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PONTINE TUMORS

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The general approach of neurological surgeons toward pontine tumors has been a dismal one. The author's experience with this group has given more cause for optimism. Of seven such cases seen in a four year period, one is asymptomatic after ten years and another has recently recurred after six and a half years, having again been relieved of his symptoms by further treatment. Two other seen outside this four-year period are included in the present report. In three, the course of the condition was unchanged by therapy, one of which received only 600r.; in four, palliation was produced for seven to ten months, and two of these when re-treated were palliated for an additional four to six months, a third case not being helped on re-treatment. All treated with 200 to 220 kilovolt x-ray therapy, most receiving from 2,700 to 5,000 r. tumor doses with 1mm. Cu. hvl. filtration.

Review of the Literature

One paper from this locality - Smith and Fincher[8] - showed that of 100 intracranial tumors in children, four lay within the pons. Buckley [5] in a review of cases from Peter Bent Brigham Hospital discussed the pathology and classification of 25 cases of pontine gliomas. Cobb Pilcher [6] in 1934 discussed a group of 11 cases with spongioblastoma polare of the pons from Washington University in St. Louis, Bailey, Buchanan, and Bucy [3] in their textbook on "Intracranial Tumors of Infancy and Childhood" had 12 verified and 8 other cases. Out of that group there was one who survived for 9 months in which time over 10,000 r. of x-ray therapy

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had been given. In 1954 Arnold, Bailey, and Harvey[2] wrote a paper discussing the "Intolerance of Primate Brainstem and Hypothalamus to Conventional and High Energy Radiation", in which they recommended that less than 4,500 r. be given in a four- to six-week period, and that probably 3,000 r. in a four-week period should be considered as a maximal dose.

Patients treated with x-ray therapy have been discussed more intensively in the last few years. Bray, Carter, and Taveras[4] in 1958 discussed 48 cases under the age of 16 occurring in a period of some 24 years. Ten were verified at autopsy, 24 verified by air study, 9 clinically, and 6 at operation, on 3 of which biopsies were taken. Thirty-nine of the patients received x-ray therapy prior to 1952 in two or three courses of 1,000 to 1,200 r. within a period of 12 to 30 days, repeated at about six-week intervals. Since 1952 adults have received a single course of 4,000 r. and children have had a scaled-down dose, those two years or younger receiving half, those three and four years 75 percent, and scaled upward to a full dose at the age of eight years. Fifteen of the 24 that were followed to death improved clinically. Twelve received a second course and 7 were improved. Eight of their cases had survived, three of them for 4, 6, and 13 years.

Redmond[7] in 1961 reported a group of 42 cases seen from 1936 to 1959, ages three to fifty-three years, 29 of which were ten years old or younger. Thirty of 42 patients received x-ray treatment, 12 receiving 3,000 to 4,000 r., two of whom have survived over five years. Of 12 receiving 2,000 to 3,000 r., two are surviving after five years. None of the 6 receiving less than 2,000 r. lived longer than a year. The 4 five-year survivors had been treated 60, 62, 75, and 117 months before the paper was published. Three of the five-year survivors are children and one is a productive 41 year old adult, all four of whom are well. At present Redmond advises 3,400 to 4,000 r., of 200 to 240 kiovolt therapy in a four week pariod. Thus far he feels he has produced no handicap. He re-treated seven of the patients, four of whom were improved by re-treatment.

An interesting point of view is expressed by Alvisi[1] of the University of Bologna, who in the handling of 20 such cases diagnosed by contrast study, had attacked the tumor directly in five cases without apparent handicap due to his surgical intervention. All of these were treated by x-ray therapy as well: one adult survives four years after operation,

one child three years in good condition, and one for a year in good condition. One given x-ray therapy survived five months after surgery and one with a firm pontine mass who was not subjected to x-ray therapy survived three months after surgery.

Author's Material

GROUP I: CASES UNAFFECTED BY X-RAY TEHRAPY.

