THE CLINICAL AND RADIOLOGICAL FEATURES OF INTRACRANIAL MENINGIOMAS IN KENYATTA NATIONAL HOSPITAL - KENYA

A dissertation submitted in part-fulfilment for the degree of MASTER OF MEDICINE (RADIODIAGNOSIS) of the University of Nairobi - Kenya.

by

DR. BENJAMIN IMALINGAT
M.B.Ch.B. (NAIROBI) KENYA

JULY 1985

DECLARATION

This dissertation is my original work and has not been submitted for a degree in any other University.

Signed: ----------

DR. B. IMALINGAT

This dissertation has been submitted for examination with my approval as the University Supervisor.

Signed: ----------

Dr. J. M. K. Kitonyi

CONTENTS

SUMMARY

The clinical and radiological features of meningioma in 56 patients with a histological proof of meningioma are presented. Generally there was no marked difference from that presented in the literature on this tumour. There were more female patients than male patients and the peak age incidence was in the 5th decade. An association between meningioma and pregnancy was noted but trauma to the skull was found to have no association with this tumour whatsoever. Most patients had symptoms lasting one year or less. The most common symptoms were headache, impaired vision and convulsions while reduced visual acuity and features of raised intracranial pressure were the main abnormal physical findings. Convexity meningioma were the most frequent followed by sphenoid ridge meningiomas. Hyperostosis of the skull and the typical tumour 'blush' of meningioma were found to be the most useful diagnostic markers. Plain skull radiography and carotid angiography were found to be adequate diagnostic methods in the diagnosis of meningiomas and the introduction of other modalities of examination such as Computerized Axial Tomography or Nuclear Magnetic Resonance Imaging would probably be of little extra benefit in as far as meningiomas are concerned.

Historical Note:

The earliest account on meningiomas seems to have been that of Louis in 1774, and Bright not only recorded a case but also suggested that the tumour was a growth of the duramater or perhaps of the arachnoid thus opening up a discussion which has lasted many years [1]. Over the successive years a multiplicity of designations were labelled on this tumour by many different authors, for example, Psammoma by Virchow, dural endothelioma by Camillo Golgi and Arachnoid Mesothelioma by Harvey Cushing, depending on what was thought to be the tissue of origin [2]. Schmidt in 1902 drew attention to the similarity between the microscopic appearance of the cells of the tumour and those of arachnoid villi [2]. Russell in 1950 drew attention to the diversity of reactions which arachnoid cells exhibit as a result of stimulation and which are reflected in the various histological types of this tumour [3]. Further information on th origins of the various histological types was shown by Kempes in 1961 by electron microscopic studies on meningiomas [4]. Stein, Opalla and Schilp in 1963 in their fatty acid analysis of meningiomas by gas phase chromatography, further suggested that the meningiomas are more closely related to the leptomeninges than the dura-mater [5]. The first major studies on this tumour were those of Harvey Cushing in 1922 and 1928 and again by

Harvey Cushing and Einsenhardt in 1938 who outlined their source and favoured seats of origin and also introduced the term "Meningioma" which is now used universally. H. Cushing considered that Arachnoid Mesothelioma was the proper anatomic name for these tumours but he felt that this was cumbersome and for convenience he adopted the name "Meningioma" as a simple and at the same time non-committal designation in as far as it indicated that the growths in question arise from the endothelium which lines the leptomeningeal spaces [2]. It is now generally accepted that these tumours arise from the endothelium which lines the arachnoid membranes. Some meningiomas are so firmly attached to the duramater that they appear to be arising from it, but it is thought that they are derived from sequestrated clumps of arachnoid cells which occur within the duramater. Intraventricular examples owe their origin to the arachnoid contribution to the telachoroidea and choroid plexus.

INTRODUCTION

The brain is completely enveloped by 3 fibrous coverings:-

- the pia-mater which is closely applied to the surface of the brain; the arachnoid membrane separate from the pia-mater by the sub-arachnoid space (the pia-meter and arachnoid membranes together constitute the leptomeninges) and the dura-mater, the outermost covering which adheres tightly to the skull bones for which it serves as a periosteum [6]. Meningiomas are benign neoplasms which arise from the cells of arachnoid membrane. Focal aggregations of these cells are to be found especially in the form of arachnoid villi and meningiomas tend to occur where arachnoid villi are more plentiful. The common sites of origin are therefore along the venous sinuses particularly the sagittal sinus (para-sagittal meningiomas),the lateral sinuses and the sphenoid wing. Meningiomas also arise on the floor of the skull above the sella-turcica, in the cerebello-pontine angle and within the ventricles. Diffuse superficial meningiomas,(meningioma en-plaque) may also occur. The meningioma is a benign encapsulated tumour which may grow for many years before producing serious symptoms. The neoplasm invaginates the brain from which it is usually clearly demarcated.

Loss of demarcation may imply malignant change. The tumour is easily shelled out but large feeding blood vessels may make surgical excision bazardous through profuse haemorrhage. The cut-surface of the tumour is grey-pink,whorled,homogeneous and firm, sometimes gritty owing to calcifications.

The histological pattern of meningioma may show some variations within one tumour, quite often however the pattern is quite uniform. Several different patterns may occur; however in all of them the characteristic whorling of the pale fusiform tumour is seen. The patterns commonly seen are transitional, syncytial, fibroblastic and angioblastic but other patterns are found which may not be so easily characterised. Laminated calcified particles (Psammoma bodies) similar to those found in arachnoid villi are common. Pleomorphism of nuclei, which are usually ovoid and uniform is not infrequently seen, when present in conjunctionwith many mitotic figures (which are usually uncommon in meningiomas) and infiltration of surrounding brain, there is a likelihood of recurrence of the tumour and a possible malignant transformation [7].

