population of pts (especially with negative ATSM PET/CT) is needed to understand whether ATSM uptake is a prognostic factor or not, and to clarify if adding a boost of dose in ATSM positive areas may change pts prognosis.

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A COMPARISON OF RADIOTHERAPY PLANNING TECHNIQUES FOR A COMPLEX CASE OF SINONASAL UNDIFFERENTIATED CARCINOMA

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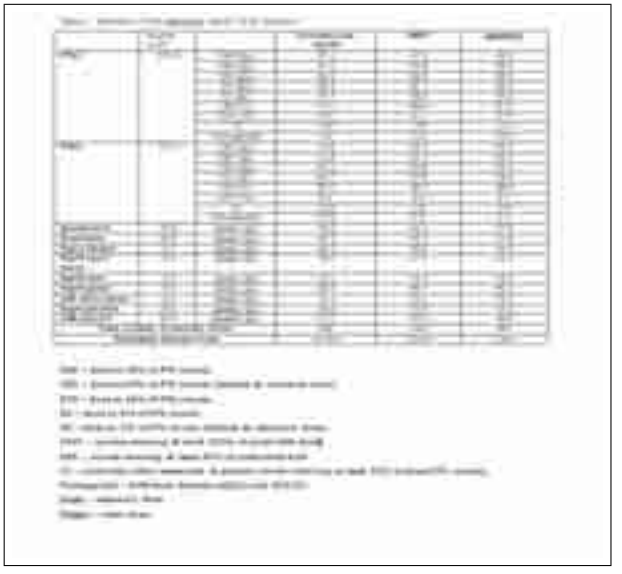
Purpose: Sinonasal undifferentiated carcinoma (SNUC) is a rare malignancy arising in the paranasal sinuses and commonly presents at an advanced stage with poor prognosis. The recommended treatment for operable disease is surgical resection and post-operative radiotherapy. We present the case of a 66 year old patient with an extensive locally advanced SNUC arising in the nasal cavity, invading the anterior skull base and left optic nerve. She was treated with radical chemoradiotherapy using IMRT. The aim of this study is to perform a retrospective planning comparison between the fixed gantry IMRT plan, a conventional 3D conformal radiotherapy (3DCRT) plan and a volumetric modulated arc therapy (RapidArc (RA)) plan to evaluate the optimal treatment plan for this complex case.

Materials: The same planning CT dataset was used in all the plans. The dose prescription to the primary PTV (PTV1) was 65Gy in 2.17Gy/fractions and 54Gy in 1.8Gy/fractions to the elective PTV (PTV2). The planning objectives were to achieve maximum dose <107% and minimum dose >95% to the PTVs. Due to left-sided visual loss, maximum priority was placed on achieving dose constraints of <50Gy to the right optic nerve (RON) and optic chiasm (OC). Standard dose constraints were used for the other OARs. The fixed gantry IMRT plan was optimised using seven coplanar fields. The 3DCRT plan used an anterior and parallel opposed lateral fields to the primary tumour and matched anterior fields to the neck. The RA plan was optimised using two 360° coplanar arcs in clock- and counterclock-wise directions. Quantitative analysis of the plans was performed using DVHs. PTV conformity and homogeneity, MU and delivery time were assessed.

Results: Dosimetric results from DVH analysis of the plans are shown in Table 1. PTV coverage was better in the IMRT and RA plans compared to the 3DCRT plan but not significantly different between the IMRT and RA plan. PTV1 coverage was compromised in all the plans due to the close proximity with the RON and OC. PTV1 maximum doses (D2%) were 108%, 105% and 106% of the prescription dose in the 3DCRT, IMRT and RA plans respectively. PTV1 minimum doses (D95%) were 68%, 92% and 90% of the prescription dose in the 3DCRT, IMRT and RA plans respectively. PTV conformity and homogeneity was similar between the IMRT and RA plans. All plans achieved the dose constraints to the RON and OC. Spinal cord maximum doses were lower in the RA plan while brainstem maximum doses were slightly lower in the IMRT plan. Parotid gland sparing was not achieved due to the small volume of the glands. The RA plan required fewer MU (48% less) and shorter delivery time (reduced by a factor of 5) compared to the IMRT plan.



Conclusions: IMRT and RA techniques achieved comparable treatment plans which were superior to the 3DCRT plan in this case. Both techniques should be considered for such technically complex planning cases. RA has the additional benefit of reduced MU and delivery time.

