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HEMANGIOBLASTOMA CEREBELLI — REPORT OF A SIX YEAR SURVIVAL AFTER ROENTGEN THERAPY BY TUMOR OSCILLATION THROUGH A GRID

by

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The incidence of blood-vessel tumors comprised only 2 per cent of the total of CUSHING's 2 033 verified intracranial tumors. Although not exclusively characteristic of the brain, these tumors are relatively important in neuropathology. They may be divided into congenital anomalies and true neoplasms. Congenital anomalies usually occur as either venous or arterial malformations. These malformations give rise to symptoms resembling those of a brain tumor. The reason for these symptoms is usually the size and increased vascularity of the congenital anomalies. The venous malformations consist of thin-walled, large venous vessels, the arterial ones of tortuous arteries. Degenerated brain tissue is often found between the vessels. Sometimes recognition of parallel streaks of calcification within the walls of such anomalous vessels, in the conventional skull films, is of help to the clinician.

Hemangioblastomas are tumors usually of middle life. They typify the true neoplasms, originating from blood vessels, and occur, most commonly, within the cerebellum. These tumors are brownish in color on their cut surface and show microscopically lacunae with richly cellular tissue in between. The cells

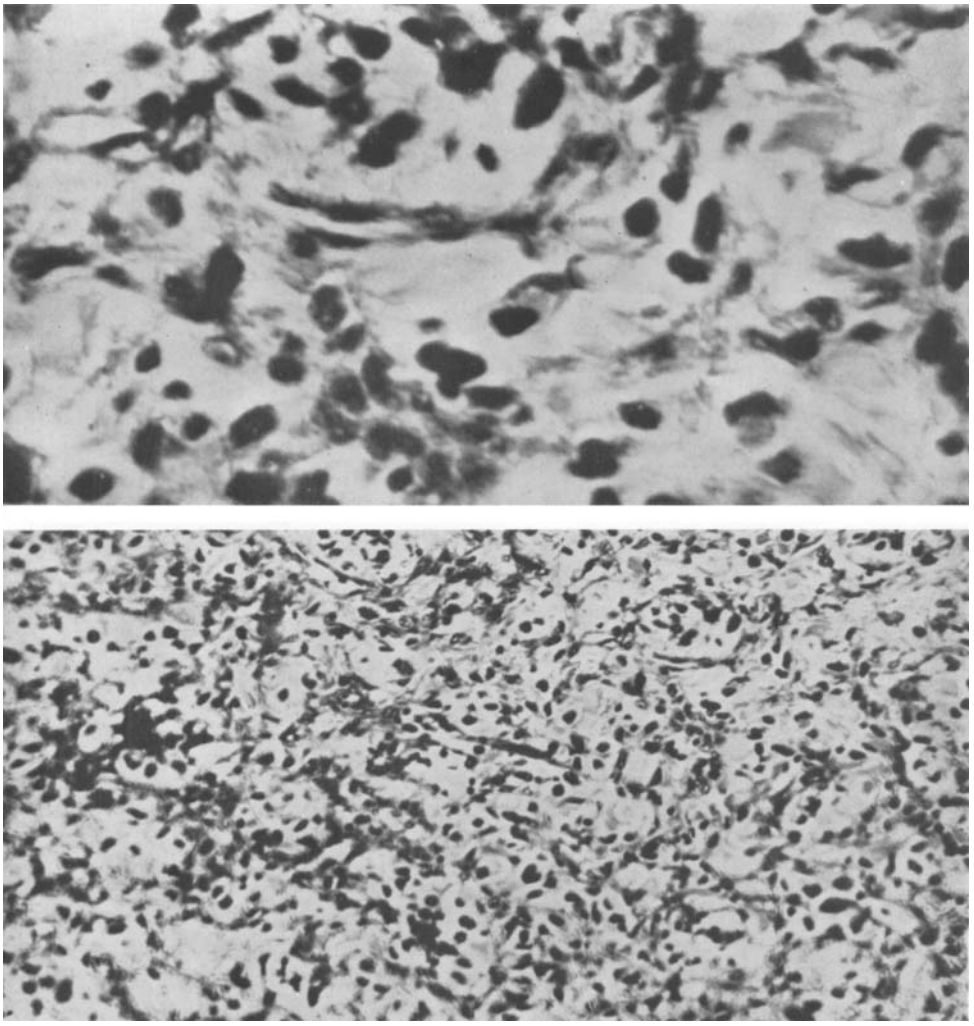

Fig. 1. Fat globules suggestive of xanthoma cells may be observed in hemangioblastoma when fat stains are applied.

have large oval nuclei with evenly distributed chromatin. Fat globules suggestive of xanthoma cells may be observed when fat stains are applied (Fig. 1).

Hemangioblastomas are most commonly seen as single lesions. They are occasionally associated with angiomatous malformations of the retinae (Van Hippel's disease) or cyst of liver, kidney, ovaries, pancreas, etc. The combinations of hemangioblastoma of the cerebellum with one or more anomalies in one patient, often familial in nature, is known as Lindau's disease (DAVIDOFF & EPSTEIN).