MATERIALS AND METHODS

This study was carried out to find the incidence, clinical features and radiological findings of intracranial meningiomas as seen in Kenyatta National Hospital. A retrospective and prospective study of all the patients with intracranial meningiomas treated at Kenyatta National Hospital over a period of six years (1978-1983) was undertaken. Relevant clinical information was extracted from the files of these patients which were obtained from the Hospital Records Department.

All the 56 patients studied had plain skull radiography and carotid angiography; while one patient had a ventriculogram and another had Radioisotope Brain Scanning in addition. Two plain skull radiographs, a lateral view and a 20^{o} occipito-frontal view were taken in all the 56 patients. A high powered Schonander Unit is used in our Department which makes skull radiography faster and more accurate. The X-ray tube is mounted on a curved cross-arm which is part of a circle, the centre of which is also the centre of the table. Thus in whatever position the tube is angled it is always centred to the table. To obtain optimum definition, the smallest possible cone is used.

The plain lateral films were taken with the patient prone, the head adjusted to a true lateral position with the median plane parallel to the film and the inter-orbital line at right angles to the film. The 20^{o} occipito-frontal views were taken with the patient prone, the head adjusted so that both the nose and forehead touch the table and the radiographic baseline is at right angles to the film. The tube is angled 20^{o} caudal and centred to the glabella.

CAROTID ANGIOGRAPHY:

Carotid angiography in all the patients was performed by percutaneous direct puncture of the common carotid artery, under general anaesthesia with the patient supine. Initial premedication consisting of atropine sulphate 0.6mg. intramuscularly for adults and 0.3mg for children was given half an hour before the onset of the procedure. A short bevelled Lindingren needle 18 British standard gauge (SWG) (external diameter 1.2mm.) was used in adults and 20 British standard gauge needle (external diameter 1.00mm.) was used in children and kept flushed with normal saline. The needles are about 9cm. long. The syringe for hand injection is joined to the needle by a flexible tube.

This connecting tube of usually 20cm. in length is built to withstand forced pressure injections and is made of transparent plastic tubing. The syringes used for hand injection were of a 10ml. capacity. The contrast medium used in all cases was Urografin 60% w/v consisting of Meglumine diatrizoate 52% w/v and sodium diatrizoate 8% w/v. Meglumine salts are known to be less toxic to brain than sodium salts.

Using the standard Schonander table with a serial hand changer two films are obtained in the antero-posterior position and three films in the lateral position. For the antero-posterior views the patient's head is supported on a circular thin wedge and positioned with the chin tucked in, the head symmetrical and the tube angled 15^{o} caudal and centred 5cm. above the glabella. With the aid of a plastic connecter and a 10ml. capacity syringe 10ml. of contrast medium is injected by hand fast enough to obtain an arterial phase and a capillary phase of the cerebral circulation. For the lateral views, a hard paper block is placed under the head to raise it from the table so that the whole head is included on the lateral film. The head is positioned symmetrically with the median sagittal plane vertical. The X-ray tube is then rotated 90^{o} and centred 1cm. above the external auditory meatus. A further hand injection of

10ml. of contrast medium is made and the arterial, capillary and venous phases of cerebral circulation obtained at two second intervals with the help of a serial hand changer.

Only those patients with a histological confirmation of a meningioma were included in the study. Radiographic films were available in most of the patients and in the few cases where they could not be traced, the Radiologist's report in the patients file was used.

RESULTS

A total of 56 patients were studied of which 30 were women and 26 were men. The peak incidence was in the 5th decade and the mean age was 35 years. The youngest patient was 13 years and the eldest was 70 years. The ages of the patients as recorded at the time of admission fall into successive decades as follows:-

