The Role of Radiation Therapy in the treatment of Intracranial Tumours.

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Abstract

The role of radiation therapy in the multimodalities treatment of intracranial tumours has been discussed. Surgery is used both for the diagnosis and the treatment of intracranial tumours. Radiation therapy has the role in both radical and palliative treatment. Local irradiation is used with the aim to reduce the size of the tumour, for alleviating pressure symptoms, to relieve obstruction of the flow of CSF to reduce hydrocephalus after the shunting operation, and to reduce the incidence or to prevent the recurrences after removal by surgery. Brain bath for palliative treatment of metastatic brain tumours and prophyllactic brain irradiation for the tumours which are notorious for brain metastases. Whole CNS irradiation is used to prevent the seedling of some tumours through the CSF. It may also be used in Leukaemias after the peripheral blood and the bone marrow pictures has been controlled by chemotherapy. The values of Radiation therapy in different kinds of intracranial tumours has been discussed.

Radiation therapy of Intracranial tumours, palliative and radical treatment, local and whole CNS irradiation, prophyllactic and supplementary irradiation to other modalities treatment.

Introduction:

Multimodalities treatment should be the treatment of choice for the management of intracranial tumours. Surgery is the first line of attack not only to have the correct diagnosis for further management but also, at the same time, will serve for the primary treatment by total, subtotal or partial removal of the mass or even only obtaining tissue for biopsy. Immediate decompression of the tumour mass which pressed on the surrounding structures or relieve the obstruction of the CSF. which has already affected the normal function of the nervous system. With the progress of the new technology, CT and MRI can help in the localization of the tumour not only the site of the lesion but also the size, extension, number of lesions, whether it be a solid, cystic or the mixture of the two components. The modern medical imaging will also tell the effects or damages of the brain that the tumour has caused such as hyrocephalus, atrophy etc. MRI with different relaxation techniques and different pulse sequence techniques can sometime tell a clue to the nature of the tumour such as a germ cell sensitive tumour or a malignant teratoma in the pineal region, the extent of edema versus the tumour mass,[11] etc. With modern equipments in radiotherapy post-operative radiation therapy can be given with more accuracy, with the help of a Simulator, delivering a high total tumour dose by a high dose-rate brachytherapy, or supervoltage teletherapy techniques. Chemotherapy as an adjuvant treatment to surgery and radiotherapy with a single or multiple drugs has ben explored by definite protocols, as well as chemical radioprotectors and radiosensitisers.[2, 5, 6, 7, 8] Some has organized a multi-institutional protocols to treat certain

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tumours and to collect the results of the treatment which may be standardized and comparable so as to have a statistical significant results.[18]

Intracranial tumours were referred for radiotherapy after having elective surgery, palliative surgery by shunting for C.S.F. drainage, open biopsy or merely clinical and CT or MRI findings of cerebral metastasis from the known primary lesion treated previously from other hospitals.

The incidence of brain tumours or intracranial tumours population base data collected in 1988 was 31 per 100,000 population in Thailand.[21]

Methods and Materials

During 1987 to 1990, a four years period, 237 cases of intracranial tumours were referred for Radiotherapy at the National Cancer Institute. Bangkok, Thailand. Among these cases, there are 166 primary brain tumours and 71 metastatic brain tumours from known primary tumours of various sites.

Table I. Intracranial tumours referred for radiotherapy.

Type	Histological Diagnosis	Number	Totel
Primary	Gliomas	89	166
	Pineal tumours	17	
	Pituitary tumours	10	
	PNETS	10	
	Medulloblastoma	9	
	Ependymoma	3	
	Craniopharyngioma	3	
	Lymphomas	4	
	Leukaemia	1	
	Meningioma	8	
	No histological diagnosis	12	
Secondary	Metastatic tumours	71	71
	Total	237	237

Malignant Gliomas

Table II. Age distribution of Gliomas grade I-III and Glioblastoma Multiforme.