Case 1. C.B. 47-1179: This four year old girl was well until March 1947 when gradually increasing irritability and behavoir difficulties developed. By May walking was impossible, but after 36 hours in bed this disappeared. In August a fall off a tricycle bruised and cut the left forehead, but she remained conscious throughout. Three days later, dragging of the left foot was noted, and by another week the left arm was weak, then a few days later difficulty in chewig and swallowing and weakness of the left face. She turned her head to the right to see, and showed fear of high places. Sept. 9 Mayo Clinic noted inco-ordination of all extremities, more so on the left; marked left Bebinski and an ataxic gait but no nystagmus. Ventriculography Sept. 15 showed slightly eniarged lateral ventricles, normal-sized third and fourth ventricles without displacement. Impression was pontine lesion, either tumor or degeneration. After being brought to Atlanta for x-ray therapy, given 600 r., the essayist examined her on Oct. 4 and noted moderate papilledema, right lateral rectus paresis, absent upward gaze, large pupils, more so on left, but no nystagmus. All left facial movements were weak, with barely discernable palate movement. Torsion of the body and the head to the left were preferred, though head could be turned to the midline. The left arm and leg were moderately weak. There was marked adiadokokinesia, and only right finger-nose test could be performed, and only fairly well. All tendonjerks were hyperactive, the left more so, and clonus was present throughout, more marked on the left. Both plantar reflexes were extensor. Though patient was to be brought back later for more treatment this was not done.

Patient expired Jan. 22, 1948, autopsy being done of the brain only at the Jacksonville Naval Hospital, their * 224. This showed a ragged, friable, gray, poorly demarcated tumor of the pons and midbrain extending into Meckel's cave on the right, moderate hydrocephalus and flattening of gyri. Microscopic description (Lt. Commander R. H. Fuller) "A

very cellular vascular tumor of varied structure. The cells are predominately spindle-shaped. In some regions there are small hyperchromatic spindle-shaped cells with oval nuclei arranged in interlacing bundles and showing palisading of the nuclei. In other regions there are many bizarre giant cells with multiple nuclei and abundant cytoplasm lying among large spindle and stellate cells. There is much nuclear variation in size and shape. Mitotic figures are numerous. No calcification or rosette formation is seen. At the borders of the tumor, malignant cells are infiltrating the surrounding brain. Blood vessels show no hyaline thickening, but fibrin thrombi are common. IMPRESSION: Glioblastoma multiforme". Unfortunately, the section of the tumor cannot be located.

Case 2. C.S. 52-168: 8½ year old girl was well until February 1952 at which time dragging of left foot was noted. By March paralysis of the palate was considered as possibly post-diphtheritic. Slowly condition worsened so that on admission in May 1952 speech was very slurred, the right eye turned in, right facial weakness, right eye deviated down and in; no right trigeminal sensation, poor gag reflex and tongue protruded slightly to the left. There was left foot drop, moderate weakness of all extremities, together with moderate weakness of all extremities, together with moderate spasticity; left plantar extensor; right hearing impaired; right corneal reflex absent. Ventriculography showed classical posterior and upward displacement of her fourth ventricle. 3,000 to 3,500 r. tumor dose was given in twenty-five days. There was no improvement in spite of the x-ray therapy and patient died December 19, 1952 at home. No autopsy was obtained.

Case 3 S.A. 58-323: Five year old female began November 1, 1958 with first one, then the other eye turning in. When first seen November 20, aside from bilateral 6th nerve palsies, there was a mild right facial weakness, hypoactive reflexes generally, and a clumsy use of left side, with positive Rhomberg. Encephalography showed a large pons. X-ray therapy was given with 4,000 r. tumor dosage in four weeks. Deterioration continued and death occurred February 22, 1959. E. U. H. autopsy * 59-46 showed a grade II astrocytoma destroying most of the pons.

GROUP 2: THOSE CASES IN WHOM X-RAY THERAPY GAVE PALLIATIVE HELP BUT WHO ULTIMATELY DIED.

Case 4. A.T. 51-216: This eight year old girl was well until April 1, 1951 when signs of nervousness and easy fatigue were followed shortly by unsteadiness in gait, difficulty in judging distances, headache, and

vomiting. On admission to Egleston Hospital, 23189, June 18 one saw a well developed and nourished but extremely droswy girl almost unaware of her surroundings. Fundi and visual fields were normal; pupils were equal and reacted to light, but eyes could only be moved one at a time mesially, convergence being absent. Right eye closure and left forehead wrinkling were absent, all reflexes hyperactive, with slight left ankle clonus. Right plantar was flexor, left extensor. Since encephalography was done which showed a pons twice-normal in thickness. Post-operative course was quite stormy, the child being extremely drowsy, speaking little and requiring catheterization. 2,500 to 3,000 r. tumor dose in a three-week period made patient essentially asymptomatic by August 15, except for eye movement handicaps. She returned to school in September. Modrate right 6th nerve palsy and a little lag of the right corner of the mouth was present through October 5, and only mild remaining neurological symptoms on December 5, 1951. By January 20, 1952 increased unsteadiness in walking occurred, and she stopped school. Bilateral 6th nerve palsy had recourred by February 12, as well as nystagmus and reducation in touch in the right first and second branches of the trigeminal nerve, and poor masseter strength. Both corneals were absent though facial movements were symmetrical. 2,500 to 3,000 r. tumor dose was exhibited in 2½ weeks. By March 14 improvement was dramatic, patient being asymptomatic except for weak upward gaze in the right eye and a little increase of the left knee and ankle jerks as compared to the right. Symptoms again began to recur around August 15, 1952 with obvious severe illness by September 4, with right hemiparesis, dysarthria, and sometimes dysphagia, as well as total deafness, and death occurred December 5. Autopsy (Crawford Long 52-202) showed almost total replacement of the pons by a hard, white, diffusely infiltrating tumor involving nearly all of the cranial nerve nuclei. The 4th ventricle was reduced to a crescentic slit. Section showed mainly polar spongioblasts with a rare suggestion of giant cell, occasional cysts, but no mitoses: Spongioblastoma polare, Grade I to II.