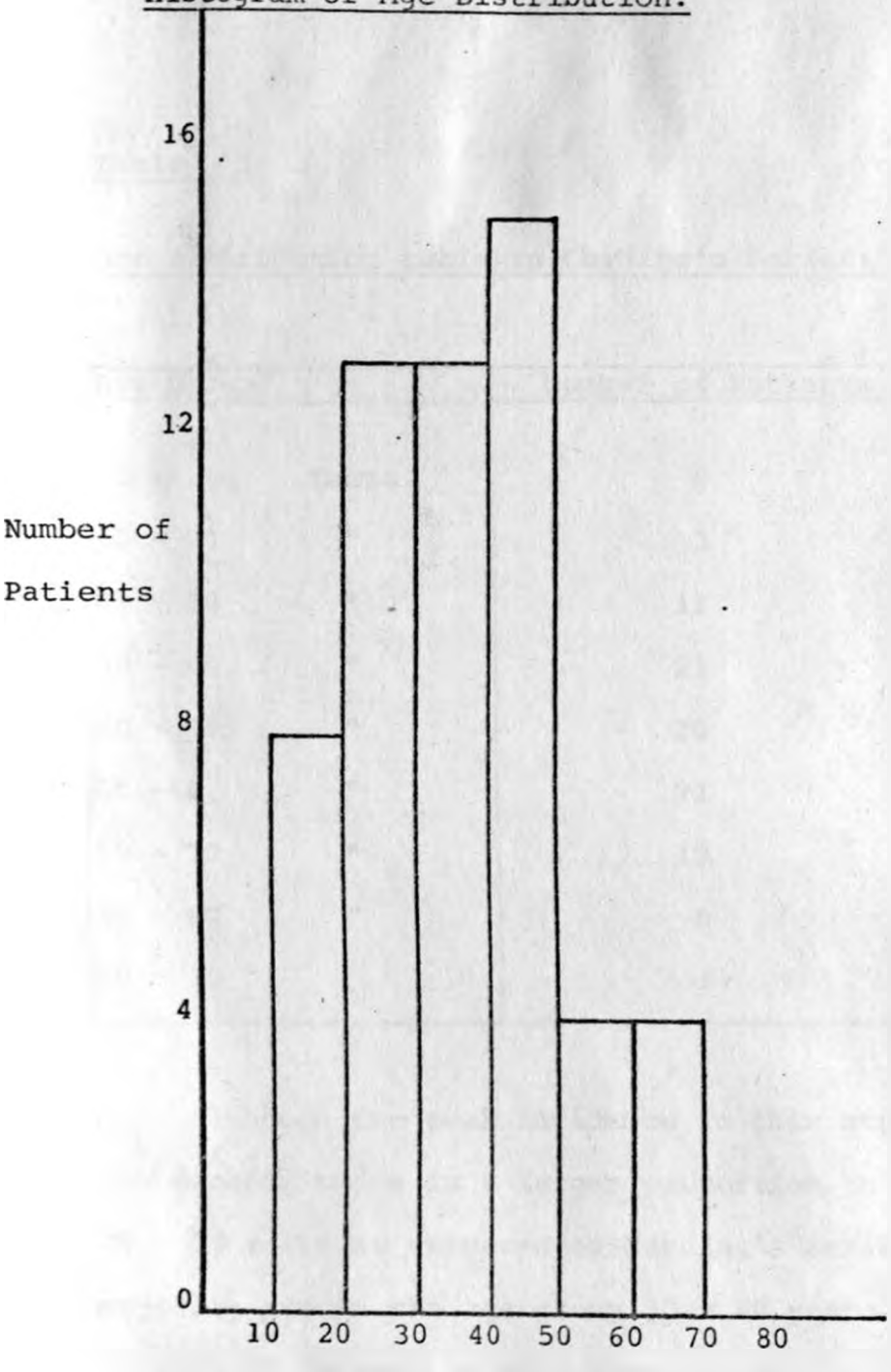
Table 1

Age distribution of 56 patients

Age Group	Number of patients	%
0 - 10 Years	0	0
10 - 20 "	8	14
20 - 30 "	13	23
30 - 40 "	13	23
40 - 50 "	15	26
50 - 60 "	4	7
60 - 70 "	4	7
> 70 "	0	0

Graph I

Histogram of Age Distribution:



For comparison the age distribution table in Cushing's Series of 97 patients [2] is presented below:-

Table II

Age distribution table in Cushing's Series:

Age Group	Number of Patients	%
0 - 10 Years	0	0
10 - 20 "	3	3.09
20 - 30 "	11	11.34
30 - 40 "	23	23.71
40 - 50 "	28	28.87
50 -60 "	21	21.65
60 - 70 "	10	10.30
70 - 80 "	0	0
80 - 90	1	1.03

Although the peak incidence in this study is in the 5th decade, there is a larger proportion in the age group 20 - 50 years as compared to Cushing's Series where the majority are in the age group 30 - 60 years. The patients in this study tend to be a decade younger.

From the figures shown above, although there were slightly more female patients than male patients the ratio of male to female patients is approximately 1:1. What was more striking however was that in 8 out of 11 female patients where the last delivery date was noted, the onset of symptoms coincides with the time during which the patient was pregnant, tending to suggest that pregnancy has some part to play in the aetiology of a meningioma. The remaining 3 patients had delivered 2 or more years prior to the onset of symptoms of a meningioma. Furthermore in 21 patients in whom the parity was noted 19 of them were multiparous while only 2 were non-parous. The relationship of pregnancy and the duration of symptoms in the 11 patients in whom the last delivery date was recorded is shown in table III below:-

Table III

PATIENT CODE NO.	AGE YEARS	PARITY	TIME SINCE LAST DELIVERY IN MONTHS	DURATION OF SYMPTOMS IN MONTHS
2	26	1 + 1	6	6
6	45	5 + 0	168	24
11	33	5 + 1	84	144
23	45	5 + 1	3	3
25	30	5 + 0	24	6
36	33	5 + 0	36	36
40	25	4 + 0	12	12
41	45	5 + 0	36	12
49	38	5 + 0	18	18
52	50	8 + 0	84	84
57	28	5 + 0	½	10

Trauma to skull:

A positive history of trauma to the skull was recorded in only 5 patients out of a total of 34 patients in whom the clinician specifically inquired into the history of skull trauma.

Table IV

History of trauma to the skull:

	Number of patients
Positive History of Trauma	5
Negative History of Trauna	29
Not recorded	22
Total	56

Table V

Tribal distribution of the 56 patients:

Tribe	Number of Patients	%
Kikuyu	22	39
Kamba	10	17
Kalenjin	8	14
Luo	5	9
Luhya	4	7
Maasai	2	4
Swahili	2	4
Somali	1	2
Non Kenyan	2	4

Most of these patients were referred to Kenyatta National Hospital and the tribal distribution and district of residence tend to reflect their proximity to Kenyatta National Hospital rather than an actual tribal bias.

Symptoms:

The symptomatology of these patients is shown in the table below:-

Table VI

Symptom	Number of Patients
-Headache	42
-Impaired vision	38
-Convulsions (Grand Mal)	18
-Weakness upper/lower limbs	15
-Mental changes	10
-Swelling of the skull	9
-Vomiting	8
-Dizziness	5
-Tinnitus	4
-Urine/faecal incontinence	3
-Jacksonian fits	3
-Dysarthria	2
-Impaired hearing	2
-Pain in the eye	2
-Restriction of eye movements	1
-Nasal obstruction	1
-Diplopia	1
-Earache	1
-Numbness of side of face	1
-Difficulty in chewing food	1
-Polydipsia	1

The most common symptoms were headache, impaired vision, convulsions and weakness of either the upper or lower limbs or both and mental changes. The other fairly common symptoms were those referable to a raised intracranial pressure. The rest of the symptoms indicated above were relatively rare. Headache and impaired vision were reported in most patients regardless of the specific site of the tumour. Convulsions and symptoms referable to hemiplegia were mainly seen in patients with convexity meningiomas while impaired vision was the most prominent symptom in patients with midline subfrontal meningiomas (i.e. olfactory groove, sphenoid ridge and tuberculum sellae meningiomas).

