

EP-2352 Evaluation of an automatic delineation software for organs at risk and lymph nodes in breast cancer

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Purpose or Objective

The intensity modulated radiation therapy (IMRT) needs a precise delineation of target volumes and organs at risk. Therefore there is an increase in the time spent on this procedure. The purpose of this study is to evaluate an automatic delineation software, Workflow Box (Mirada Medical, UK), for the everyday use of OAR and lymph nodes (LN) delineation in patients treated for early stage breast cancer.

Material and Methods

Twenty patients' CT scans in treatment position for their breast cancer radiotherapy were delineated in respect of the ESTRO delineation guidelines to begin the creation of automatic delineation atlas. Then 30 others CT scans were delineated this time by the automatic delineation system and by the radiation oncologist (reference delineation plan). The precision of the delineation was evaluated using Overlap Volume (OV) Index and evaluation of standard deviation (SD).

Results

Regarding the OAR, the mean OV were between 0.49 (SD = 0.21) and 0.97 (ET= 0.03). Five OAR of 9 have shown OV \geq 0.8. The mean OV for all OAR was 0.77 (SD=0.17). The system was less performing for the lymph nodes volumes with a mean OV of 0.43 (SD=0.1) and the OV were between 0.23 (SD= 0.13) and 0.52 (SD= 0.1). The use of this software reduced the delineation time by 40% per patient.

Conclusion

For patients with breast cancer, the automatic delineation software Workflow Box (Mirada Medical, UK) has allowed to reduce the time devoted to delineation with acceptable OAR contours. Improvement of delineation of the LN volumes is needed. A new evaluation will be realized after the use of the system in the routine practice.

EP-2353 Influence of MRI/CT fusion image on target volumes delineation for RT of cervical vertebra tumor

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Purpose or Objective

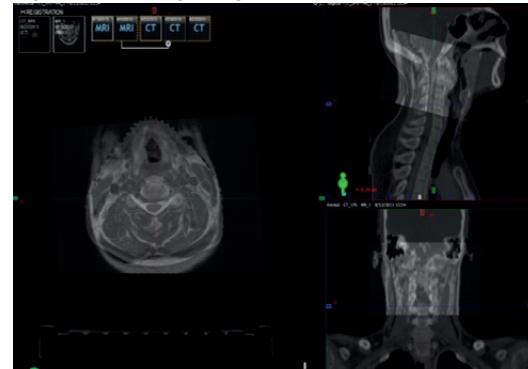
To compare the differences of target volumes and dose distribution between outlined based on MRI/CT fusion image and based on CT image. To investigate the accuracy of target delineation on MRI based image

Material and Methods

10 cases with primary cervical malignant tumor received IMRT in our center. Patients commit cervical spine column MRI examination (GE Discovery MR 750 3.0T) follow routine procedural of radiology department. The images of MRI of each patient transferred to our TPS work station (Varian) by PACS (Picture Archiving and Communication Systems) to registrate with CT image of treatment plan. 5 physicians outline the target on MRI/CT fusion based image and CT based image respectively. Target volumes outlined and dose distributions analysed on different bases of Image To compare the differences

of target volumes and dose distribution between outlined based on MRI/CT fusion image and based on CT image. Interobserver difference on different image based target outline were analysed.

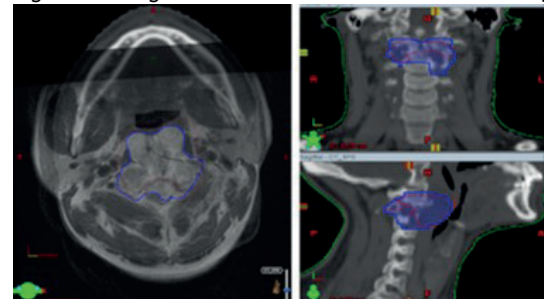
Figure 1 . Image registration on TPS work station



