NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

Health Technology Appraisal

Intensity modulated radiotherapy for treatment of head and neck cancer

Final Scope

Remit/appraisal objective

To appraise the clinical and cost effectiveness of intensity modulated radiotherapy for the treatment of head and neck cancer

Background

Head and neck cancer is a broad term that includes any cancer with its primary site anywhere from the base of the neck upwards. The definition generally excludes tumours of the brain and related tissues and malignant melanomas. Head and neck cancer can be divided into the following sites: skin and lip, oral cavity, oropharynx, larynx, hypopharyx, nasopharynx, salivary glands, nasal cavity and paranasal sinuses, and external auditory meatus and middle ear. The most common histological type of head and neck cancer is a squamous cell carcinoma, particularly affecting the oral cavity and larynx. Local metastases from head and neck cancer occur frequently, usually spreading through the lymphatic system in the neck. Distant metastases occur less commonly, and metastases from other cancers to the head and neck are rare.

There were approximately 8,000 new registrations for head and neck cancer in England and Wales in 2003, and 2,667 deaths in 2004. The five-year survival rate is approximately 33% but this is dependent on many factors, including the origin of the cancer and stage at diagnosis. Head and neck cancer is three to four times more common in men than in women, and most tend to occur from age 40 onwards. Some of the rarer tumours such as nasopharyngeal carcinomas and salivary gland tumours can occur in people under the age of 40 years. The development of head and neck cancer is associated with tobacco, alcohol and other environmental and dietary factors.

Treatment for head and neck cancer usually consists of a combination of surgery and radiotherapy, and may include chemotherapy. The choice of treatment is made on an individual basis taking into account: the stage of the disease and its potential resectability; any previous treatment; likely treatment related morbidity and functional outcome and consequent effects on quality of life; the patient's general health and the patient's preferences...

Radiotherapy for head and neck cancer is currently delivered using 3-dimensional conformal radiotherapy (3D CRT). It may be administered with curative intent (radical radiotherapy), in order to improve local control following surgery (adjuvant radiotherapy) or to provide symptomatic relief only

(palliative radiotherapy). The side effects of radiotherapy are caused by unavoidable irradiation of the normal tissue surrounding the tumour. In patients with head and neck cancer common side effects that are likely to cause patient discomfort are inflammation and ulceration of the mucous membranes lining the mouth and dry mouth due to a lack of saliva.

The technology

Intensity modulated radiotherapy (IMRT) is the term applied to any radiotherapy where the beam of radiation is not uniform across the field to be irradiated, but consists of beamlets of varying intensity. IMRT is delivered by attaching a multileaf collimator (MLC) to a linear accelerator or by using compensators which are designed and constructed for individual patients. The modulation of the radiation beam in IMRT allows precise delivery to cancerous tissue while sparing surrounding normal tissue from exposure. It is therefore suitable for the delivery of radiation to locations where diseased tissue is located close to vital structures and decreases the side-effects of radiation.

IMRT systems available in the UK include the following models:

Manufacturer	Model
Elekta	Axesse Precise Treatment System Synergy Synergy Platform
Varian	Clinac Trilogy
Siemens	Artiste Primus Oncor Impression Oncor Avant-garde Oncor Expression Simtec
TomoTherapy	Hi-Art

The system requires essential software that allows the physician to determine the dose and distribution of radiation. IMRT makes use of ‘inverse planning’ where the clinician determines the dose and distribution of radiation and computer software works backwards from this to determine the direction and intensity of the beams required to achieve this. IMRT can also be delivered using ‘forward planning’.

Systems that combine the ability to simultaneously image can improve the accuracy of targeting of radiation by compensating for movement of body structures. Imaging also allows verification of the actual dose delivered and

allows for compensation for any deviation from planned dose in subsequent sessions.

Quality assurance (QA) is an important component of IMRT. It consists of checks on the precision of the equipment and verification that the prescribed dose and dose distribution have been planned and are being delivered. For some cancers QA is less time consuming as the QA procedure can be standardised for the class of tumour, but for unusual or complex cancers it needs to be individualised.

Intervention	Intensity modulated radiotherapy
Population(s)	People with head and neck cancer for whom radiotherapy is considered appropriate.
Standard comparators	3-dimensional conformal radiotherapy (3D CRT)
Outcomes	The outcome measures to be considered include: • overall survival • progression-free survival • response rates • adverse effects of treatment • health-related quality of life.
Economic analysis	The reference case stipulates that the cost effectiveness of treatments should be expressed in terms of incremental cost per quality-adjusted life year. The reference case stipulates that the time horizon for estimating clinical and cost effectiveness should be sufficiently long to reflect any differences in costs or outcomes between the technologies being compared. Costs will be considered from an NHS and Personal Social Services perspective. This should include costs for quality assurance and specialist staff.

Other considerations	If evidence allows, the appraisal will seek to identify subgroups of individuals (e.g. by origin of cancer, stage of cancer, performance status or biomarkers, previous irradiation to the head and neck) for whom the technology is particularly clinically and cost-effective.
Related NICE recommendations	Related Technology Appraisals: Technology Appraisal No.145, June 2008 Cetuximab for the treatment of locally advanced squamous cell cancer of the head and neck. Ongoing appraisals. Technology Appraisal in preparation: Cetuximab for the treatment of metastatic and/or recurrent squamous cell carcinoma of the head and neck. Earliest anticipated date of publication: to be confirmed. Related Guidelines: Cancer Service Guidance: Improving Outcomes in Head and Neck Cancers, November 2004.