Duration of symptoms:

More than half of the patients, 35 of the 56 patients presented with symptoms lasting one year or less and indeed 15 out of those 35 patients presented with symptoms lasting 3 months or less. The shortest duration of symptoms that was recorded was one week which was noted in 2 patients both of whom had headache and convulsions and were found to have convexity meningiomas. The longest duration of symptoms was in a

65 year old lady who had a left sided parietal bone swelling and a right lower limb weakness for a period of 17 years and was also found to have a convexity meningioma. Below is a table showing the duration of symptoms.

Table VII

Table of duration of symptoms in 56 patients:

Duration of Symptoms	Number of Patients	%
0 - 1 year	35	62
1 - 3 years	10	18
Over 3 years	9	16
Unknown	2	4

ABNORMAL PHYSICAL FINDINGS IN 56 PATIENTS:

By far the most common abnormal clinical finding was a reduced visual acuity which was noted in 37 patients (56%). This was followed by features of raised intracranial pressure which was noted in 46% of the patients, optic atrophy in 20 patients (36%) and hemiplegia 15 patients (26%). All other clinical findings as listed in the table below were relatively rare.

Table VIII

Table of abnormal physical findings in 56 patients:

Physical Sign	Number of Patients
-Impaired vision	37
-Raised intracranial pressure	26
-Optic atrophy	20
-Hemiplegia	15
-Mental changes	10
-Palpable skull swelling	9
-Abnormal deep tendon reflexes	9
-Exophthalmos	7
-Cranial nerve palsies	6
-Dysarthria	2
-Cerebellar ataxia	1
-Anosmia	1

Site distribution of the tumour:

Site distribution as revealed at carotid angiography and craniotomy is shown in a table below:-

Table IX

Table of tumour site distribution:

Site	Number of Patients	%
- Convexity meningiomas ----------	27	48
- Sphenoid ridge meningiomas ------	12	22
- Para-sagittal and Falx meningiomas ----------	8	14
- Olfactory groove meningiomas ----	6	11
- Tuberculum sellae meningiomas ---	3	5
- Ventricular meningiomas ---------	0	0
- Total number of patients -------	56	

The convexity meningiomas, the most frequent in this study constituting 48% are taken to be those which overlie the cerebral hemispheres between the base and parasagittal regions and have no attachment to a major venous sinus. The sphenoid ridge is taken to be that sharply edged shelf of bone which supports the posterior part of the undersurface of the frontal lobe and provides the boundary between the anterior and middle cranial fossae. Meningiomas arising from the meninges clothing this ridge form a clinical entity and constitute 22% of the patients in this study. Taken as a single site, the sphenoid ridge was the single most common site of this tumour. No ventricular meningiomas were seen. There was no significant laterality as 24 occurred in the left hemisphere, 21 in the right hemisphere and 4 along the midline.

RADIOLOGICAL FINDINGS

Plain film findings:

Of the 56 patients 43 (77%) had abnormal plain film findings while 23 (23%) were normal. The most frequent of these were localised hyperostosis of bone

adjacent to the site of the tumour, erosion or ballooning of the pituitary fossa and increased vascular markings. Sutural diastasis, increased convolutional markings, localised bone resorption and tumour calcification were also fairly common. The bone resorption was either patchy or presented as a single large bone defect. A combination of bone resorption and bone sclerosis was seen quite frequently. Tumour calcification was noted in 21% of the cases, one of whom had an unusually large psammomatous calcification that could have been mistaken for a tuberculoma or a calcified haematoma. That example is shown in photographs 3 and 4.

Marked hyperostosis with spiculation of bone was seen in some patients especially those where the tumour was large, while in patients with massive tumours there was complete bone destruction at the site with the tumour breaking through and then only being covered by the scalp.

Table X

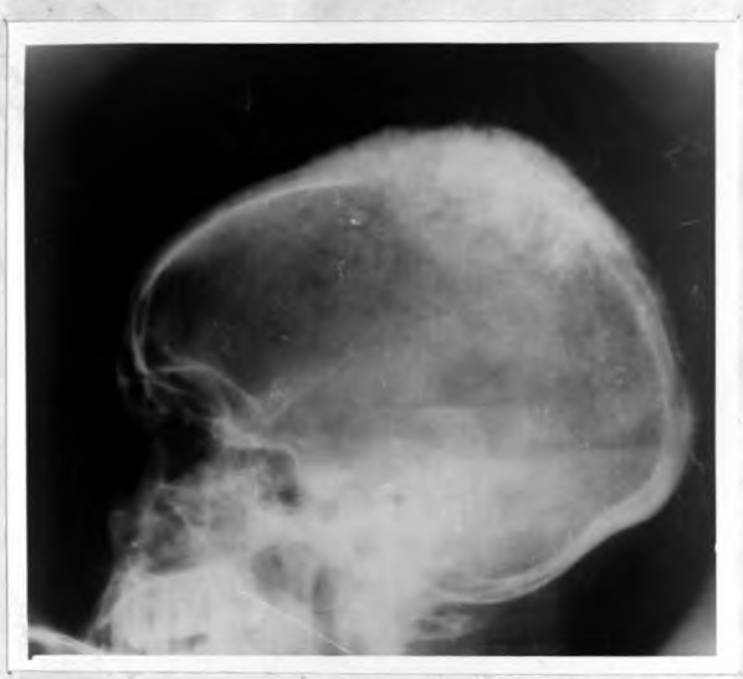
Table of plain film findings:

Total Number of Patients - 56:

	Total	%
Normal	13	23
Abnormal	43	77
-Localised hyperostosis	31	76.80
-Pituitary erosion/ballooning	29	67.04
-Increased vascular markings	18	41.01
-Localised bone resorption	16	36.05
-Sutural separation	15	34.01
-Increased convolutional markings	11	25.05
-Mixed osteoblastic/osteolytic bone reaction	11	25.05
-Tumour calcification	9	21
-Marked bone spiculation	3	7
-Thinned cortex	3	7
-Localised skull elevation	2	4.06