Case 5. A.S. 52-9: White female, age 3. Around December 15, 1951 this child began to be more nervous than usual; more noticeably around January 1, 1952 with some difficulty in speech, the words being "thick", and child was more sensitive to scoldings or emotional disturbances, pouting more than usual. When admitted to Crawford Long Hospital * 257320 January 8, all findings were normal except for 6% eosinophilia suggesting intestinal parasites, the family having noted worms in the stool.

Neurological examination was essentially normal at this time. Spinal fluid pressure and examination were entirely normal. Due to emotional reactions, she was sent home to stay with a favorite aunt. By January 30, increased dysphagia with some nasal regurgitation of liquids and almost complete inability to swallow solids were noted. Chewing-gum, which she liked, ended up in the roof of mouth due to tongue weakness. Examination showed palate movements moderately feeble, tongue movements quite poor with some vermicular movement, and lack of sensation in the posterior pharynx. The hands were used clumsily. There was gross tremor of both arms and legs on trying to use any of them seperately though gait was fairly good. Prostigmine produced no improvement. Air studies showed clivus to 4th ventricle was 4.5 cm. Tumor dose of 3,000 to 3,500 r. was given in three weeks, and patient was well by March 12, but began to become unsteady in walking around November 10. When seen November 21, there was only a little less expression in the left face. By January 20, 1953 deterioration was obvious, with fading speech, turning in of both eyes, essentially no talking, some drooling, total absence of palate movements, and considerable dysphagia. There was mild adiadokokinesia on the right, and slight reduction of left leg power, bilateral extensor plantar responses, and slight swaying in station and gait. On being taken to the Spears Chiropractic Clinic in Denver, Colorado, death occurred March 21, 1953. Autopsy was not performed, and coronor's death certificate * C-24273 showed "Tumor, brain, type undetermined".

Case 6. R.S. 53-255: White male, age 4. Onset July 1, 1953 of unsteadiness, indistinct speech, and nervousness noted chiefly as tremors of the arms "when he is rushed" Admitted Egleston Hospital * 20416 July 13: when first seen by the author on fifth day in the hospital left lower face moved a little less to all stimuli; both hands were ataxic and clumsy on rapid alternating movements. Plantar reflexes were bilaterally extensor, station and gait markedly unsteady. Spainal fluid showed protein 13.5m% and on repeat puncture 30mg%. By July 29 there was no question but that he had a pontine tumor, with weakness of both 6th nerves, facial weakness, more on the right, corneal reflex poor on the right, a blank facial expression, drooling, no palate movement and absence of throat sensation, poor tongue movements, markedly unsteady hand movements, and inability to walk. Ventriculography, August 4, showed markedly enlarged pons with bulging posteriorly into the 4th ventricle. 4,500 r. tumor dose was given within a five-week period. He looked entirely well by September 21, but beginning about May 7, 1954 there was

marked deterioration over the following three weeks. Another 1,000 r. tumor dose was given in 18 days in June and on examination July 26 only a minimal nasal speech, minimal slowing of right face, and markedly hypoactive reflexes generally could be noted. Improvement continued until about December 7 when gradual deterioration again began and he died January 15, 1955. Autopsy done by Emory University Pathology Department showed a tremendous tumor of the pons extending into the cerebellum with necrosis and cystic spaces and a diagnosis of Grade III astrocytoma.