813 poster

A RANDOMISED STUDY COMPARING TWO IMMOBILISATION DEVICES FOR PATIENTS RECEIVING RADIOTHERAPY FOR HEAD AND NECK CANCER (H & N) VIA CONE-BEAM CT.

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Purpose: Two forms of immobilistion , clear plastic shells and a commercial thermoplastic material were compared for immobilisation , cost and radiation skin reaction .Both types of immobilisation device locate onto a carbon fibre and individual T-shaped vacuum bags were used as headrests.

Materials: 30 patients with oropharyngeal cancer were planned using the treatment planning system and treated using intensity modulated radiotherapy (IMRT) on a Varian linear accelerator with cone beam computerised tomography (CBCT) facility. All patients had CBCT's at fractions 1-3 and then weekly once the systematic errors had been identified and the random errors were within departmental tolerances. The CBCT's were registered with reference scan on line at the superior, centre and inferior levels of the PTV. The results from the match of reference scan with CBCT were used to compare the interfraction displacement for both types of immobilisation mask. The interfraction displacements were separated into systematic (Σ) and random errors(σ). For each patient, the average displacement (Mp) and the standard deviation (SDp) of all the displacements over all fractions were calculated. The systematic error was calculated from the standard deviation of Mp of all patients for both types of immobilisation mask; the random error was calculated as the root-mean-square over all SDp.

Results:
Conclusions: The study showed that Thermoplastic and clear plastic shells produced similar patient immobilisation , equivalent in cost , however , the clear plastic shells produced more severe skin reactions.

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ACCELERATED FRACTIONATION FOR EARLY GLOTTIC CARCINOMA – SINGLE INSTITUTE EXPERIENCE

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Purpose: To report the outcomes of definitive accelerated radiotherapy (RT) for early stage squamous cell carcinoma (SCC) of the glottic larynx.
Materials: Retrospective analysis of 275 patients with T1-T2 N0 squamous cell carcinoma of the glottis treated between 2003 and 2008. All patients were treated with an accelerated radiotherapy schedule of 52.5Gy /15fr (3.5Gy/fr) over 3 weeks.
Results: The median follow-up is 46 months. The 5 year disease free survival rates were : T1a,94 %; T1b,94.5%; T2,89.9% and overall 93.4%. Seventeen (6.2%) patients relapsed either locally or in the neck, of which 11 patients were salvaged successfully by surgery with an ultimate local control of 96% at 5 years. In univariate analysis, involvement of the subglottis was the only factor found to influence the local control and overall survival. Eighteen patients (6.5%) had loss of laryngeal function due to laryngectomy (8 patients) or tracheostomy (10 patients). Three (1.1%) patients developed chondronecrosis which required laryngectomy and10 (3.6%) patients had dyspnoea due to laryngeal edema which required tracheostomy. The 5 year survival rates with laryngeal function preservation are T1a, 94.5%; T1b, 85.7%; T2, 79.7% and overall 90%. Tumour stage and subglottis involvement were found to significantly influence the laryngeal function preservation rates.
Conclusions: Accelerated radiotherapy has excellent cure rates in T1-T2 N0 glottic SCC and has very low rates of severe late complications.