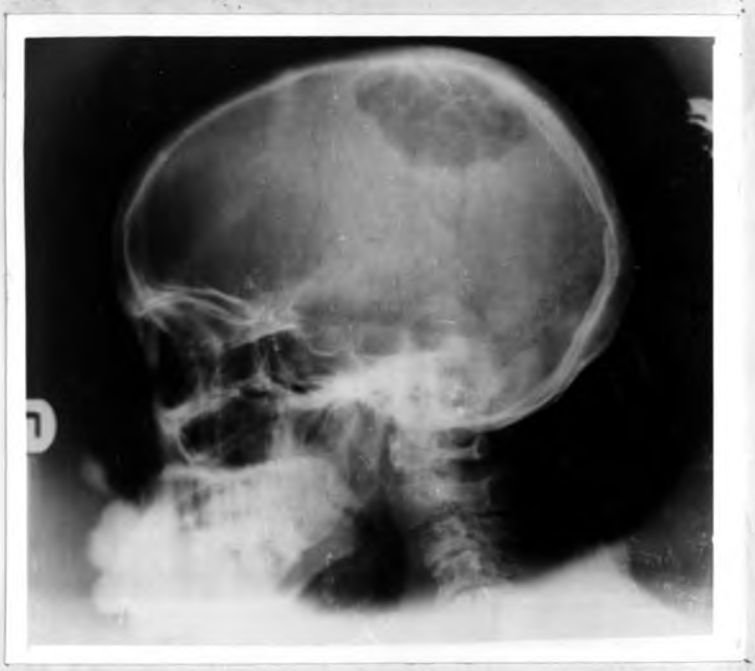
Of all these plain film findings, hyperostosis, increased vascular markings and psammomatous calcification are the only features that are specifically diagnostic of meningioma while the other x-ray findings named above are mainly features of space occupying lesion with raised intracranial pressure.

Photograph 1:



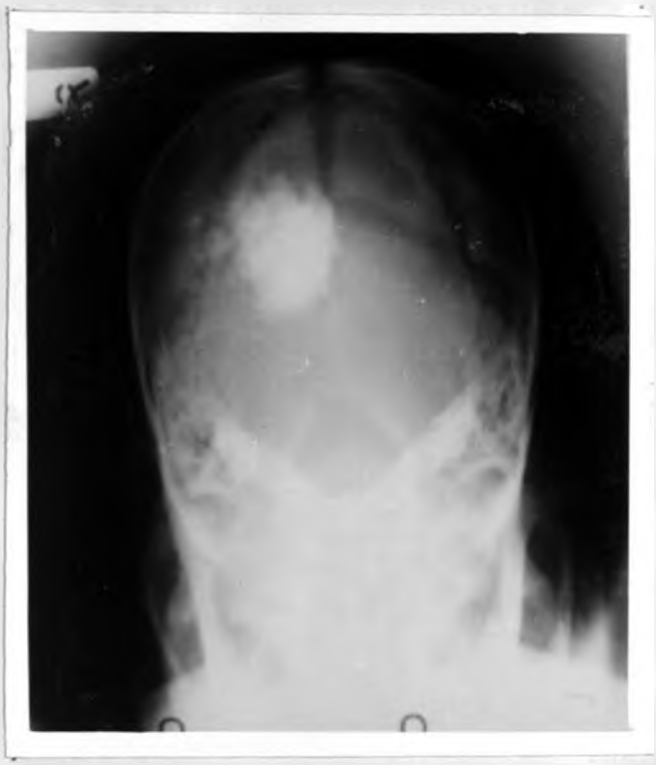
Plain lateral film in a 56 year old lady who presented with 17 years history of a swelling over the skull. It shows marked hyperostosis with spiculation.

Photograph 2:



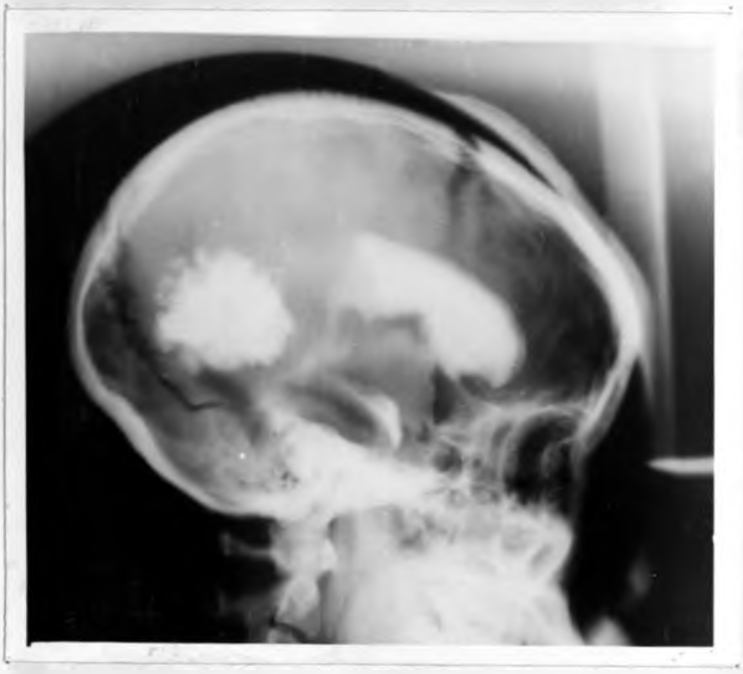
Lateral view showing an unusually large osteolytic lesion caused by a meningioma. A region of hyperostosis adjacent to it is noted and the pituitary fossa is eroded.

