

THE ASSESSMENT AND CLINICAL IMPLEMENTATION OF ADDITIONAL BEAM FILTRATION IN PAEDIATRIC RADIOLOGY

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ABSTRACT

The field of paediatric radiology is an important area for dose reduction and optimisation. The CEC recent recommendations for paediatric radiographic technique include the use of additional tube filtration of 0.1 - 0.2 mm copper, whereas other authors have suggested alternative filter materials, such as erbium. The effect of additional filtration with respect to entrance dose, total energy imparted and image contrast was assessed using Monte Carlo techniques, for a range of patient sizes. Experimental measurements were also made using anthropomorphic paediatric phantoms. Results indicated that use of additional copper filtration could reduce both entrance and integral dose to the patient without adversely affecting image quality. The practical problem of using such filtration for paediatric fluoroscopy examinations on non-dedicated equipment, with an inaccessible undercouch tube, needed to be addressed. For neonates and infants this was solved by using a 0.1 mm copper sheet, laminated for protection, on which the children could lie for the duration of the examination. DAP values were already monitored routinely in the room, and this continued throughout the clinical trial of the filter. Organ dose factors were calculated, both with and without the filter in place, using anthropomorphic phantoms and these were used in conjunction with the DAP values to assess the level of dose reduction achieved. The acceptability of image quality was assessed continually throughout the trial, and also from a blind trial of spot films taken with and without the filter. The filter was found to be acceptable for use on a routine basis.

INTRODUCTION

The reduction of radiation dose is of particular concern in paediatric radiology, but the concurrent changes in image quality must always be considered. One method of dose optimisation is the use of additional or replacement beam filtration. The Commission of the European Communities' guidelines for paediatric radiology suggest the use of 0.1-0.2mm copper in addition to the standard aluminium filtration⁽¹⁾. Other authors have suggested that K-edge filters have enhanced beam shaping properties, and thus are of particular use for dose optimisation⁽²⁾. Investigation into the usefulness of different filters can be theoretical, such as in the use of Monte Carlo techniques, or experimental. The former enable a wide range of parameters to be studied, whereas the latter may be more closely related to actual practice and are needed to verify theoretical predictions. Any suggested change in technique needs to be assessed clinically for a specific situation before being adopted for routine use.