Case 7. J.L. 54-341: Eight year old white male. On September 22, 1954 this boy's left eye turned in; his right eye had turned in by October 10. By Oct. 15 he had a bilateral facial nerve paralysis. Ventriculography done October 19 showed a definite pontine mass which was treated over a five-week period with a tumor dose of 4,500 r. By December 1, he was alert, cooperative and happy though he still had bilateral 6th nerve palsies. On return to school January 20, 1955 the eyes were a little less turned in. By June 13, he was as asymptomatic though speech had a slightly nasal character. By August 5, deterioration had begun and by the 18th there were mild left 7th nerve palsy, complete left 6th nerve palsy, and partial slowing of his palate movements. He was put on a pap-like diet. By September 16 bilateral 6th nerve and left 7th nerve palsies, slightly nasal speech, falling away of the left hand, and reduced right arm reflexes were obvious. 1,000 r. tumor dose was give in two and a half weeks. with again improvement for a short time, but then worsening. Death occurred December 8, 1955, no autopsy being performed.

GROUP 3: THOSE WITH LONG-TERM HELP

Case 8. J.T. 53-71: White female, age 12. Headaches began in the fall of 1952 and on December 11 there was abrupt loss of consciousness and feeling of left sided numbness, with occasional staggering gait. Admitted Crawford Long Hospital * 280909 February 20, 1953, showing 3d. papilledema with a few small hemorrhages, slightly less movement left side of face, slinging of left hand a little on alternating movements and mild falling to the left with eyes closed; all reflexes hypoactive; plantar response flexor bilaterally. EEG showed diffuse dysrhythmia and skull film was within normal limits. Ventriculography demonstrated a massive enlargement of the pons with the 4th ventricle reduced to a small crescent (Figs. 1 & 2). Tumor dose of 4,200 r. was given in four

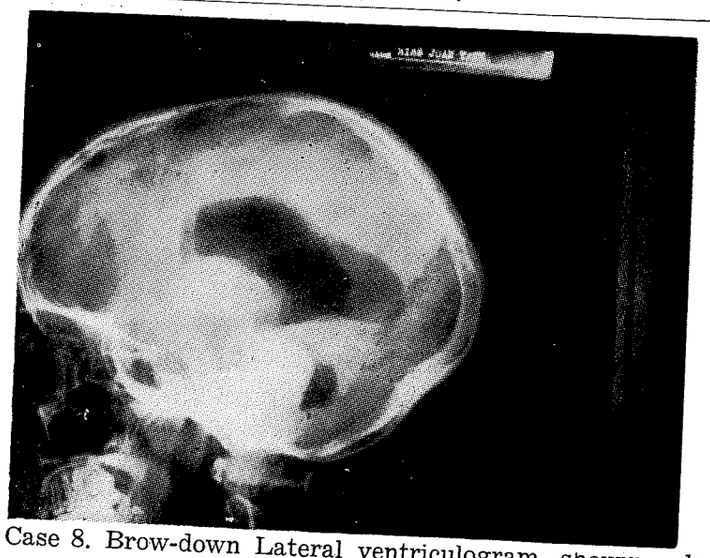

Fig. 1. Case 8. Brow-down Lateral ventriculogram, showing elongated curved aqueduct, markedly posterior fourth ventricle, crescent-shaped.

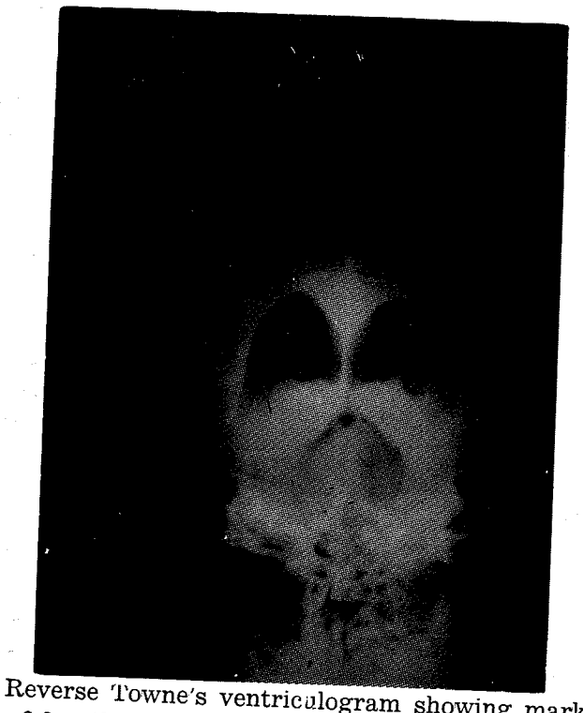

Fig. 2. Case Reverse Towne's ventriculogram showing marked enlargement of fourth ventricle, and large anterior mass bulging upward and distorting the usual outline.

