exploration by axillary-thoracotomy remains the procedure of choice for patients undergoing pulmonary metastasectomy, because of limitation in preoperative radiological assessment of lung lesions smaller than 5 mm.

We reviewed our series on thoracotomic metastasectomy performed for various primary tumors and tried to establish better prognostic indicators for its surgical application. 163 patients underwent lung metastasectomies from January 2001 to January 2012 in our Department. Lung metastases were from colorectal cancer in 75 patients, renal cells carcinoma in 20, breat in9, gynaecologic tumor in 17, head and neck cancer in 12, bone and soft tissue sarcoma in 12,melanoma in 9, hepato and biliary tract in 4 patients. The mean disease-free interval (DFI) was 36,9 months. 89 patients had a single-lung metastasis, 49 oligometastases, 25 multiple metastases.

The actuarial survival after complete metastasectomy was 83% at 1 years, 52%at 5 years and 16% at 10 years.The absence of mediastinal lymph node involvement, a limited number of pulmonary metastatic lesions, a long disease-free interval, small metastasis, and no elevation of tumor markers seem to be prognostic factor in patients with pulmonary metastases. The true survival benefits of pulmonary metastasectomy remain unclear since there have been no randomized trials. However, surgical resection of overt pulmonary metastases can render some patients free of disease for long periods.

SP-0056

SBRT for lung metastases - patient selection and evidence needed

A. Bezjak[1]
[1]*Princess Margaret Cancer Center, Department of Radiation Oncology, Toronto, Canada*

Stereotactic Body Radiotherapy (SBRT) or as it is referred to, Stereotactic Ablative Radiotherapy (SABR) has emerged as an effective local modality for lung lesions, whether early stage lung cancers in medically inoperable patients, or lung metastases from other primary tumors. Many series describe the safety and effectiveness of lung SBRT – it is well tolerated, convenient for patients, non-invasive, and is associated with very mild acute side-effects, and a low reported rate of significant late effects. The main challenges in implementing it for patients with lung metastases lie in patient selection, deciding on goals of therapy, and what level of evidence is needed to proceed with treatment.

A rationale approach to offering SBRT for lung metastases is to use the same criteria as surgical series, and as documented in the large international Lung metastases registry. Patients who are most likely to benefit from a radical “curative” approach to their lung metastases are those who have no evidence of disease elsewhere, a longer period from initial diagnosis to onset of lung metastases, one to max three lung metastases and no nodal disease. Critical issues to consider is whether this is indeed a metastasis from the previously diagnosed extra-thoracic cancer, or possibly a new lung cancer, and what will the decision making be once post-SBRT changes on CT scan make the assessment of the local control challenging. If the goal of treatment is control of the lung lesion with minimal negative quality of life impact, then the non-invasive nature of SBRT and low rates of serious side-effects for peripheral lesions is an attractive consideration. If however the focus is on definitively knowing the status of the lung lesions, especially if the patient is fit and a good surgical candidate, then the uncertainty of radiological changes post-SBRT is a current challenge in managements. Current research will likely shed light on this challenge for the future. For the time being, discussion of suitable patients in a multidisciplinary setting, with input from treating oncologists and surgical and radiation specialists, and education of patients, radiologists and all members of the team to the post-SBRT changes will facilitate optimal management of patients, while evidence continues to accumulate.

An interesting question is what evidence should we have in order to offer SBRT for patients with lung metastases. Just because we can treat lung metastases with SBRT, should we?? An ideal situation would be to have high quality data from multiple controlled randomized trials, ideally randomizing patients to standard care vs Lung SBRT. An immediate question that remains unresolved is what would standard care be? Chemotherapy ie systemic therapy alone? No therapy or systemic therapy, at the choice of oncologist and patient? Or should surgical resection be the control arm? There are some attempts to compare surgical resection to lung SBRT for primary lung cancer, although most experts feel that the more pertinent question is whether patients (or more likely, which patients) benefit from local ablative therapy to their lung metastases. Thus, a randomized study of local SBRT therapy vs “management of choice that does not include local lung metastases therapy” would be most likely to shed light on the benefit of lung SBRT in improving survival, and potentially leading to a proportion of patients with lung metastases being cured. Such efforts are underway, and will be discussed.