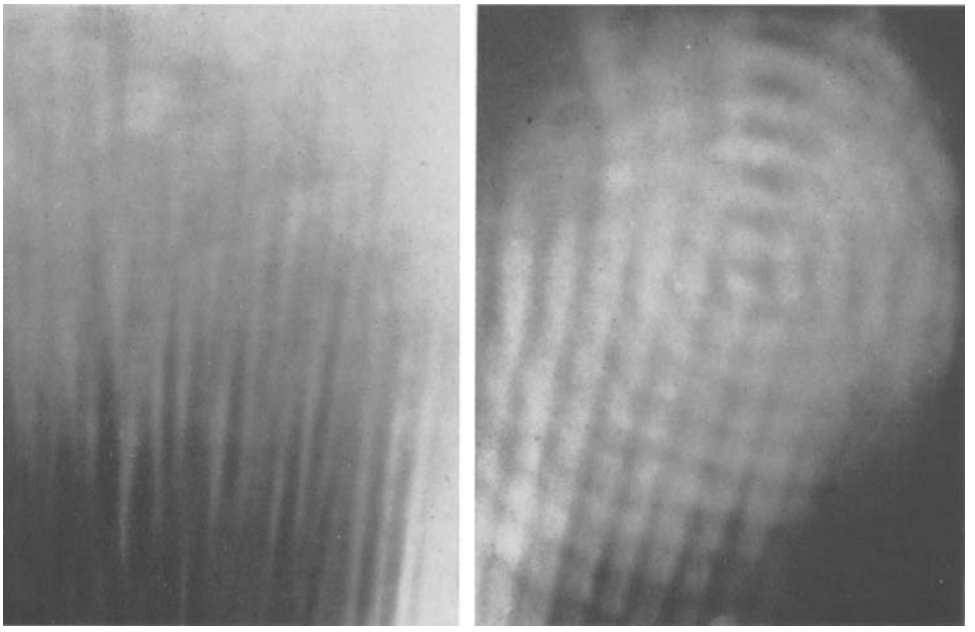

Fig. 2. Absorption patterns in pendulum grid therapy.

Case report: Female, age 36 years. Two years before admission, she first became aware o pain in the right side of her head which grew progressively in intensity and extent, spreading to the eyes and face. Recently, the headaches were accompanied by vertigo, nausea, vomiting independent of food intake, and on one occasion terminated in loss of consciousness and convulsions. The past history revealed hysterectomy at the age of 20 years for excessive bleeding, and asthma at the age of 16 years.

On neurological examination, the patient was seen swaying with eyes open; considerable tremor of head; ataxic gait with falling to the right side, and tremor of the right hand on voluntary movement; enunciation with irregular force and rapidity. Ophthalmoscopic examination revealed blurred vision, nystagmus and bilateral papilledema; retinal veins were dilated and tortuous; the arteries were constricted, and all vessels were broken off at the margins of the disks. Spinal fluid studies elicited the following: pressure 380 mm of water glucose 80 mg/100 ml, chlorides 720 mg/100 ml, protein 52 mg/100 ml.

Ventriculography showed marked symmetrical dilatation of both lateral ventricles as well as of the third ventricle, with no evident displacement.

Operative findings (Schenkman): A reddish blue mass was seen on separating the cerebellar hemispheres; it was hard to determine whether this mass was entirely within the fourth ventricle or was arising from the edge of the right cerebellar hemisphere. Extreme vascularity prevented the resection of the mass. Several small biopsy specimens were obtained from this tissue. The gross description of the pathologic report (Dolgopol) was: specimen consisted of 4 small fragments of spongy grayish-white tissue; gross section revealed some grayish brown areas. The microscopic diagnosis was: Malignant hemangioblastoma.

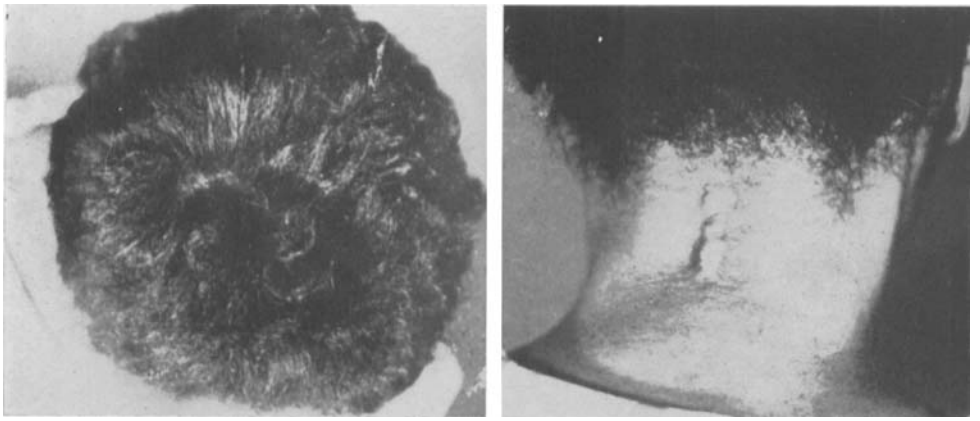

Fig. 3. Case of hemangioblastoma of cerebellum. No epilation after 4 000 r in air by rotation through a grid 10 × 15 cm; absence of any depilatory reaction of the scalp.

