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Radiotherapy in the Elderly

ALTHOUGH there is an obvious need to lay down guidelines for the use of radiotherapy in elderly patients, few books or publications have dealt specifically with this aspect of oncology, usually without providing the detailed information necessary for the development of appropriate routine practice. There is, however, considerable current interest in developing more rational approaches to oncological problems in old age as shown by the organisation in October 1990 of a joint NCI–EORTC consensus meeting by the European School of Oncology on neoplasia in the elderly.

These initiatives complement the efforts directed by oncologists to the treatment of malignant disease in children over the past 20 years. Indeed the considerable volume of data describing tolerance to radiation in childhood contrasts with the paucity of information dealing specifically with comparable problems in the elderly. Oncological approaches directed specifically towards the old age group assume that there are important and relevant biological differences between the elderly and young adults. Clearly in this respect the definition of old age is arbitrary; for example a 60-year-old obese individual with cardiac problems is biologically older than Gandhi in his later years, underlining the fact that the concept of old age is more a combination of chronic pathologies than a straightforward chronological issue.

Epidemiological information, together with medical and ethical factors, underlines the importance of considering geriatric oncology as an integral part of general oncology. In the most common forms of malignant disease (cancers of the lung, prostate and digestive system in men, and of the breast, digestive system and gynaecological organs in women, with lung cancer becoming increasingly important), incidence increases progressively with age. This, taken in conjunction with the trend towards an ageing population in Western countries, explains why the annual incidence of cancer increases regularly with time and suggests that cancer patients will increasingly present at an advanced age. In this department for example 63% of new patients are over the age of 60 and 25% over the age of 70. With current demographic trends it may be anticipated that the proportion of elderly patients will increase in the coming decades particularly in patients over the age of 70.

A further important epidemiological finding is the increasing frequency of isolated or multiple organ insufficiencies associated with old age [1]. We believe that the problem for the use of radiotherapy in old age is the frequency of associated pathologies which may determine the tolerance of older patients' normal tissues to treatment. Thus, it is rather the general condition of the patient than age which conditions the approach to the management of his disease and to the selection of treatment on an individualised basis. Old patients are frequently considered unsuitable for curative surgery because of their general condition which further increases the proportion of elderly patients referred for radiotherapy. The basis for the decision of the radiation oncologist with regard to the selection of a palliative or curative approach includes medical judgement and a humanistic appreciation of the patients' needs and wishes.

Epidemiological information also suggests that as age increases, histological verification of the presence of malignant disease decreases [2]. A presumed diagnosis of cancer may be considered adequate in the elderly patient because life expectation is assumed to be limited. It is important to remind ourselves that a woman of 70 years has a further life expectation of 15 years and a man of 70 can expect to live a further 8–10 years [3]. It is true, however, that with increasing age, cancer becomes a relatively less important cause of death (Table 1) [2].

Information on epidemiological trends is a mandatory basis for the future planning of radiotherapy as has been carried out in the Netherlands in the 1980s [4]. This aspect, however, will not be discussed further.

In considering the use of radiotherapy in elderly patients three major problems need to be addressed: firstly to determine the likely natural course of the disease in relation to age and to assess prognosis; secondly to acquire information on the tolerance to radiotherapy which includes a consideration of technical problems (immobilisation, the feasibility of prolonged supine

Table 1. Mortality from cancer according to age (West of Scotland, 1983–1985) [2]

	Deaths	
	Male	Female
All ages	24	22
>65	id.	id.
>75	20	14
>85	14	10

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positioning, active patient collaboration, attendance on a daily basis, etc.) and consideration of biological factors (tissue radiosensitivity in relation to age and medicosurgical antecedents); and thirdly to assess how these factors affect treatment decision-making, in particular the choice between different modalities of treatment used alone or in combination.

With regard to the natural history of cancer, it is often assumed that cancer has a slower, more indolent course in old age and that a gentle palliative approach is the most appropriate form of treatment. This, however, is a misconception. The few available data in lung cancer or cancer of the digestive tract show that after correction for death from intercurrent disease, survival is not markedly influenced by age [5, 6]. Breast cancer is a notable exception; however here the prognosis seems to be poorer in younger women [7]. Young women are, however, longer exposed to the risk of relapse which gives a misleading figure of enhanced mortality in younger age groups.

Given a similar prognosis for comparable oncological conditions in old patients, the prospect of cure is realistic only if the treatment approach is broadly similar to that employed in younger patients. If less aggressive but equally effective treatments proved to be feasible in older patients these would be equally applicable to the younger age group. Thus only in patients with a short life expectation should the therapeutic approach be substantially modified; for example, the replacement of surgery and radiotherapy by tamoxifen in the treatment of breast cancer. In general the choice is between curative and palliative management rather than an adaptation of a curative treatment approach.