Photograph 3:



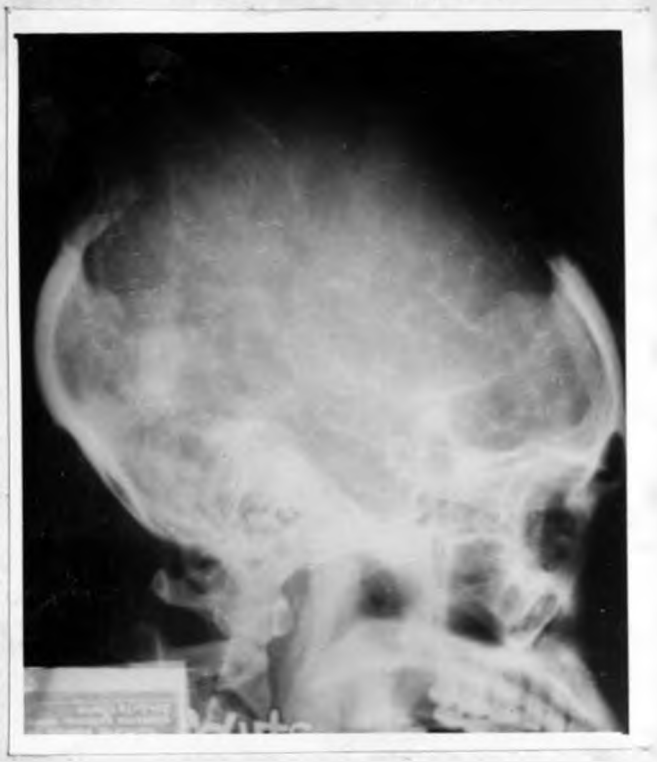
A Towne's view of an 18 year old girl who presented with 3 months history of headache, reduced visual acuity and features of raised intracranial pressure. An unusually large calcification is noted along with marked sutural diastasis.

Photograph 4:



Lateral view of the same patient shown in photograph 3 at ventriculography.

Photograph 5:



Lateral view of a patient with a massive convexity meningioma that has completely destroyed a portion of the parietal bone with the tumour protruding through the skull.

CAROTID ANGIOGRAPHIC FINDINGS

Of the 56 patients in this study, 55 had carotid angiograms all of which were abnormal. Only one patient had a vetriculogram examination that revealed a tumour mass causing a pressure effect on the posterior horns of the lateral ventricles. There was a significant shift of the anterior cerebral artery to the contra-lateral side or merely a displacement from its normal course in 94.5% of the cases. A significant shift or displacement of the middle cerebral artery or its branches was seen in as a high as 83% of the cases while a localised zone of a vascularity was present in only 6 patients representing 10.9%. Tumours situated at the posterior tentorial region tended to produce slight displacement if any of the anterior cerebral or middle cerebral arteries. Below is a table of the non-specific angiographic changes denoting merely the presence of a space occupying lesion.

Table XI

Non-specific angiographic findings:

	Total	%
Normal	0	0
Abnormal	55	100
-Significant shift/displacement of anterior cerebral artery	52	94.5
-New vessel formation at the site of tumour	46	83.6
-Circumferential vascular delineation of the tumour	40	72.7
-Significant shift/displacement of middle cerebral artery	38	69
-Localised zone of avascularity	6	10.9

Specific angiographic findings:

In 78% of these patients the cerebral arteries were sharply deflected from their course in the region of the tumour connoting the well demarcated nature of this neoplasm. About 2/3rds of the patients showed the classical homogeneous well demarcated "cloud" of meningioma. The typical "cloud" circulation was noted in the arterial, capillary and venous phases in

most cases. A prominent external carotid circulation supplying the tumour was demonstrable in 27.2% of these patients. In a considerable number of patients the centre of the tumour "cloud" corresponded well with the region of hyperostosis of the skull. Only 8 patients (14.5%) had a break in the superior sagittal sinus.

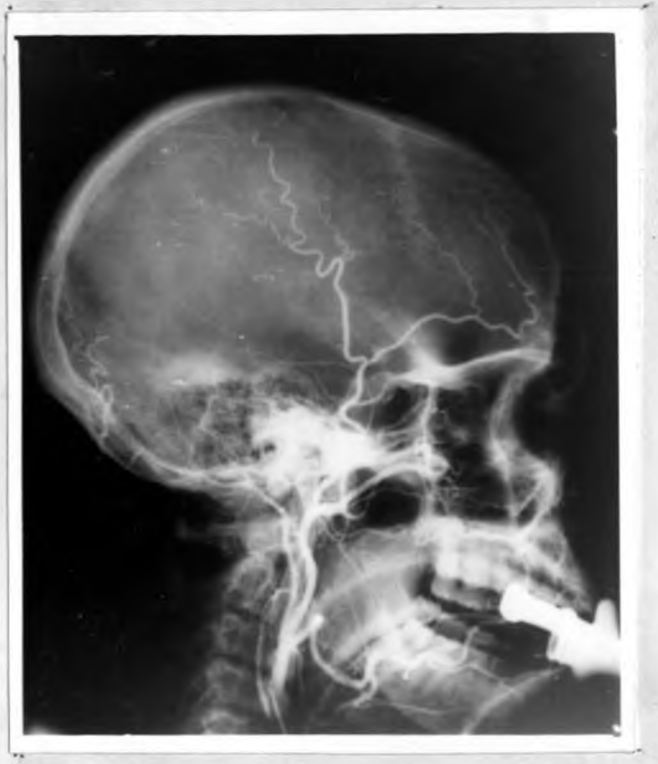
Table XII

Specific angiographic changes in 55 patients:

	Total	%
-Sharp deflections of arteries ----------	43	78
-Classical "cloud" ----------	35	63.6
-Central arterial zone with a peripheral venous drainage ----------	22	40
-Beaded various small vessels within tumour area ----------	16	29.1
-Prominent external carotid circulation ---	15	27.2
-Fine linear, wiry arterial vessels within tumour area ----------	7	12.9
-Break in superior sagittal sinus ---------	8	14.5
-Radiolucent defects within the "cloud" ---	10	18.1