Treatment

Roentgen therapy with the use of a grid was instituted by tumor oscillation in an angle of 180° through the sub-occipital region. The radiation was of quality 1.6 mm Cu HVL, 50 cm STD, 250 kV, grid size 10 × 15 cm with apertures of 0.5 cm in diameter and of an area ratio of 40 % translucent and 60 % opaque. The daily dose was 200 r in air. The total dose, assessed by the gradual disappearance of the clinical symptoms, was reached at 4 000 r in air, and was administered in 20 treatment days, in an overall period of 4 weeks and 4 days.

The constant presence and vigilance of the attending radiotherapist are the condition sine qua non of the clinical method of treatment. With the symptoms, and not an a priori dose, as the guideposts, one is compelled to discontinue the treatment once the symptoms have attained their vanishing point. Some slight symptoms may persist for a while after completion of the treatments. However, when they continue unabated, as was the case with our patients, additional treatment must be administered. The latter, 1 400 r in air, was delivered with the same factors as above, in daily doses of 200 r in air, in an overall period of 12 days. Citrus bioflavanoid compound with ascorbic acid, 1 500 mg daily, was administered as adjuvant therapy.

Comments

The skin reaction to roentgen irradiation through a grid in rotation is reduced to a minimum and is lowest in anatomical sites approximating a cylindrical configuration.

This observation was gleaned from clinical experience about 9 years ago (MARKS 1953, 1954, 1955), at a first attempt at irradiation, by tumor oscillation through a grid, of a patient in extremis. This patient had been previously

treated to skin tolerance and returned to work. One year later an emergency tracheotomy was performed for a diffusely growing and rapidly expanding carcinoma of the laryngo-pharynx with circular metastases to the neck. The ensuing total lysis of the malignant process with no concomitant skin reaction except erythema, served as a powerful incentive to spur the author on the apply irradiation by tumor oscillation through a grid as the method of choice in all patients for whom encompassing the growth daily was an imperative.

This method effectively impedes spread of the growth without the dreaded stress of local and generalized systemic reaction. That these reactions were obviated was largely due to the recovery factors inherent in the unirradiated spaces as well as to the higher ratio of tumor to integral dose absorption afforded by this method.

The higher ratio of absorption is brought to fruition in the following manner: the primary energy impulses, emanating from row upon row of grid apertures — upon leaving, on the surface-film of the masonite phantom, the imprint of a grill (Fig. 2), and on the succeeding films beneath it a latticework imprint (Fig. 2) — continue to pursue their paths in the form of a ripple (Fig. 2) around the oscillating tumor in the depth. The primary energies along with their secondaries are, therefore, diverted away from the periphery toward the revolving tumor center, and the normal tissues outside the irradiated field are consequently relieved of the stress of secondary radiation.

Thus, a physical therapeutic agent, roentgen rays — bedevilled by many side effects of a local and general character which render it impossible of application in tumors of large volume — was converted by oscillation through a grid to a therapeutic agent par excellence, akin in its effectiveness to the organ-affinity or tropism of a chemical agent.

Acknowledgements

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SUMMARY

A case of unresectable hemangioblastoma of the cerebellum was treated by oscillation through a grid with 250 electronkilovolts. The patient has been symptom-free for the past 6 years. There was increased selective localization of the radiation energy in the tumor proper and very little in the skin of the scalp.

ZUSAMMENFASSUNG

Ein Fall mit einem nicht resezierbarem Hämangioblastom des Kleinhirns wurde mit 250 Kiloelektronvolt mittels Oscillation under Verwendung von einem Raster behandelt. Der Patient ist seit 6 Jahren symptomfrei. Durch diese Technik wurde eine erhöhte selektive Lokalisierung der Bestrahlungsenergie im eigentlichen Tumor erhalten weil die Hautbestrahlung nur gering war.

RÉSUMÉ

Un cas d'hémangioblastome inextirpable du cervelet a été traité par roentgenthérapie pendulaire avec grille sous 250 kV. Le malade a survécu sans symptomes ces six dernières années. La localisation sélective de la dose d'irradiation a été très augmentée au niveau de la tumeur et très faible sur le cuir chevelu.

REFERENCES

DAVIDOFF L. M., and EPSTEIN B. S.: The abnormal pneumoencephalogram. Lea & Febiger, New York 1950.

MARKS H.: Neurofibrosarcoma of the neck. Amer. J. Roentgenol. 64 (1950), 470.

— Roentgen therapy of advanced cancer through a grid. Acta Un. int. Cancer 9 (1953), 54.

— Inoperable carcinoma of antrum of Highmore; report of a 20 yr. survival after telecurie therapy and of a 5 yr. survival after roentgen-grid therapy. A. M. A. Arch. Otolaryng. 59 (1954), 340.

— Roentgen-grid therapy of advanced cancer. Recent advances with rotation. Acta Un. int. Cancer 11 (1955), 533.