In operable patients the upcoming OPERA randomized trial will like the Lyon R96-02 try to show that CXB in addition to CRT (CAP 45) may achieve in T2 T3a-b at least 40% of organ preservation with good bowel function. The new machine Papillon+™ will bring some technical improvements. But the most important issue is that radiation oncologists willing to use CXB must get a good clinical practice of rigid rectoscopy on an ambulatory basis.

References


SP-0224

Endoluminal radiotherapy in rectal cancer: Which questions do we need to answer?
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In the treatment of rectal cancer, total mesorectal excision surgery is now the standard of care. In most patients, surgery will be preceded by external beam radiotherapy (EBRT), either in a short course (25 Gy/5 fractions) or in a conventional schedule (45-50 Gy/25 fractions) with chemotherapy. Brachytherapy (BT) is an appealing alternative to EBRT. In comparison to the EBRT, it offers the advantage of delivering a high dose of radiation with a rapid dose fall-off around the site of interest (tumor target). This results in the sparing of normal tissues such as small bowel but also the bladder, the prostate, anal sphincter and skin.

In order to understand why brachytherapy may work as replacement for external beam radiotherapy, an exact target volume definition for rectal cancer is required, based on precise data on the local recurrence patterns. The decision which nodal regions should be included in the clinical target volume is often topic of discussion. In general, it can be stated that the highest risk of lymph node involvement is in the mesorectal fat. In addition, the presacral space and the internal iliac region are at risk. Depending on the exact localization and tumor stage, the obturator nodes, the external iliac nodes and the inguinal nodes may sometimes be affected. For years, this has lead to a more or less standard clinical target volume, including the primary tumor, the mesorectal fat and the presacral and internal iliac lymph node regions. However, given the limited number of recurrences after TME surgery, the standard clinical target volume can be seriously questioned.

Another interesting application of endoluminal brachytherapy is the ability to increase the dose on the primary tumour. In elderly patients, standard surgery may be hampered by the...
fact that the risk of morbidity and mortality can be too high. For these patients unfit for surgery, definitive radiotherapy is an option that should seriously be considered. This, however, requires a higher dose on the primary tumour, to increase the likelihood of complete response. In this respect, brachytherapy (BT) is an appealing treatment modality. In comparison to external beam radiotherapy, it offers the advantage of delivering a high dose of radiation with a rapid dose fall-off around the site of interest (tumour target). From published studies it is clear that for relatively small tumours, local treatment with either contact X-rays or intraluminal brachytherapy is a reasonable option. For patients with larger tumours, the risk of nodal involvement makes the combination of local radiotherapy with external beam radiotherapy necessary.

So far, this combination has mainly been given with contact X-rays and only sporadically with intraluminal brachytherapy. In this presentation, a summary of published studies will be given, with an update on the HERBERT trial, a brachytherapy trial for medically unfit patients with T2-T4 rectal tumours.

Symposium with Proffered Papers: Focused and focal therapy via brachytherapy in prostate cancer

SP-0225
Defining the focal volume; how reliable is MR imaging?
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Prostate cancer is a major health issue in aging men. No treatment is required in less aggressive prostate cancer but there is consensus that radical treatment is needed in aggressive prostate cancer. Radical treatment has to start while the tumor is still confined to the gland and has not spread beyond. Potential side effects of radical treatment, such as impotence and incontinence, have a substantial impact on quality of life. This is of special importance because more than 25% of patients eligible for radical treatment are in the age range of 40 to 65 years.

Conventional anatomical T2-weighted MR imaging is the mainstay in prostate cancer imaging. On T2-weighted MR images, normal prostate tissue displays an intermediate to high signal intensity while the central gland has lower signal intensity than the peripheral zone. Currently several new MR imaging techniques are being explored. These include: 1H-MR spectroscopic imaging (MRSI), dynamic contrast-enhanced MR imaging (DCE-MRI), and diffusion weighted imaging (DWI).

MRSI is a unique method that can provide information based on tumor metabolism. The chemical environment of protons within a certain molecule defines their so-called chemical shift: a unique resonance frequency when positioned in a magnetic field, which can be observed in an MR spectrum. Specific spectral profiles reflect the identity of (bio-) chemicals present at that location and the intensity of the spectral signals is related to the tissue levels of these compounds. Analytical and clinical studies have shown significant differences of the metabolic state of the different tissue types by MRSI.

Dynamic contrast-enhanced MR imaging - with a low molecular weight contrast media (<1 kDa) enables non-invasive imaging of tumor angiogenesis. DCE-MRI is the most common imaging method for evaluating human tumor vascular function in situ. Insights into these physiologic processes are obtained qualitatively by characterizing kinetic enhancement curves or quantitatively by applying complex compartmental modeling techniques. Data reflecting the tissue perfusion (blood flow, blood volume, and mean transit time), the microvesSEL permeability, and the extracellular leakage space can be obtained.

Diffusion weighted MR imaging - can quantify the water motion in an indirect manner. The DWI pulse sequence labels hydrogen nuclei in space, of which most will be part of water molecules at any moment, and determines the length of the path that water molecules travel over a short period of time. DWI is able to estimate the mean distance traveled by all hydrogen nuclei in every voxel of imaged tissue. The greater this mean distance the more self-diffusion of water molecules has taken place in a certain time interval. From this estimate an apparent diffusion coefficient (ADC) as a reflection of the self-diffusion of water in tissue in a certain direction can be calculated.

Multiple studies have explored optimal parameter settings for the diagnostic MR-protocol, which allows accurate tumor localization and tumor volume assessment. Although reported accuracies of the different separate and combined multiparametric MR imaging techniques vary for diverse clinical prostate cancer indications, multiparametric prostate MR imaging has shown promising results and may be of additional value in prostate cancer localization and local staging. To increase MR imaging accuracy for the different clinical prostate cancer indications, one or more functional MR imaging techniques should be combined with T2-weighted MR imaging in a multiparametric MR imaging exam of the prostate.

SP-0226
Focal boosts: The best of both worlds?
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High dose rate (HDR) brachytherapy can deliver a high, localised radiation dose to the prostate which results in excellent biochemical control of prostate cancer. Multi-parametric magnetic resonance imaging (mpMRI) can be used to define regions within the prostate that are at highest risk of containing clinically significant tumour. Incorporation of these multi-parametric datasets into the HDR brachytherapy planning process facilitates ‘dose painting’ where regions of greatest risk are given a higher radiotherapy dose using an inhomogeneous plan (figure).

Figure: HDR brachytherapy with focussed dose escalation. A dominant intra-prostatic lesion (DIL) in the right posterolateral peripheral zone has been defined using multi-parametric MRI. High dose rate brachytherapy catheters have been inserted under general anaesthetic. The planning computer optimisation software has been programmed to maximise the radiation dose to the DIL and limit the dose to the rest of the prostate to a defined ceiling.