Age distribution	Gliomas grade I-III	Glioblastoma Multiforme
5 - 9	2	2
10 - 19	6	0
20 - 29	12	6
30 - 39	16 (35)	3
40 - 49	7	8
50 - 59	5	13 (26)
60 - 69	2	5
70 and over	1	1
Total	51	38

Fig. I Bar Chart shows the difference in peak incidence between gliomas and G.M.

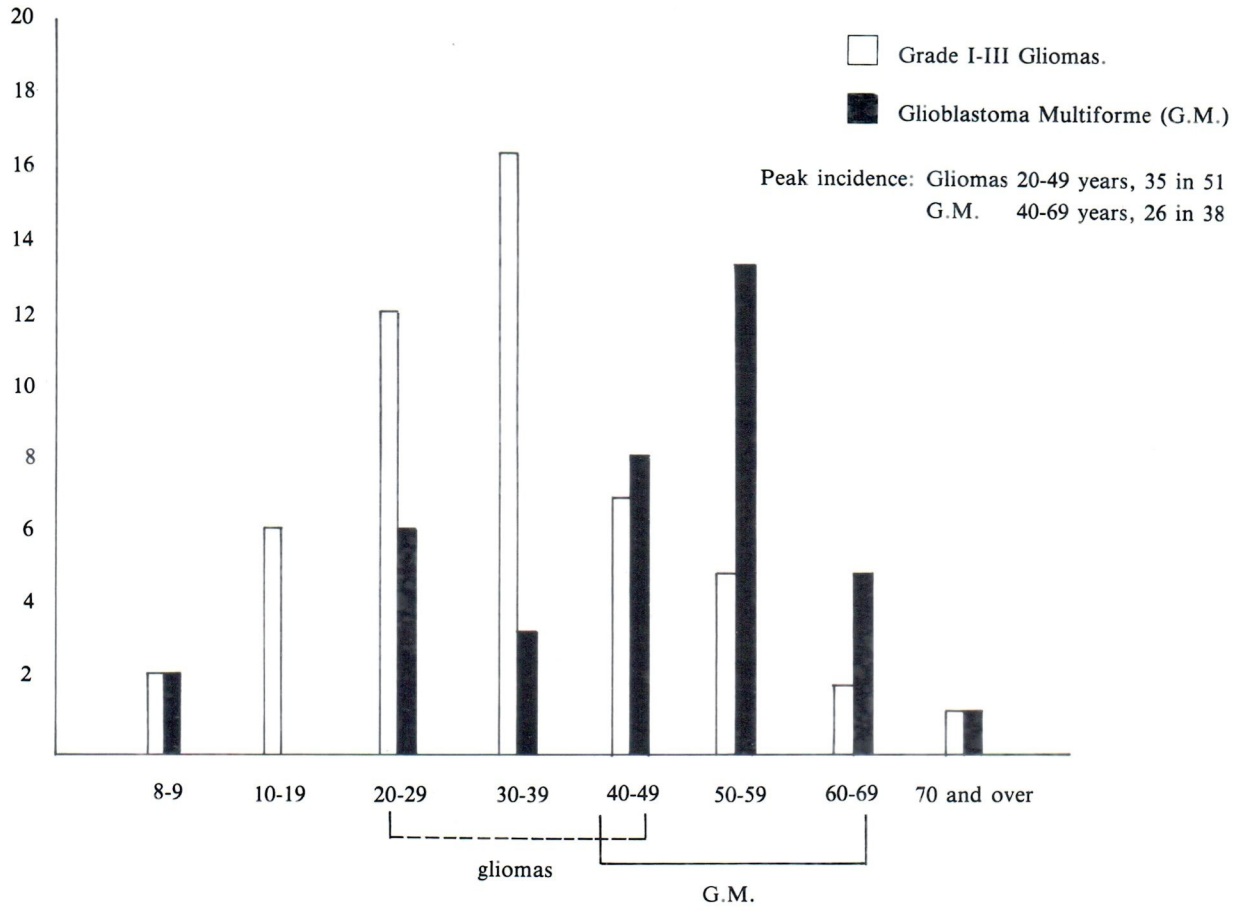

Table III. Lobes distribution among gliomas grade I-III and Glioblastoma Multiforme.