Results

The target (GTV and Cord) volume outlined on base of MRI/CT image and base of CT were different. $GTV_{MRI/CT}$ volume $>$ GTV_{CT} volume. The VOI (Volume Overlap Index) was 0.84 ± 0.17 . $Cord_{MRI/CT}$ volume $<$ $Cord_{CT}$ volume. The target volumes outlined interobserver of 5 physicians were different, Coefficient of Variation $CV_{MRI/CT}$ (GTV and cord) were all lower than CV_{CT} (GTV and cord), 24% and 37% (GTV), 31% and 48% (Cord). The dose distributions ($V100\%$ & $V105\%$ $_{MRI/CT}$ and $V100\%$ & $V05\%$ $_{CT}$ of GTV) on base of MRI/CT image and base of CT image were significantly different. Dose parameters of spinal cord $Dmax_{MRI/CT}$ and $Dmax_{CT}$ were 46.00 ± 1.09 Gy and 52.39 ± 1.34 Gy ($F=7.627$, $P=0.014$); $D2\%$ $_{MRI/CT}$ and $D2\%$ $_{CT}$ were 45.60 ± 3.78 Gy and 48.90 ± 8.97 .

Figure 2. Target volumes outlined on different image.



Conclusion

$GTV_{MRI/CT}$ volume $>$ GTV_{CT} volume, Not easy to cause the target omissions; $Cord_{MRI/CT}$ volume $<$ $Cord_{CT}$ volume, facilitate target dose boost. Target delineation on MRI/CT fusion image reduce the discrepancy of interobserver physicians. MRI/CT fusion image should be used for accurate target outline and accurate treatment planning.

EP-2354 Impact of PET-TC-simulation in radiotherapy treatment planning in nasopharyngeal carcinoma

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Purpose or Objective

To analyze the impact of simulation by PET-CT versus RMI & CT on gross tumor volume (GTV) and planning target volume (PTV) in nasopharyngeal carcinoma (NFC) patients.

Material and Methods

From 2014 to 2016, 20 consecutive nasopharyngeal carcinoma patients were enrolled. All of them underwent a full body 18F-FDG-PET-TC, by a hybrid PET-CT with automatic image fusion (Discovery 600, General Electric), to staging or re-staging and at least another diagnostic image; 12 a contrast CT, 16 a MRI and 7 both. In patients without distant metastases a late cervical selective study (85 min-3.3 h after injection of 18F-FDG) for RTP was performed using laser positioning and the required immobilization devices. In order to evaluate the differences, we recorded and compared the volumes of GTV and PTV (in cc) contoured with the diagnostic RMI and CT and those contoured using the tree explorations, PET/TC, RMI and CT. The volumes automatically contoured based on relative thresholds of the maximum tumor intensity standardized uptake value (SUV) (40% and 50% SUVmax) were also collected. Differences between the volumes were evaluated using paired Wilcoxon signed rank test for continuous variables and McNemar test for dichotomized variables. Statistical analyses were performed using SPSS_22.

Results

Age: Mean 43 years (range 31-57). Gender: 12 males and 8 females. Histology: Non-Keratinizing differentiated carcinoma 9 patients (45%), Non-Keratinizing undifferentiated carcinoma 9 patients (45%), and Keratinizing carcinoma 2 patients (20%). Metastatic disease was detected in 5 (25%), therefore 15 patients were analyzed. Besides, the nodal stage was changed in 7 patients. All volumes were reduced with a significant difference. The GTV PET/CT was lower in 13 cases (60% of the patients) with a median reduction of 13 cc (range: 0-23 cc) ($p=0,004$). The volume of concordance between GTV CT and GTV PET/CT had a median value of 19 cc (range: 15-27) which means that it matches 80% with final GTV PET/CT. The PTV PET/CT was lower in 15 cases (100%) with a median reduction of 59 cc (range: 20-70) ($p=0,001$). An important reduction ($p=0,001$) of the GTV PET-CT volumes contoured automatically with 40% and 50% SUVmax: 14 cc (range: 10-31) and 10 cc (range: 5-17), respectively was observed, being the GTV 40% SUVmax the most similar to the final GTV PET/CT. (Table1) (Figure1).

