

BRACHYTHERAPY IN LUNG CANCER

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Brachytherapy, the technique of placing radioactive sources in or alongside tumours, is a long established technique. Its use for lung tumours is relatively new in the U.K. and is still not widely available. It has been made possible by the development of flexible fiberoptic bronchoscopy and by the use of miniaturised, high dose-rate sources, principally Iridium 192. The source, welded to a drive cable, is passed from a safe down a catheter or applicator which has been placed through or alongside the tumour using a standard bronchoscopic technique. Typically, a sausage-shaped field, some 10cm x 2cm in diameter is treated, affecting that portion a tumour which lies within the airways but penetrating very little into surrounding tissue. We have used, for the most part, a single fraction of 15 Gy, calculated at 1cm radius from the centre of the source, this determined by the dwell-time at each position.

We have established that the technique is effective for the primary palliation of inoperable disease, obtaining worthwhile relief of cough, breathlessness and haemoptysis, and with significant success in re-expansion of collapsed lung tissue. We have conducted a series of clinical trials, comparing brachytherapy with external beam radiotherapy (XRT) for primary palliation in good performance patients. The two treatments have produced similar levels of symptom relief but the duration of palliation was slightly inferior to external beam radiotherapy, more patients requiring re-treatment. There was also a small survival advantage with XRT, 287 versus 250 days. Early side-effects were reduced in the brachytherapy group, principally because of the absence of oesophagitis. No significant difference was found in the effects of the two treatments on breathlessness and objective respiratory function. We have also looked at the effect of combining external beam radiotherapy with brachytherapy. The indications are that improved local control is gained at the expense of an increase in the incidence of massive fatal haemoptysis. There was no difference in survival

between the two groups.

Brachytherapy offers additional treatment options and flexibility in a number of situations, including bilateral disease, relapsed disease following external beam radiotherapy, and in the treatment of patients where there is a need to reduce the treated lung volume. Treatment of smaller tumours can produce symptom relief of longer duration and with substantial survival, median survival recorded at 709 days in one such group of 35 patients.

We have used fractionated brachytherapy, usually 3 x 10 Gy, for the radical treatment of small tumours in patients with poor respiratory function or where the tumour was too small to plan an external beam treatment volume. Brachytherapy has also been useful in producing re-expansion of collapsed lung tissue, enabling, thereafter, the proper assessment and planning of a radical external beam treatment.. This group is still under evaluation.

Morbidity was assessed in 406 patients with primary non-small cell carcinoma of the bronchus. The most common early side-effect was mild transient cough. 55% showed some degree of mucosal radiation reaction at re-bronchoscopy, the majority of these showing some fibrosis by 6 months. 32 patients died from massive fatal haemoptysis, a multi-variant analysis showing an increased risk from increased dosage (20 Gy) prior laser treatment, and a second ILT treatment in the same location. Concurrent use of external beam radiotherapy showed a trend to increased risk but failed to reach significance. 20 patients had evidence of recurrent or residual tumour before death. Massive haemoptysis was a late phenomenon at 9-12 months post-treatment, a later peak than other causes.

Pulmonary brachytherapy is valuable as an alternative or additional treatment in a multi-modal approach to lung cancer. Its efficacy needs to be tested by properly conducted randomized clinical trials, a current possibility being a comparison with photodynamic therapy. Capital costs are relatively high depending on the potential for use for other organ cancers in a particular treatment centre but the per-treatment cost is modest, administered in most cases as a single fraction in a day-case procedure. Brachytherapy should be available as a therapeutic option to a regional cancer centre or network.

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