Lobe	Gliomas Grade I-III	Glioblastoma Multiforme
Frontal	25	5
Parietal	13	7
Temporal	1	5
Occipital	3	9
Cerebellum	5	—
Fronto-Temporal	—	2 ┐
Tempero-Parietal	—	3 ├ 11
Tempero-Occipital	—	6 ┘
Corpus Callosum	1	—
Medulla Oblongata	1	—
Parasella	2	1
Total	51	38

Note: Gliomas grade I-III are confined in one lobe and mostly in the operable sites. Glioblastoma Multiforme are spreading into the adjacent lobes or in the sites difficult to have total removal of the tumours.

Malignant Gliomas

The patients were referred for radiotherapy mostly after total removal of the tumours or subtotal removal of the visible tumours or partial removal of the part which may not be risky for operative death or neurological dificit after operation. In some cases, the tumour may have been removed piece meal or only some tissues may have been removed for biopsy. The 89 cases referred between 1987-1990 having the histological diagnosis as malignant glioma are reviewed and divided into two groups. The first group are those classified as Astrocytomas, Oligodendrogliomas or mixed Astrocytoma and Oligodendroglioma, Grade I-III which are altogether 51 cases. The second group are those classified as Glioblastoma Multiforme or the undifferentiated malignant gliomas. There is no significant difference in sex distribution in both group, male: female = 28:23 in the first group and 21:17 in the second group respectively. The youngest ages were about 7-8 years while the oldest ages were 71-72 years nearly the same in both groups. The peak incidence in the more differentiated form of malignant glioma are between 20-49, while in Glioblastoma Multiforme are between 40-69, about 2 decades older.

Pineal Tumours

17 cases are pineal and CNS germ cell tumours. These are the tumours which are found in the midline principally in the pineal area or anteriorly around the third venticle and suprasella region. In these 17 cases, there are 12 males and 5 females. The ratio between male: female = 2.4:1. The peak age incidence is between 12-24 years, i.e. 10 cases or 58.82% of the total cases. The youngest age was $13\frac{3}{12}$ years and the oldest was 59 years.

Table IV. Age distribution in Pineal tumours.

Age	Number
10 - 19	5] 10
20 - 29	5]
30 - 39	3
40 - 49	2
50 - 59	2
Total	17

Primitive Neuro-Ectodermal Tumours (PNETS) 10 cases

sex incidence; male : female about 2:1. There were 7 males and 3 females. The lowest age was $1\frac{5}{12}$ years and the oldest age was $10\frac{7}{12}$ years. The peak incidence was between 3-6 years. There were 6 cases or 60% of the total cases found between 3-6 years of age.

Medulloblastoma. 9 cases

sex incidence; males 5 : females 4. age incidence: lowest age found was 11 months and the oldest age 18 years.

Ependymoma 3 cases

Our three cases are adults, age 45, 49 and 64 years old. The first two cases were female and the oldest one was a male patient.

Craniopharyngioma 3 cases

All cases are female aged 12, 23 and 34 respectively.

Pituitary tumours 10 cases

All cases are chromophobe adenomas and came to see the doctor because of the reduction of the lateral field of visions with an evidence of enlargement of sella turcica seen in the lateral view of the skull. The lowest age found was 10 years old. 50% of the cases were more than 50 years old. In the 10 cases, there were 7 female and only 3 male patients. There were also symptoms of hormonal deficit in the patients found in active sexual life, between the age of 32 to 49. There were oligomenorrhea in the female patients and decrease libido in the male patients. In our male patients there were also decrease in the sex characteristics e.g. the growing of the beard and the sternal hair were diminished.