815 poster

ADVANCED RADIATION THERAPY PLAN FOR GLM BASED ON FMRI

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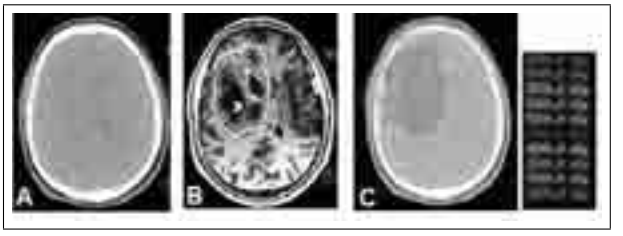
Purpose: Following radical radiotherapy (RT), high grade gliomas such as glioblastoma multiforme (GBM) frequently recur within the high dose volume and it is plausible that conventional planning margins might be reduced without a loss of local tumour control. Akin to the current evaluation of reduction in the dose delivered to the hippocampal and limbic systems to reduce radiation-related memory impairment, other uninvolved critical functional cerebral areas should be spared to minimise the potential acute and late toxicities of radiation therapy. The aim of this study was to explore the impact of speech centre localisation using functional MRI (fMRI) on the RT planning process in GBM.
Materials: Language function was activated in a 68-year old male with a right fronto-parietal GBM using a 'word generation' task. Block designed blood oxygenation level dependent (BOLD) fMRI was applied (1.5 T Siemens Avanto scanner) during lingual stimulation [1]. BOLD-clusters were assessed individually for anatomical localization. fMRI was performed using EPI sequence and T1-weighted anatomical 3D VIBE sequence was used for functional image analysis and overlay [1]. The functional image analysis and overlay procedures were performed using BrainVoyager (BrainInnovationBV, Maastricht, The Netherlands). A CT scan (Siemens Open Sensation) was performed to delineate the radiation target volume and organs at risk (OAR) (Fig 1A). The fusion of the 3-D anatomical and functional datasets (CT+fMRI) as well as the segmentation of the radiation target volume was achieved using Siemens Oncology workstation (Fig. 1B). The speech centres were defined as OARs in the IMRT planning process (mean 45 Gy, max. 50 Gy) (Fig. 1C). The treatment plan (Pinnacle 8.0m TPS, Philips Healthcare, The Netherlands) was not used clinically and the patient was informed.
Results: Speech activation areas and the GBM (as defined on the T1 MRI images) could be visualised separately. The plan did not compromise any other constraint and spared the critical structures. The mean and maximum doses to the PTV (60 Gy prescribed to 100%) were 61.97 Gy and 69.47 Gy respectively. Broca's area was partially within the PTV, however the mean and maximum doses to Wernicke's area were 36 Gy and 52.81 Gy (Fig. 1C).
Figure 1. A) CT scan, B) Broca's and Wernicke's areas as detected by fMRI and C) axial slice through radiation treatment plan.



Conclusions: Our 3-D CT/fMRI fusion protocol provides a method to localise the speech centres and thus to define them as OARs for clinical radiotherapy planning. This novel technique enables the first steps towards the individualisation of radiotherapy treatment planning for selected patients with glioma, where the tumour does not overlap the speech areas. [1] Berberat et al. Radiother Oncol 96: Suppl. 1; 1136, 2010

816 poster

ALTERNATING CHEMO-RADIOTHERAPY FOR ADVANCED HEAD AND NECK CANCER: 30 YEARS OF EXPERIENCE IN GENOA

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Purpose: To review data from advanced HNSCC pts enrolled in several CTRT clinical trials exploring the alternating approach devised at National Institute for Cancer Research Genoa, Italy.
Materials: From 1983 to 2010, 662 pts with stage II-III-IV HNSCC/UNPC or relapsed after surgery were treated with different CT-RT cooperative protocols aiming to improve outcome and toxicity
Results: The clinical trials were carried out to assess the role and/or timing of alternating CTRT in comparison to conventional or accelerated RT and to evaluate how to safely intensify this strategy. These issues were addressed by a phase III randomized trial (HN7) published in 1988 and updated in 1991: 116 pts were randomized to receive sequential CT(VBML)RT vs alternated CTRT (ALT-VBML). The ALT-VBML RT arm had better complete response, PFS and OS but worse mucosal toxicity. Results from two subsequent phase II trials published between '88 and '90 showed good results with mild toxicity in 34 pts treated with ALT CT (Cisplatin-5FU)RT and good results with high toxicity in 16 pts treated with the CT (Cisplatin-5Fu) alternated with RT given in 2 courses of 32 Gy/10 fx/2Gy Bid each. Owing to the interesting results of the platin based ALT CTRT, in 1996 the results of a second phase III trial (HN8) that addressed the question about the superiority of ALT CTRT over RT alone were published: data from 157 pts showed significantly better results for the ALT CTRT group. In 1997 a comparison between the HN7 and HN8 arms (273 pts) showed better outcome in pts treated with CDDP ALT CTRT. In 2001 data from a phase III randomized trial (HN9) showed in 136 patients no better results with ALT CTRT when compared with partly accelerated RT (PART). In 2008 we explored ALT CTRT after induction CT in 50 pts with stage IV UNPC with excellent outcome (OS 81%9 . Between 2001 and 2008, data from three trials, addressing the question if different doses of a strong radiosensitizer as Gemcitabine added to ALT CTRT could further improve outcomes, were published. As 2 trials (9 and 47 pts) with different full doses of GEM added to ALT CTRT showed good results in terms of outcome but high rates of grade III-IV toxicity, a third trial (47 pts) with low doses of GEM added to ALT CTRT was performed with improved long term outcome and an acceptable increase of mucosal toxicity. The step forward further improvement of outcome and toxicity profile has been made with the ALTERC trial which has explored the benefit of adding to ALT CTRT a biologic agent as Cetuximab given weekly concurrent to RT. Data published in 2010, from the 45 pts enrolled, show high rates of CR and good toxicity profile. Results are shown in tab 1