weeks. By April 6 the papilledema was receding. Since then she has been completely asymptomatic, with graduation from high school, marriage, and term delivery of a son in June 1961. Re-examination February 1,1963 revealed a slightly too well nourished 22 year old lady, alert and cooperative. Epilation of the post-auricular ports was still marked, and frontal trephine openings were barely palpable. There was mild secondary optic atrophy, with larger left temporal pigmentary crescent. The left pupil was a little larger. Tendon jerks were active except for hypoactive ankle jerks, all being symmetrical. The mild optic atrophy did not prevent following a gainful winter occupation in the local fruit juice factory, and she could read fine newspaper print without difficulty. *

Case 9. W.L. 55-138: Colored male, age 3½. April 17, 1955 seemed to limp a little on left leg; by April 25 obviously limped and leaned to left, became very clumsy, bumping into things and dropping objects, with left sided convulsions, drawing of tongue and spiting up that evening. May 22 showed left facial weakness, more marked in lower face, marked nystagmus on looking to the left, normal fundi, poor palate movements on the left, and no palate movements on the right with poor gag reflex, although sensation was present. Tongue protruded slightly to the right but lateral movements could be accomplished to either side. All the reflexes were hypoactive except for knee jerks which were active and equal, left Babinski was equivocal. Ventriculography May 10 showed mild displacement of the 4th ventricle posteriorly without lateral displacement. Tumor dose of 3,000 to 3,500 r. given in a one-month period. Improved by June 24, but markedly so by September 12 and when seen on April 4, 1956 he had only minimal nasal quality to his speech. He then did well over a six-year period. Beginning early in January 1962 school work became poorer and head was turned to the left in reading. Moderate unsteadiness of gait, increasing clumsiness, dropping of objects from left hand, and mild left facial weakness developed. On examination there was complete left 6th nerve palsy, moderate nystagmus with quick component to the right, minimally slowed left lower face, slight falling away of right arm when extended, and mild adiadokokinesia and clumsiness of left hand. Reflexes were a little less active right than left. Since he was in school, we postponed air study until June 1962 when we found that the clivus-to-4th ventricle distance was a full 5cm. July 1 to August 15 tumor dose of about 4,000 r. was given.

* A letter in December 1964 stated that she was momentarily expecting to deliver her second child, and felt fairly well.

On examination February 25, 1963 still showed epilation of the postauricular x-ray ports, walking was a little unsteady and patient could not move the left eye laterally. There were broad nystagmoid jerks on looking to the right, the left face was slightly weak and right facial sensation was reduced, left corneal poor. There was still a "hot potato" type of speech, right arm fell away slightly and slung more widely on pronation-supination; hearing was a little less on the left. It was felt that there were minor residuals, but that he was markedly improved.

Discussion

Although the tumor in three of nine cases was apparently unaffected by x-ray therapy, in the other six cases definite palliation was obtained, and in the last two symptoms were completely relieved in one for eleven years and have not yet recurred, and for six and a half years in the other patient with further palliation on re-treatment. Only in Case 8 was there any papilledema, although most of the patients showed ocular muscle palsies, facial movement handicaps, and at times facial numbnesses as well as deafness and more frequently dysphagia and dysarthria. A suggestion of convulsive seizures in at least two of these patients is of considerable interest inasmuch as both were fairly well palliated, one being apparently cured. Certainly it seems worthwhile to offer x-ray therapy to such children. One need not be too gloomy insofar as ultimate prognosis is concerned.

Summary

Eight patients with gross lesions of the pons as demonstrated by air contrast study as well as cranial nerve, long tract and cerebellar symphomatology, were treated with 240 kilovolt x-ray therapy, receiving 2,750 to 5,000 r. initial dose with palliation for most of them. Another 2,750 to 5,000 r. intial does palliation for most of them. Another child received only 600 r. and was not helped.

There are two survivors, one asymptomatic in ten years, having a child, and one who recurred at six and a half years and has received further palliation additional x-ray therapy.

With initial palliation of six months or more, a second course of x-ray therapy has given furt her palliation is three cases even though the ultimate outcome was fatal.

Résumé

Huit malades avec des lésions du trone cérébral démontré par les radiographies de contrastes, aussi bien que la symptomatologie clinique (nefls craniens, signes cerebelleux etc...) ont été irradié avec 240 kilovolt, recevant de 2750 à 5000 r. dose initiale, avec amélioration pour les pluparts d'entre eux. Un autre enfant a reçu seulement 600r. sans pouvoir être efficace.

Il y a 2 survivants, un asymptomatique pour 10 ans, ayant un enfant, et un autre avec recidive 6½ ans après qui pu être aidé avec la radiothérapie suplementaire.

Avec une amélioration de 6 mois ou plus, une deuxième serie de radiothérapie a pu amener d'autre amélioration dans 3 cas, quoique le resultat final était fatal.

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