Meningioma 8 cases

The sex incidence is equal in male and female 4:4. The lowest age is 21 years old and the oldest is 76 years old. There are two in the frontal lobe, two in the mid temporal fossa, three in the occipital region and one is in the parasella region of the middle fossa. It has been observed that all of the cases, the tumours are in the Lt. side. Two patients who had the tumours in the frontal region, one was referred for post-operative radiotherapy after the 3rd recurrence post subtotal removal, another one was referred after the 1st recurrence post subtotal removal. These two cases have no recurrence after post-operative radiotherapy for 2½ years.

Lymphoma and Leukaemia.

4 cases were non-Hodgkin Lymphoma. In all cases, there are also lymph node involvement which proved to be lymphoma. The lesions in the brain are found by symptoms indicating lesions in the brain and confirmed by C.T.

1 case was leukaemia referring for radiotherapy after having chemotherapy.

Brain lesions with no histological report available

12 cases with evidence of lesion in the brain without histological confirmation were also referred for radiotherapy. The diagnosis in these cases were done by the C.T. or MRI, together with clinical symptoms. These tumours are in the brain stem, Thalamic, Pontine or Third ventricle regions where the surgeon considered too risky to obtain the tissue for histologic diagnosis. These patients had palliative surgery by doing V-V. shunt or V-A. shunt according to the perference of the surgeons. All of these patients had some degree of hydrocephalus prior to shunting operation.

Metastatic Carcinoma to the Brain 71 cases

sex incidence : male 54 cases versus female 18 cases. In 18 female cases, two cases had a primary lesion in the breast. One had a single lesion in the frontal lobe, age 52 who is a long term survivor, another one had multiple lesions in the brain who had brain bath for 40 Gy with a good palliative value or having a good quality of life. 4 cases had primary lesion from different sites, one had a primary in the scalp, one had a primary from melanoma of the face, one had a primary from Ca. Cervix and another one from a choriocarcinoma. All these 4 cases are short term survivors between 3-8 months.

The rest 12 cases had metastazised from bronchogenic Ca., 4 were squamous cell type but 8 were adenocarcinoma. The 4 squamous cell type cases had multiple lesions while 6 adenocarcinoma cases also had multiple lesions and 2 cases had single lesion, one in the frontal lobe, another one at the parieto-temporal lobe. Both solitary lesions in the brain had total removal with local irradiation at the tumour beds by 3 fields technique or two wedges fields technique.

In 53 male patients, the youngest age 40, the oldest age 78, there were only two cases who had a primary lesion in other sites apart from bronchogenic Ca. These two cases, one had a primary lesion from Ca. Thyroid papillary type, another one from the renal cell Ca. Both of these cases had a single metastasis in the frontal lobe and had frontal lobectomy and post-operative local radiotherapy. Both are long term survivors with good quality of life.

51 cases had a primary lesion in the bronchus, the detail of which can be seen in table V.

Table V. Detail of 51 brain metastasis cases from bronchogenic Ca.

Cell type	Cases	Multiple	Single	Lobe	No	Rt.	Lt.
Squamous cell	6	5	1	frontal	1	1	—
Large cell-undiff.	2	2	—	—	—	—	—
Adenocarcinoma	43	25	18	frontal	12	7	5
				parietal	2	2	—
				temporal	2	2	—
				Fronto temporal	2	1	1

Results and Discussion.

Over the past 25 years there has been progressive improvement in the results of treating intracranial tumours either a primary or a metastatic ones. There are several reasons for this which include advances in neurological imaging leading to more accurate localization, improvements in neurosurgical techniques, better peri-operative care, wider use of megavoltage equipments and techniques including greater and more precise dosage delivered to the tumour and the introduction of chemotherapy.[2, 3, 4,5,6, 7]

Since the introduction of CT Scanning, it is clear that in patients with inoperable tumours situated deeply within the cerebral hemispheres, radiotherapy alone often decrease tumour bulk, reduce neurological disability and prolongs active life sometimes for many years. The treatment of the entire cerebro-spinal axis by irradiation has become mandatory for the control of medulloblastoma, germinomas and high grade ependymomas especially when occuring in the posterior fossa. In a substantial number of patients with intracranial tumours, tissue will not be available for histological diagnosis at the time of referal for radiotherapy either because of frank inoperability or because the hazards associated even with biopsy were considered to be unduly great.[2, 6]

Malignant Gliomas.

