Medulloblastomas are common tumors of the posterior cranial fossa in children, although they may also occur in young adults. They comprise about 7% of all brain tumors of neuro-epithelial origin. In children their incidence is about 10% of all malignant disease, comprising about 80 cases per year in the whole of Great Britain.

It is well recognized that they metastasize or seed themselves very rapidly via the cerebrospinal fluid to involve the whole cerebrospinal axis, and without treatment the average life expectancy of the patient is around 9 months. Radical surgery of the primary tumor is rarely possible, and even if it were this would not deal with the metastases or potential spread of the tumor. However, if the intracranial pressure is very high at the time of the initial craniotomy, decompression and removal of the main mass of tumor, or a by-pass procedure using a Spitz-Holter valve, may be of value.

Fortunately, these tumors are very radiosensitive, and treatment should be given by irradiating the whole cerebrospinal axis homogeneously over a period of 4 to 5 weeks. Although I have seen marked tumor regression after a dose of 1750 R one should aim for a much higher dose; usually a minimum of 3000 R is recommended, and 3500 to 4000 R is preferred, at least to the primary tumor site.

One long continuous field to the spinal cord and posterior portion of the skull is preferable to a number of smaller matched fields, since in the latter method there is the danger of over or under dosage at the junctional points. The anterior portion of the brain should be irradiated simultaneously by one or more fields, the former being preferred. Some authors advocate that, if the patient's general condition is very poor, then only the brain should be treated, leaving irradiation of the spinal cord to a later date.

This was tried on one of our cases at The London Hospital; after the brain had received a tumor dose of 1750 R, however, the child's general condition deteriorated and she went into a state of complete spinal rigidity. Four months later, having remained in the same state, she died. At postmortem examination the primary tumor, which was originally 4 cm, was found to have disappeared, but the spinal cord was solid with neoplasm (Fig. 1). Had we treated the whole central nervous system this might not have happened.

In the irradiation scheme originally described by Paterson and Farr, the whole brain was included in the spade-shaped posterior field, the lower limit being the second sacral vertebra. The dose of the tumor site was increased by an added wedged cerebellar field, which meant shielding the head portion of the posterior field for some of the treatments. However, the shielding of any one field has the same disadvantages as the use of contiguous fields.

At The London Hospital the problem was met by designing a full-scale composite filter for the posterior field, to which was added a direct field to the skull. The filter was designed to cover an appropriate length and width of the spine and head, and, in conjunction with the anterior cobalt field, to provide a uniform dosage throughout the cerebrospinal axis without the addition of any other fields or shielding.

The thickness of the copper foil sections of the filter, which overlap to prevent leakage, can be varied to produce partial dose reduction in the head region, and also to allow the isodoses to follow the curve of the spinal cord. This filter is associated with a 3 mm thick lead shield to protect the rest of the body. One further advantage of this system is that it allows the quick reproduction of full isodose curves for any patient, and, in practice, this has meant that patients can start their treatment within 2 days of the first localization film or as soon as the stitches

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have been removed, instead of the usual 7 to 10 days needed to produce a complete plan.

The detailed dosage distribution for a patient is achieved by taking localization films on a diagnostic x-ray machine and marking out the position and depth of the spinal cord (Fig. 2). Marker films are also taken to show the position of the angled cobalt skull field. One must be careful at this site to ensure that the eyes are not included in the direct field. A final dose distribution is made for each patient. We have tried to give the whole spinal cord a minimum dose of 3000 R, and preferably 3500 R, with up to 4000 R to the brain. At the same time 4500 R should not be exceeded on the skin of the back.

Setting up of the posterior field is achieved by making an individual plaster cast in which the patient can lie flat, face downward (Fig. 3). For the anterior cobalt field the patient lies supine and the angulation of the field is adjusted until the beam edge lies behind the eyebrows (Fig. 4).

The patients are treated slowly, increasing the dose of irradiation by 50 R per day, as this not only minimizes irradiation sickness and bone marrow depression, but, if no decompression or by-pass procedure has been carried out, it will also diminish the chances of producing cerebral edema.

With young children under 5 years of age some form of sedation will be required as the child must be asleep or unconscious to allow accurate setting up. A "trial and error" method is used as follows:

1. Chloral hydrate 0.4 gr/lb body weight (giving usually 10 to 15 gr total dose)
2. Nembutal 0.6 gr/lb body weight (1 to 3 gr total dose)
3. Vallergan 60 mg
4. Chloral hydrate + Vallergan
5. Nembutal 10 mg + Morphine 1 mg
6. Various combinations of the above drugs can then be tried, but if there is any difficulty the advice of an anesthetist should be sought, and if all else fails a general anesthetic may be required. Two of our recent cases were managed in this way with endotracheal intubation for 25 to 30 treatments daily. They were not unduly disturbed