PROFFERED PAPERS: PHYSICS 1: IMAGING IN RADIOTHERAPY: TECHNICAL DEVELOPMENTS

OC-0057

Assessment of geometric distortions in diffusion weighted MR imaging in head and neck cancer

T. Schakel[1], C.H.J. Terhaard[1], J.M. Hoogduin[2], M.E.P. Philippens[1]
[1]*UMC Utrecht, Radiotherapy, Utrecht, The Netherlands*
[2]*UMC Utrecht, Radiology, Utrecht, The Netherlands*

Purpose/Objective: Diffusion weighted magnetic resonance imaging (DW-MRI) is a functional imaging technique increasingly used for tumor and recurrence diagnosis and response prediction and monitoring. Due to the high contrast between tumor and surrounding tissue, DW-MRI might be a suitable candidate to facilitate GTV definition. However, the use of DW-MRI for tumor delineation in head and neck RT is hampered by geometric distortions. These distortions are caused by the use of echo planar imaging (EPI) in combination with an anatomical region with air/tissue transitions. These transitions lead to susceptibility differences and thus magnetic field (B0) inhomogeneities.

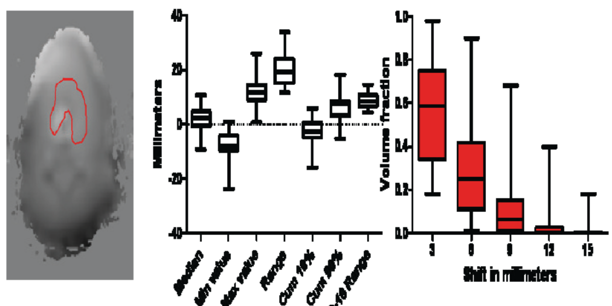
The EPI distortions can be estimated by characterizing the magnetic field inhomogeneities and the effective spectral width per pixel in the EPI sequence [Jezzard 1995]. The aim of this study was to quantify geometrical distortion of DW-EPI in head and neck tumors.

Materials and Methods: In this retrospective study, 27 head and neck cancer patients scanned between April 2011 and March 2012 were analyzed. For these patients, a B0 map was acquired during standard RT treatment planning scans. MR imaging was performed at 3.0T (Philips Achieva) and the patients were scanned in an RT immobilization mask with Flex-M surface coils.

MR sequences: B0 map: mDixon 3D T1 FFE; 3-point multi acquisition Dixon; ΔTE 1 ms; TR/TE 5.7/2.0 ms; acquired voxel size 2.0 x 2.0 x 2.0 mm3; FOV 250 x 250 x 150 mm3; acquisition time 0m42s. DW-EPI: Single shot SE EPI; EPI factor 43; b-values 0, 150, 800 s/mm2; TR/TE 3699/66 ms; acquired voxel size 3.0 x 3.0 mm2; slice thickness 3.0 mm; number of slices 40; FOV 250 x 250 x 120 mm3; SENSE factor 2; bandwidth/pixel (phase encode) 35 Hz; acquisition time 2m35s.

GTVs, as delineated by the radiation oncologist, were retrieved and transferred onto the acquired B0 maps (fig **1A**). The B0 maps were converted to pixel shift maps using the bandwidth per pixel from the DW-EPI sequence, which was converted to millimeters using the voxel size. Statistical analysis was performed on the displacements within these GTVs and the results were averaged over all patients.

Results:



A: B0 map with GTV delineation

B: Displacements in GTV derived from B0 maps

C: Fraction of the GTV volume that shifts at least X millimeters for all patients

The displacement occurs only in the phase encoding direction of the DW-EPI scan, which was AP. Median displacement is relatively small because both positive and negative shifts were found. The median minimal and maximal displacements were around 1 cm but the extremes showed shifts of more than 2 cm (fig **1B**). The distortions within the GTV can be estimated from the range in displacements. Within the GTV a median range of 2 cm was found with a maximum of 3.5 cm. If the extremes are ignored, still a median range of shifts of 1 cm was found (fig **1B**). The median fraction of the GTV that showed a displacement of 6 millimeters (2 voxels) or more was 0.24 (fig **1C**).

Conclusions: Current DW-EPI images in the head and neck area show displacements and distortions up to several centimeters which severely restricts its usability for GTV delineation in RT treatment planning.