There is good evidence that survival of children and adults with intracranial gliomas in increase by routine post-operative radiotherapy compared with surgery alone.[2, 6] Reviews of the literatures show the value of conventional radiotherapy for high grade gliomas in the adult but fails to show a clear advantage for radiosensitizers, hyperfractionation, acceleration or particle radiotherapy, which have been studied to date. For low grade gliomas, the survival of oligodendroglioma patients was greater than those with astrocytoma but the difference was less marked in the long term.[4] No difference in survival was found between grade I and grade II astrocytoma. Low grade astrocytoma, may progress to greater malignancy. This process is related to the natural biology of the tumour and not to previous radiotherapy since progression to greater malignancy may appear spontaneously or after surgery alone. A number of retrospective studies have suggested a beneficial role for radiotherapy in low grade astrocytomas incompletely resected at surgery. In low grade oligodendroglioma the role of radiotherapy is less clear. Although a survival advantage could not be demonstrated, there was a trend toward a lowering of the recurrence rates in patients with subtotally excised solid tumours who received radiation therapy.[4, 5, 8, 19, 20] Since this is our primary report, therefore our follow up period is still so short. In term of survival we have observed the survival in two categories, the short term and the long term. The short term survirors are those who survive only 6-8 months after radiotherapy, complete or incomplete course. The long term survivor are those who survive longer than 8 months after the completion of the radiotherapy course. Those who hae no complete course of radiation by any reason, never have long term survivor. In the patients with glioma grade I-III: there are 74.50% long term survivors while in the patients with Glioblastoma Multiforme only 18.42% are long term survivors. One important factor which may have the impact on survival is the extent of surgery prior to radiation. The majority of the patients in the low grade glioma group had the tumour in the frontal lobes which are amendable for total removal while those in the high grade glioma or Glioblastoma Multiforme group had the tumour already spread into 2 lobes and difficult to have total removal. (table III)

In both groups, the important prognostic factors are : the extent of surgery whether it was a total removal or a subtotal or partial removal of the mass, the general condition of the patients and the dose of the radiation received. In both groups, the technique of radiation are those for a local irradiation of the tumour bed or the residual tumour by 3 fields technique or a wedge pair technique giving a daily dose of 180 cGy/day, five times per week with a wider margin for the Glioblastoma Multiforme. The total tumour does was 5500-6500 cGy in $6\frac{1}{2}$-7 weeks

Pineal Tumours.

In the past, attempts to obtain tissue from pineal tumours were associated with a very high morbidity. Torkildsen proposed that these tumours should be treated by shunting procedure and irradiation.[11] Irradiation may be used as a therapeutic "diagnostic" test in cases which tissue can not be taken for biopsy. Tumours in these areas may be classified into two groups, the radiosensitive and the radioresistant tumours. The radiosensitive group consisted of the germ cell tumours and the pineoblastoma. The radioresistant group consisted of the malignant teratomas and the non-germ cell tumour (pineocytoma and gliomas).

The tumours in these groups we have given a limited volume irradiation to a dose of 20 Gy as localized by the C.T. and the simulator. If the tumours respond well as evaluated by C.T. after a "Diagnostic" therapeutic approach, we shall regard that it is a sensitive tumour which may have a high incidence of cerebro-spinal fluid seeding.[11] These patients are subsequently treated by whole craniospinal axis radiotherapy whereas resistant tumours are continued to have the treatment to local field alone. In our series, there are 9 short term survivors (die within 6-8 months) and 8 long term survivors who are follow up from 1 to 3 years. The long term survivors are those having the sensitive tumours and 7 in the 8 long term survivors having the age below 24, only 1 case having the age above 24. The 9 short term survivors are those