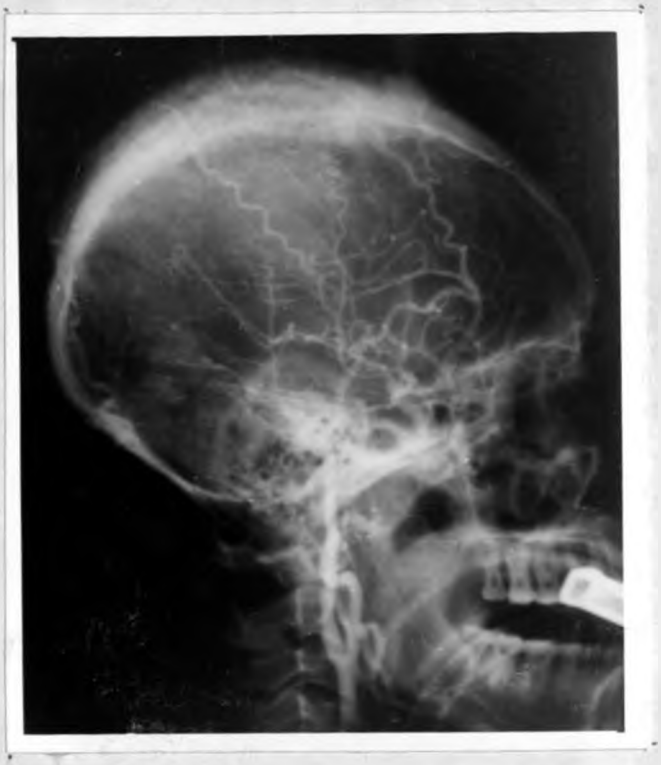
Tumours of the parasagittal or the falx and the convexity meningiomas in most cases tended to produce marked and obvious changes especially the typical tumour "cloud" and a prominent external carotid circulation. Meningiomas of the base of the skull showed typical angiographic changes depending on the specific site of the tumour. In the olfactory groove meningiomas the lateral angiogram film (arterial phase) revealed elevation of the proximal branches of the anterior cerebral artery as well as bowing with a forward concavity. The tuberculum sellae meningiomas tended to displace A_1 of the anterior cerebral artery upwards and posteriorly while the terminal portion of the internal carotid artery is straightened and displaced laterally, the two vessels thus forming an obtuse angle, the normal angle being an acute one. The sphenoid ridge meningiomas were characterised by elevation of the horizontal portion (M_1) of the middle cerebral artery while the anterior cerebral artery was displaced to the contralateral side. Together with the distal portion of the internal carotid artery these take the shape of the letter "Y".

Photograph 6:



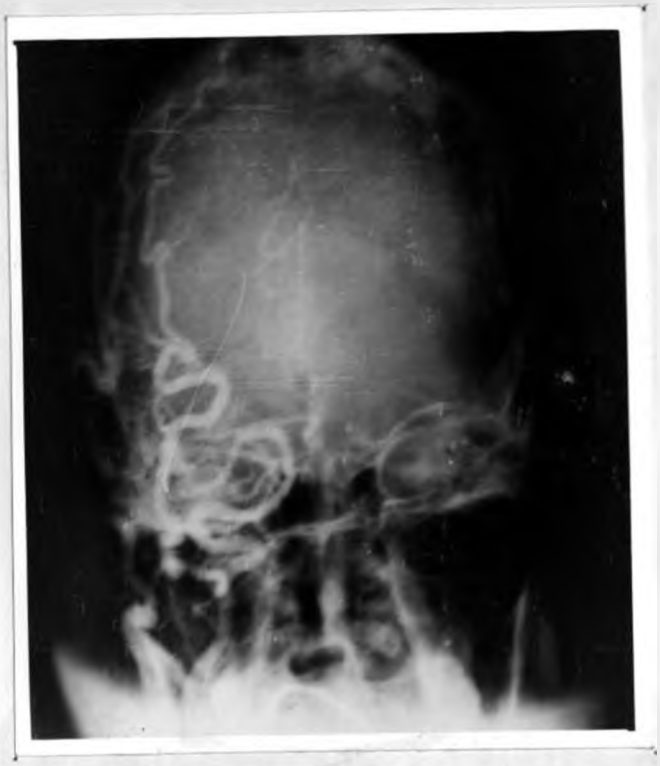
Lateral view of the arterial phase of an angiogram showing a normal external carotid circulation.

Photograph 7:



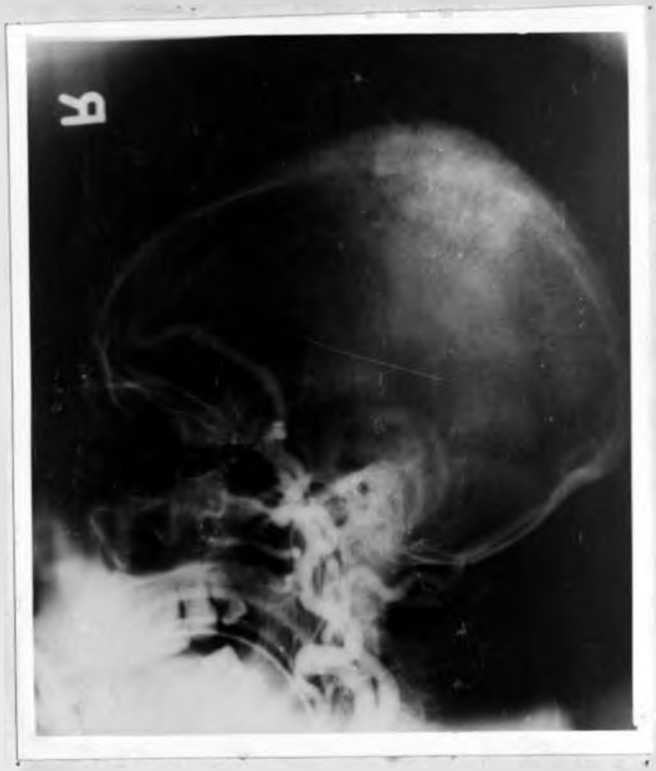
Lateral view of an arterial phase of a carotid angiogram showing a prominent external carotid circulation supplying the tumours in the parietal region.

