head and neck cancer CT
personalized treatment
new advances

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since 1982
number of patients with head and neck cancer stable
increasing proportion of cases in 45-54 age group
HPV+ cases increased by 225%
fewer early cancers, more locally advanced diseases
improvement in survival - oral cavity, oropharynx (20%)
no improvement - hypopharynx and larynx

CT - preferred imaging method for the routine evaluation of HNC
will answer most questions of the referring clinician

CT superior to MRI:
- widespread use,
- easy performance, standard reproducibility
- low cost
- short examination time (less motion artifacts)
- superior information on cortical bone
- possibility of adding more anatomical regions

CT - workhorse HNC imaging
head and neck cancer
head and neck CT
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anatomical imaging: CT or MRI alone
to select patients for oncologic therapies - INSUFFICIENT

Noninvasive and repetitive measurements of biological tumor characteristics - potential to PREDICT which patients will BENEFIT from a particular treatment and enable more SPECIFIC SELECTION

Changes in treatment strategy of advanced head & neck cancer, necessitate more ACCURATE radiological evaluation, knowledge of more tumour characteristics and prognostic factors.

New therapeutic strategies evolve with improved understanding of cancer biology and factors affecting prognosis

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personalized cancer treatment
detailed information about cancer
molecular imaging
in vivo characterization and measurement of the molecularly based events that are fundamental to the malignant state

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molecular imaging:
classical imaging
images the advanced manifestation of cancer.
molecular imaging: describes and measures the key biomolecules and molecularly based events that are fundamental to the malignant state.

classical imaging: images the advanced manifestation of cancer.

molecular imaging technologies:
- positron emission tomography (PET)
- single photon emission computed tomography (SPECT)
- computed tomography (CT)
- magnetic resonance imaging (MRI)
- magnetic resonance spectroscopy imaging (MRSI)
- ultrasound
- optical imaging
Molecular imaging can be achieved using endogenous information or exogenous probes.

MR spectroscopy
some optical techniques (Raman spectroscopy)

probes provide imaging signal or contrast

conventional contrast agent

assessment of molecular processes that influence blood flow and vascularization:
Exogenous probes provide imaging signal or contrast. Conventional contrast agent assesses molecular processes that influence blood flow and vascularization:

- Early depiction / detailed description
- Monitoring the early effects and prediction of long-term response to cancer treatments (anti-angiogenesis drugs), radiotherapy, and chemotherapy.

Computed tomography examination + contrast agent administration = molecular imaging technique which is called PERfusion CT (PERFUSION CT).
perfusion CT role in early depiction - detailed description of tumoral tissue


Faggioni L, Neri E, Cerri F et al. Eur Radiol 2010


reconstruction of hard and soft palate with radial forearm free flap

reconstruction of right lateral pharyngeal wall with pectoralis major flap

perfusion CT role in early depiction of tumor recurrence

perfusion CT role in early depiction of tumor recurrence

<table>
<thead>
<tr>
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<th>BF</th>
<th>BV</th>
<th>PS</th>
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perfusion CT role in early depiction of tumor recurrence

analysis of perfusion CT-derived parameters (BF, BV, PS)

allows

precise delineation of the tumor

and

early detection of recurrence

perfusion CT role in predicting response to chemo- radiotherapy

pre-treatment CTP parameters can predict response - BF, BV, PS

BF + BV directly correlated with MVD = CTP as noninvasive marker for tumor MVD and hypoxia

identifying tumors which initially responded to CHRT
reductions in BV - responders
progressive elevations in BV - non-responders

96% reduction in BF and 63% reduction in BV
therapy successfull

BF/BV mismatch - high risk of local recurrence

why should we care?
cure the cancer = eradicate on initial treatment
(salvage rates HNSCC < 20%)

beginning of „individualized” therapy (VEGF, EGF, C)
response during treatment - no longer „wait and see”
why should we care?

- tumor less likely to respond?
- dose modification or adjuvant chemotherapy
- tumor not responding?
- surgery is a GOOD OPTION

early identification of non-responders to RT avoids morbidity and complications of salvage surgery after completed RT

conclusions

new imaging techniques may be helpful in
- defining tumour boundaries
- characterization of lymph nodes
- early detection of recurrence

HOWEVER

the true power of new techniques is
the early monitoring of the effects of NSOPT