having the resistant tumours, not responding after the dose of 2000 cGy and 5 of the 9 patients have the age above 24 with poor general condition. Interestingly the other 4 short term survivors are under 12 years old and received incomplete radiotherapy course. For the sensitive tumours, we deliver 50 Gy to the local tumour and 30 Gy to the remaining brain and spinal cord. We start with a local irradiation with a limited field to the tumour, a dialy dose of 180 cGy/day performing the "diagnostic" therapy to a dose of 20 Gy then evaluation was made by a CT. If it proved to be a senstive tumour then cerebro-spinal axis irradiation will be made giving a daily dose of about 150-160 cGy/day. If the tumour proved to be a resistant one, then a further local irradiation will be given to a tumour dose of 50 Gy - 55 Gy.

Factors affecting the prognsis:

1. General conditions of the patient prior to radiotherapy is given.
2. Neurological symptoms or deficits prior to surgical treatment is given which depend on the duration of symptoms before seeking medical treatment.
3. The surgical intervention whether it was only V-P or V-A shunting, with or without partial removal or biopsy.
4. The Radiotherapy received is completed or not.

Anyhow, the tumour types and neurological performance status are the most important factors predicting the probability of survival.

The factors which may affect the patients to have complete radiotherapy course or not are:

1. Poor general condition before treatment.
2. Parents are uneducated and stop bringing their children to have a long course of radiotherapy.
3. Parents stop rdiation therapy and seek the old Thai traditional medicine

We concluded that shunting and radiosensitivity testing remains the treatment of choice for tumours in the pineal region.

Primitive Neuro-Ectodernal Tumours (PNETS).

Highly malignant anaplastic tumours similar in histological appearance to medulloblastoma are called Primitive Neuro-Ectodernal Tumours (PNETS) They may occur in the cerebral hemispheres of children and young adults. These tumours are highly malignant and generally run a rapidly fatal course. The biological behaviour, therapeutic response and prognosis of patients with medulloblastoma are different from the PNET group which confined to certain cerebral hemisphere tumours. The survival was influenced by the proportion of the tumour that was undifferentiated. All patients with more than 90% of the tumour undifferentiated died by 30 months, compared with those when tumours were less than 90% undifferentiated are long term survivors.[6] In our 10 cases, 6 cases died rapidly within 6-8 months, only 4 cases are long term survivors who are still alive and are followed up 1-3 years. These 4 cases are $3\frac{9}{12}$, 4, 4 and 7 years old and had good general condition and telerated the radiotherapy until having completed the course. We have irradiated the whole cerebro-spinal axis to a dose of 3000 cGy in 6-$7\frac{1}{2}$ weeks with a daily dose of 150-180 cGy.

Medulloblastoma.

Medulloblastoma is the frequent type of posterior fossa tumours found in children and also is the most malignant. Surgery is the most important initial measure against this disease.

The aims of surgery are to relieve C.S.F. hypertension and relieve local pressure effects, safe the failing vision, obtain tissue for biopsy, stage the tumour and reduce the tumour mass as much as possible prior to radiotherapy. Most failures in the treatment for medulloblastoma have been due to local recurrence in the posterior fossa. CT and MRI scanning will reveal the size and extent of any residual tumour in the posterior fossa after surgery and/or radiotherapy. Myelography and CSF cytology after craniotomy may reveal sub-clinical spinal deposits.[6] In our 9 cases, 4 were dead within 6-8 months after treatment, all of which are below 3 years of age. Among the 5 long term survivors, all were children older than 3 years except 1 patient age $1\frac{6}{12}$ years whose general and neurological performance status was good after subtotal removal of the mass.

Treatment factors associated with a long term survival, was complete or subtotal resection of the primary tumour, as opposed to partial removal. A radiation dose to the posterior fossa of 55 Gy or more and the cerebro-spinal axis radiation of 3000 cGy were given in a period of 7-8½ weeks according to the tolerance of the patients.

Ependymoma. 3 cases.