The overall approach to treatment of malignant disease in old age tends to be dominated by quality of life considerations, with prominence given to the avoidance of mutilation and the minimisation of side-effects. With regard to radiotherapy the key issue is normal tissue tolerance. Although it is frequently asserted that normal tissues in old age are less tolerant to radiation than the normal tissues of young adults, there are no convincing data in the literature to support this contention. This assertion is probably based on the presence of associated medical conditions and the consequent impact on the risk of normal tissue damage, for example the correlation between hypertension and the increased risk of neural tissue necrosis [8]. Because concurrent disease is more frequent in older people, being old tends to be confused with being chronically ill. Indeed, in one of the key references on normal tissue tolerance [9] age is mentioned only with respect to the differences between adults and children.

In the presence of concurrent chronic disease, reduction of radiation dose is generally recommended either because the risk of developing permanent damage is enhanced or because the unirradiated part of an organ is unable to compensate for loss of function in irradiated tissue. In the lung, for example, irradiation of an appreciable functional volume is only possible in patients with good respiratory function. In patients with poor lung function the irradiation fields need to be reduced if not strictly limited to areas of known disease. This also holds true for the liver and kidney. Whereas it is possible to risk compromising the function of a kidney if this is the only chance of achieving cure, such an approach is only feasible providing the contralateral kidney can compensate for the functional loss. This is also true for surgery, particularly the consideration of how much of an organ can be ablated without grossly impairing its function. In the case of chronic inflammatory or degenerative disease such as diabetes mellitus or vasculitis, dose reductions are recommended when the abdomen is being irradiated because the bowel is believed to be less tolerant to irradiation. In fact the only condition for which an increase in frequency of complications is well documented is the association between abdominal irradiation and multiple surgical interventions. In patients receiving abdominal irradiation for ovarian cancer the development of abdominal symptoms compatible with radiation enteritis is higher in those who have had prior debulking laparotomy [10]. These considerations, however, are not directly pertinent to the old age group since they also apply to younger patients with associated medical conditions. Thus although older people present more commonly with associated medical conditions, the issue of whether age *per se* modifies normal tissue tolerance remains unknown.

Information on the relationship between age and normal tissue response in radiobiology is scanty. Landuyt and van der Schueren observed no difference in the response of lip mucosa to radiation in 1 and 18-month-old mice [11]. Peak reactions were identical indicating that the radiosensitivity of the tissue was unchanged and repetition of doses at intervals failed to demonstrate any difference in repopulation rates between young and old mice. Masuda and colleagues have investigated skin reactions in 12, 38 and 64-week-old mice and although a trend for increasing sensitivity of tissues of young mice was described this was not statistically significant [12]. Hamilton studied bowel crypt cell regeneration after irradiation in 3–5 and 24-month-old mice [13]. Crypt cell survival was identical in young and old mice but the size of regenerating crypt colonies was smaller in the older group. The interpretation was that the surviving fraction of cells was identical after irradiation (and thus the radiosensitivity of the stem cells was unchanged) but that the repopulation rate was slower in older mice. It is, however, necessary to point out that these data relate only to the age effect in rapidly proliferating tissues. Although the acute effects of damage in these tissues (mucositis, acute diarrhoea, skin reactions etc.) may be dose limiting in radiotherapy, late tolerance is a primary concern since the acute effects generally resolve whereas late effects are irreversible. Unfortunately no data are available describing the effects of age on late responding normal tissues.

The safe delivery of radiotherapy requires immobilisation of the patient, generally in a supine position, and a high degree of collaboration between patient and staff. This can pose a problem in old patients with chronic arthritic conditions, respiratory insufficiency and so on. However, this is not specific to the elderly although more frequently encountered. In general if simulation is feasible, treatment will not pose a problem since each session lasts only a few minutes.

Patient refusal for technical reasons (severe arthritic conditions for example) is uncommon in our experience and the development of more gentle but more efficient means of immobilisation (polystyrene foam moulds) helps considerably in this regard. Non-compliance is estimated at approximately 1% in this centre. The need for daily attendance may also be a limitation for older patients but can be overcome, particularly with the help of social services.

In conclusion, there is a striking lack of information to form the basis for guidelines for radiotherapeutic practice in old patients, particularly with respect to normal tissue tolerance. With regard to the response of the tumour itself, there appears to be no reason to modify a potentially curative approach unless the patient is severely debilitated, in which case a well-considered palliative approach is appropriate. However, it is important to

predict as objectively as possible the likely life expectation of the elderly patient before automatically assuming that a purely palliative procedure is the treatment of choice. The Karnofsky and other performance scales attempt to do this but provide only a subjective assessment. It is important to stress that there is no known way of adapting curative treatments in old age so that they are associated with fewer side-effects without compromising the chance of cure; were this the case there would be no reason to restrict the application of such approaches to old or debilitated patients. Dose-effect relationships are well defined in radiation oncology and show that dose reductions aiming at reducing the risk of complications will also decrease the probability of cure. There may be a case for accepting a reduction in disease-free survival in older age compensated by reduced treatment morbidity and mortality. However, this still remains to be investigated.

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