



Overview

Basic Principles of Paediatric Radiotherapy

N. Thorp

Clatterbridge Cancer Centre, Bebington, Wirral, UK

Received 23 March 2012; received in revised form 6 June 2012; accepted 31 July 2012

Abstract

This article gives an introduction to the fundamentals of paediatric radiotherapy, describing the historical development of the speciality and its organisation in the UK, the clinical pathway (including issues around immobilisation) and an overview of indications for radiotherapy in the paediatric population. Late effects of radiotherapy, their mitigation and the role of the late effects clinic are summarised.

© 2012 The Royal College of Radiologists. Published by Elsevier Ltd. All rights reserved.

Key words: Paediatric; radiotherapy

Introduction

Paediatric radiotherapy presents the clinical oncologist with particular challenges. A heterogeneous range of diseases is encountered and their management requires familiarity with complex protocols and an understanding of technically demanding radiotherapy techniques. The clinical oncologist must be ever cognisant of the competing priorities of maximising cure and minimising late effects. The paediatric age range spans birth to late teens, thus incorporating a population of varying maturity with the need for age appropriate care. Added logistical considerations include immobilisation difficulties and prolonged courses of daily anaesthetics for very young children, administration of concurrent chemotherapy, and appropriate provision of support to deal with the psychosocial needs of the child and their wider family. Paediatric radiotherapy should only be carried out at centres with experience and expertise in treating this population of patients.

Historical Perspective

Harvey Cushing pioneered the use of radiotherapy after surgery for medulloblastoma in 1919, noting improvement in survival in a number of cases [1]. Edith Paterson recognised

the importance of radiation to the whole craniospinal axis in the control of medulloblastoma in the 1950s [2]. Over the mid-20th century, following the work of these and other pioneers, radiotherapy became an integral part of the management of many paediatric tumours. With the increasing recognition of sometimes devastating and unpredicted late effects on normal tissue, in conjunction with the emergence of cytotoxic systemic therapy, there was a relative waning of interest in the use of radiotherapy in the treatment of paediatric tumours in the latter years of the 20th century. During this period, an increased understanding of the science of radiation therapy, including physics and radiobiology, led to the introduction of linear accelerators, improved immobilisation and quality assurance, and manipulation of dose/fractionation regimens [3]. These advances, together with progress in computer technology, have enabled the development of highly conformal delivery techniques. The clinical oncologist now has access to intensity-modulated radiotherapy (IMRT) and, increasingly, high energy proton therapy. The importance of radiation in the local control of many paediatric tumours is now undisputed and, with new techniques, we are able to refine protocols to increase cure while minimising late effects.

Organisation of Paediatric Radiotherapy in the UK

Paediatric radiotherapy in the UK and Eire is under the joint auspices of the Children's Cancer and Leukaemia

Author for correspondence: Clatterbridge Cancer Centre, Clatterbridge Rd, Bebington, Wirral, Merseyside CH63 4JY, UK.

E-mail address: nicky.thorp@clatterbridgecc.nhs.uk

Group (CCLG, formerly UKCCSG) and the Royal College of Radiologists. The Paediatric Radiotherapy Working Group functions as a discipline group of the CCLG. The CCLG collaborates with international groups, including the International Society of Paediatric Radiotherapy and the Pediatric Radiation Oncology Society.

A separate organisation exists for paediatric radiographers – SPRIGG – which is a subgroup of the Society and College of Radiographers. SPRIGG and the CCLG Radiotherapy Group work closely together and the two groups run a very successful joint meeting annually.

All 20 paediatric oncology centres in the UK and Ireland and their associated radiotherapy centres are affiliated to the CCLG. Standards for the local organisation of paediatric radiotherapy have been set out in the Improving Outcomes Guidance document [4]. Facilities for the provision of safe general anaesthetics and the existence of two clinical oncologists per centre for cross-cover, are now mandatory requirements for a paediatric radiotherapy centre. More detailed guidance is to be set out in the Paediatric Good Practice Guide, a joint publication of the CCLG, the Royal College of Radiologists and the Society and College of Radiographers. Providing excellence in all aspects of care for individual patients is extremely time consuming and this must be acknowledged in the design of job plans for clinical oncologists specialising in paediatric radiotherapy.

Epidemiology of Paediatric Malignancies

Cancers in the under 15s are rare, with an age-standardised incidence rate of 140 per million for children aged 0–14 years in Europe in the 1990s [5]. Acute lymphocytic leukaemia (ALL) is the most common malignant diagnosis (42.9 per million in the UK), followed by brain and spinal neoplasms (31.4 per million) and lymphoma (12.0 per million) [5]. There seems to have been an increase over time in the incidence of childhood cancers in England and Wales [6,7].

The overall incidence of malignancy and of individual diagnoses varies with age [8,9]. There is a peak in the first 5 years of life, but a trough between 8 and 10 years, and then a steady increase in adolescence and young adulthood. Leukaemias and brain tumours are more common in younger age groups, with an increase in epithelial malignancies, lymphomas, germ cell tumours and melanomas in older age groups. Malignancy is more common in boys than girls (1.2:1), excepting malignant melanoma and cancers of the breast, thyroid and genitourinary tract [8,9].

The Clinical Pathway

All paediatric clinical oncologists in the UK work within the framework of a multidisciplinary team (MDT). All new patients are discussed in the MDT and most (non-emergency) treatment decisions made therein. Most paediatric protocols involve multiple treatment modalities and membership of the MDT includes paediatric oncologists, surgeons, clinical oncologists, radiologists, pathologists, nurse specialists and play therapists.

A key worker is mandatory (normally a clinical nurse specialist) and good working relationships between the various members of the MDT help to ensure a smooth transition between specialties. The clinical oncologist should be made aware of patients who may require radiotherapy as soon as possible after diagnosis to allow plenty of time for review, counselling, consent taking and, increasingly, referral for proton therapy if applicable. As far as possible, information regarding radiotherapy should be given by members of the radiotherapy team. At referral, all relevant work-up investigations should be made available to the radiotherapist (i.e. demographics, pathology reports, imaging and operation notes), and they should be advised of relevant psychosocial issues. It is very helpful to be aware of an approximate start date for radiotherapy. The clinical oncologist (and the paediatric radiographer) meets the child and their family to discuss the rationale for radiotherapy, the process of planning and the early and late effects. The child is also assessed by the radiotherapy team regarding co-operation and their need for a general anaesthetic. Radiotherapy planning and treatment then proceeds with the specialist paediatric radiographer co-ordinating aspects such as anaesthesia, concurrent chemotherapy, blood tests, etc.

Immobilisation

The age at which a child is able to co-operate reliably with the demands of immobilisation for a prolonged course of radiotherapy is variable and dependent on a number of factors, including age, previous experience and their level of understanding. Most children aged 3 years or below do not have the required comprehension to lie still and will almost certainly require general anaesthetic (Figure 1). Between the ages of 4 and 5 years the situation is more variable and for many, a course of play therapy is invaluable in avoiding general anaesthetics [10,11]. Modern general anaesthetics are safe, with rapid recovery and a low risk of anaesthesia-related complications (around 1–2%) [12]. Propofol-based regimens are most widely used, although various protocols are described [12]. Sedation, in the absence of an anaesthetic



Fig 1. Child receiving radiotherapy under general anaesthetic.

Download English Version:

<https://daneshyari.com/en/article/5698945>

Download Persian Version:

<https://daneshyari.com/article/5698945>

[Daneshyari.com](https://daneshyari.com)