All of our case are found in adults age 45, 49 and 64 respectively. They presented with the symptom of headache and increased intracranial pressure. C.T. revealed a mass in the lateral, 3rd and 4th ventricle respectively. Operation was done in the first case for biopsy only, but in the second and third cases, shunt and biopsy was done. Histological reports were low grade ependymoma in all cases. Brain bath was given in all cases to a dose of 3000 cGy in 4-4½ weeks and a booster dose of 2000 cGy were given by reduced field to posterior fossa only. After that, irradiation of the spinal axis were also

done to a total dose of 3000 cGy in 4-4½ weeks. For all patients with high grade tumours and for all those with tumours of any grade situated in the posterior fossa, we recommend irradiation to the whole cerebro-spinal axis. The potential value of prophylactic cerebro-spinal irradiation compared with local cerebral irradiation was supported by the reduced risk of tumour seeding associated with neurospinal axis irradiation. Two of our cases who had complete course of radiation are long term survivors while another one died in 8 months and we have to stop the radiation before she received the full course.

Craniopharyngioma. 3 cases

The ages of these 3 cases were 12, 23 and 34 years old respectively. All had the chief complaint of lossing lateral field of vision due to optic chiasma compression. The operation was done for decompression and also for partial removal of the tumours. In all cases the lateral view of the skull showed no enlargement of the sella turcica. C.T. of the skull showed suprasellar tumours at the parasellar region and having the cystic part extending anteriorly.

After partial removal of the tumour, local irradiation was given to a total tumour dose of 5500-6000 cGy in 6-6½ weeks with a daily dose of 180 cGy day, 5 sessions a week.

All of them are long term survivor with recovery of the field of vision.

In the largest series of the world's literature, Bloom presented the results of 122 patients managed by conservative surgery and post-operative irradiation of high dose level (50-60 Gy) yielding 5-10 year survivals of 85-74% respectively. The results of treatment are improved using Megavoltage therapy and the results in children are better than in adults.[6,18]

Even when the surgeon believes that total tumour removal has been accomplished and the patient makes a good post-operative recovery, many such cases still die of tumour recurrence.

In more recent reports where comparison has been possible between surgery alone and surgery with post-operative radiotherapy, distinctly superior results has been obtained for the combined treatment.[14,17]

Partial removal or even simple cyst aspiration combined with radical radiotherapy appear to give the best results. Children with recurrence after surgery alone can be salvaged by a conservative operation with radical radiotherapy.

Lymphoma 4 cases, Leukaemia 1 case.

All the 4 cases are systemic non-Hodgkin's Lymphoma with cerebral symptoms. C.T. reveal lesions in the brain. Brain bath has been given to a dose of 30-40 Gy with improvement of the cerebral symptoms. Chemotherapy has also been given for the systemic diseases. The result of treatment was unsatisfactory. There is only one case that survived over 1 year.

In the Leukaemia case, neuro-spinal axis irradiation was given after the blood picture has been recovered by chemotherapy. Neuro spinal axis irradiation was given to kill the leukaemic cells that has survived in the cerebro-spinal system because of the "blood-brain barrier".

Meningiomas. 8 cases

Histologically, meningiomas have been considered to be radioresistant and therefore the role of radiotherapy has been disputed.[13]

Radiotherapy prolongs survival in patients with incomplete resected or inoperable meningioma. Following radiotherapy alone, neurological improvement will occur in a significant proportion of patients with inoperable disease. Radiation with a tumour dose of not more than 1.8 Gy per fraction with treatment on a daily basis to a total tumour dose of 6500-7000 cGy result in minimal late morbidity.[6,13,15,16,18]

The result of treatment in our cases are satisfactory. 7 in 8 cases are long term survivors with reasonably good quality of life. One case having repeated recurrences for 3 times in a duration of 2 years, 1½ years and 1 year respectively, after surgery alone in the past, was referred for post-operative radiation therapy, and this time without recurrence for 4 years at present. Another one having recurrence 3 years after the fist operation without post-operative radiation therapy, also was referred for post-operative radiation therapy. These two cases the tumours were in the frontal area which is feasible for repeated surgery. The case who died after 8 months was the one who had the tumour at the middle fossa, parasellar region in which subtotal removal was not feasible because of the risk to morbidity and mortality. This case had only partial removal, the majority of the tumour remained intact. The observed transformation of these tumours to higher histological grade probably represent a natural progression of neoplastic tissue to frank malignancy.[13]

Table VI. 12 cases with no histological report, diagnosis were made by CT or MRI.