Table1. Final volumes results

	GTV TC	GTV PET/TC	PTV TC	PTV PET/TC	GTV SUV40%	GTV SUV50%	Concordance Vol (GTV PET/TC-CT)
Vol cc	40	24	108	49	14	10	19
% Vol matching final PET/TC treatment	167%	100%	220%	100%	58%	42%	79%
	$p=0,004$		$p=0,001$		$p=0,001$		

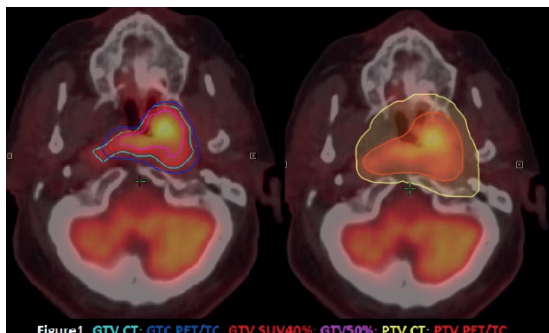


Figure1. GTV CT; GTV PET/TC; GTV SUV40%; GTV SUV50%; PTV CT; PTV PET/TC

Conclusion

In the patients studied, PET-CT-based planning allows an accurate delineation of volumes, reducing target volumes and modifying radiotherapy cervical treatments. A large number of patients are needed to confirm our preliminary data. Therefore, recruitment continues.

EP-2355 Impact of DIBH irradiation on dose reduction to the heart and left coronary artery in breast cancer

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Purpose or Objective

The aim of the study was to assess the impact of deep inspiration breath hold (DIBH) irradiation on dose reduction to the heart and left coronary artery (LCA) in left-sided early breast cancer patients treated with intact breast.

Material and Methods

We analyzed dose to the heart, LCA and ipsilateral lung on DIBH and free breathing (FB) plans of 30 consecutive patients treated with tangential 6MeV photon fields. 50Gy in 25 fractions to the PTV (whole breast with 5mm margin) was prescribed.

Results

Mean heart dose (MHD) was significantly lower in DIBH comparing to FB (2,9 vs. 5,9Gy; $p<00001$). Mean MHD reduction between DIBH and FB was 3,1Gy. Mean and maximum LCA doses were also reduced in DIBH (16,1 vs. 30,4Gy; $p<00001$ and 38,7 vs. 50Gy; $p<0,0001$; respectively). Mean lung dose was significantly lower in DIBH comparing to FB (9,7 vs. 11Gy; $p=0,002$). Lower MHD dose did not correlate with lower mean LCA ($p=0,14$) and maximum LCA ($p=0,76$) dose in the whole group. Only in patients with modest MHD reduction (defined as <3 Gy difference between DIBH and FB) maximum and mean LCA doses were significantly reduced in DIBH (39 vs. 49,6Gy; $p=0,006$ and 16,2 vs. 27,9Gy; $p=0,0001$; respectively).

Conclusion

DIBH in early left-sided breast cancer patients allows for significant MHD, LCA and left lung MLD dose reduction. Patients with modest MHD reduction in DIBH have also significantly lower doses to the LCA.

EP-2356 Inter-observer variability in OAR and target volume delineation in curative prostate cancer patients

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Purpose or Objective

In North Estonia Medical Centre prostate and OAR-s delineation is assigned to RTT-s who work in the radiotherapy department CT-SIM room. Previously the radiation oncologists did the delineation of prostate and OAR-s, but due to increasing workload the RTT-s have taken over during few previous years. The expectations for RTT-s are high - in addition to delineate easily detectable OAR-s as the lungs, spinal cord etc. they also delineate the OAR-s in the head and neck patients, SBRT and SRS cases and pelvic patients. To find out the need of precise instructions and need of training an inter-observer delineation study was done.