12.	Age	Sex	Site of the tumour	Survival after Brain Bath	
1.	4	m.	Brain Stem	died	2 months
2.	5 5/12	f.	Pontine tumour	died	2 months
3.	9 8/12	f.	Pontine tumour	died, abandon treatment	
4.	20	m.	3rd ventricle	died	3 months
5.	21	m.	Ventricular hydrocephalus	died	8 months
6.	26	m.	Ventricular hydrocephalus	died, abandon treatment	
7.	18	m.	Basal ganglion lesion	survive	1 year
8.	34	m.	Thalamic tumour Rt.	died, abandon treatment	
9.	38	f.	Brain stem tumour	died	3 months
10.	35	f.	Thalamic tumour Rt.	died, abandon treatment	
11.	58	m.	Brain stem tumour	died, abandon treatment	
12.	65	m.	Thalamic tumour	died, abandon treatment	

m. = male, f. = female

These are the cases which the tumours had block the path way of the C.S.F. and marked degree of hydrocephalus had occured. The patients mostly had poor general conditions and marked degree of neurological deficit had already established. Surgical intervention were feasible only doing V-P. or V-A shunt according to the preferential of the surgeon. The parents or the relative of the patients mostly discourage to have further radiation treatment and taking the patients back home after few radiation doses. Only one patient who had completed the radiation course survive for one year.

Pituitary Tumours.

The treatment of pituitary adenomas which have optic chiasma compression with unilateral or bitemporal heminopsia by surgical decompression and post-operative rediotherapy is well accepted. Total or partial removal of the tumours as much as feasible and post-operative radiotherapy with a limited fields always followed by recovery of the visual fields and long term survivors. Replacement therapy with hormones that are deficient, will make a good quality of life for the survivors.[1,6,18] In the 10 cases treated in our Institute, 9 cases did well. Only one case who died because of the operative complication. The patient was 66 years old, diabetic and weak. She died a few days after operation because of septicemia.

Metastatic Carcinoma to the Brain 71 cases.

It is our policy for matastatic brain lesions, if the primary has been controlled and had a solitary lesion in the brain, resection of the tumour and post-operative local irradiation is the treatment of choice. By this policy we have many long term survivors. If there are multiple lesions, whether the primary, lesion has been controlled or not, palliative radiation by brain bath will be given. Eventhough these cases with multiple lesions in the brain may be short term survivors, radiation therapy with brain bath will improve the neurological performance of the patients and thus improve the quality of the rest of their lives.

Conclusion:

We have treated 237 cases of intracranial tumours referred for radiotherapy post-operatively during 1987-1990, a 4 years period of which 225 cases having definite histological diagnosis and 12 cases having no histological diagnosis eventhough operation had been done but the tissue was not obtainable due to one or another reasons. There are 166 cases of primary lesions but another 71 cases are metastatic ones. All the metastatic cases had a history of a known primary tumour that had been treated by multimodalities therapy and having a proven histological diagnosis. The patients were following up for a varying period of 1-3 years. The results of treatment in each specific group of the tumours were analysed and prove to be satisfactory in comparison with the report elsewhere. The 5 years survival rate and long term results will be followed up and analysed in future.

From this study we have observed that adenocarcinoma of the lungs is the most frequent cell type which produce brain metastasis either being the multiple or a solitary ones. So it may be advisable to do a prophylactic brain bath in the patient with adenocarcinoma of the lung after the primary lesion has been controlled.

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