Photograph 8:



Antero-posterior view of a carotid angiogram in the patient whose plain film is shown in photograph I showing a marked external carotid circulation supplying the tumour.

Photograph 9:

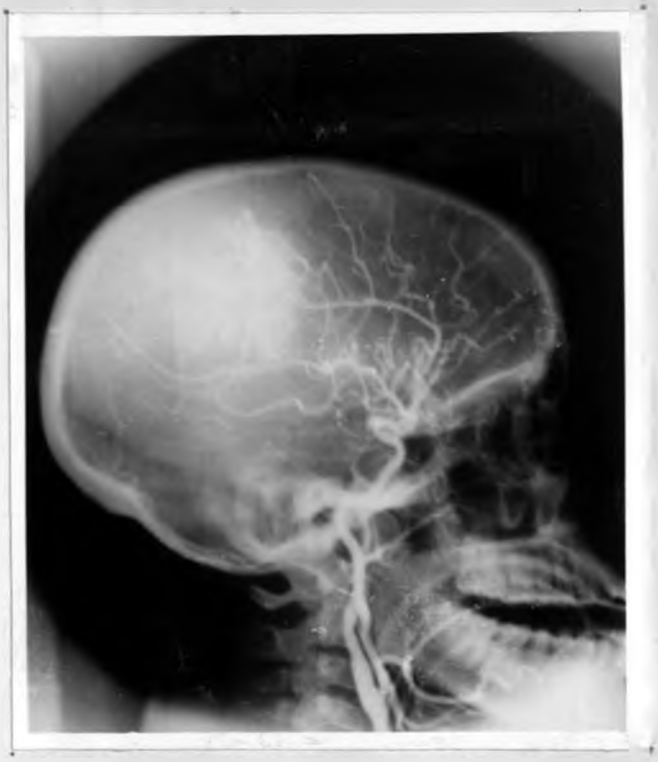


Lateral film of the same patient as in photograph 8 showing much of the contrast media in the external carotid circulation and very little in the internal carotid circulation.

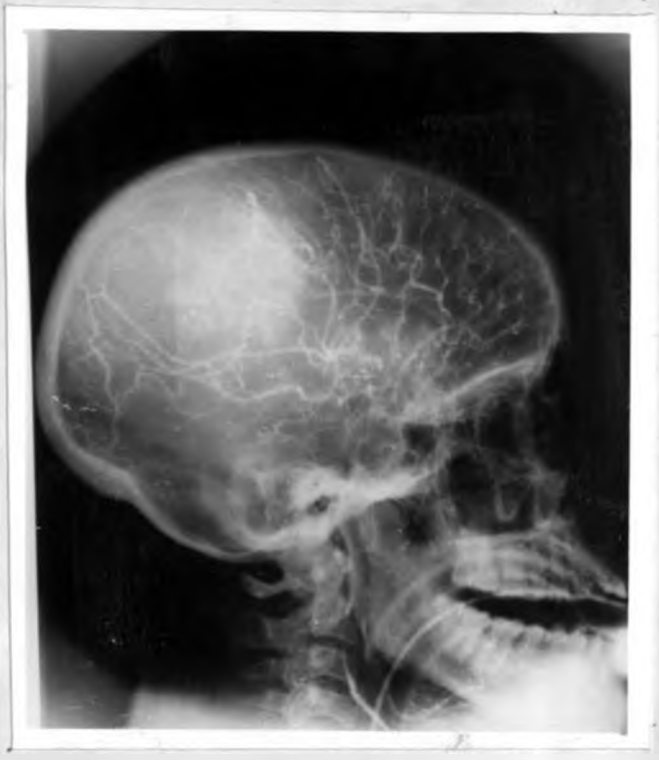
Photographs 10, 11 and 12 below:

Show the lateral views of a carotid angiogram showing the typical tumour blush "cloud" as seen in the arterial, capilarry and cenous phases.

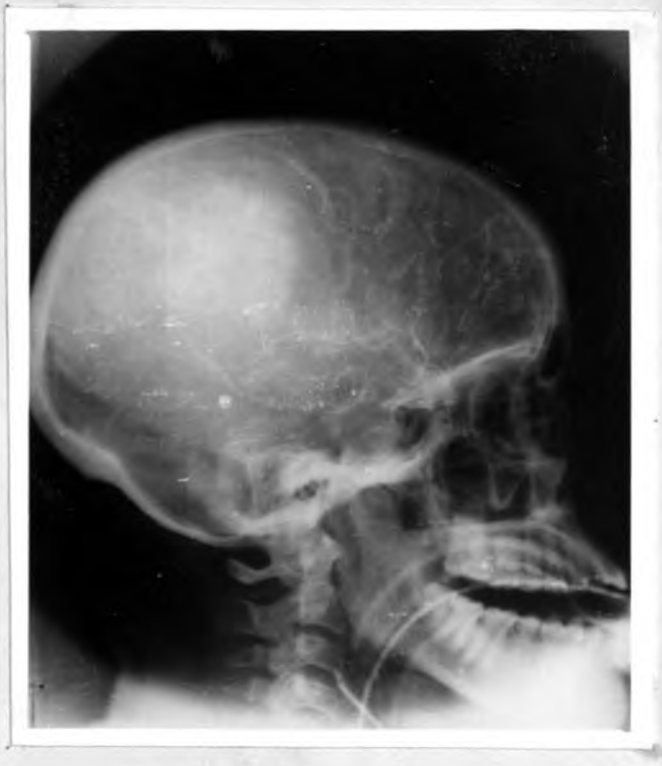
Photograph 10:



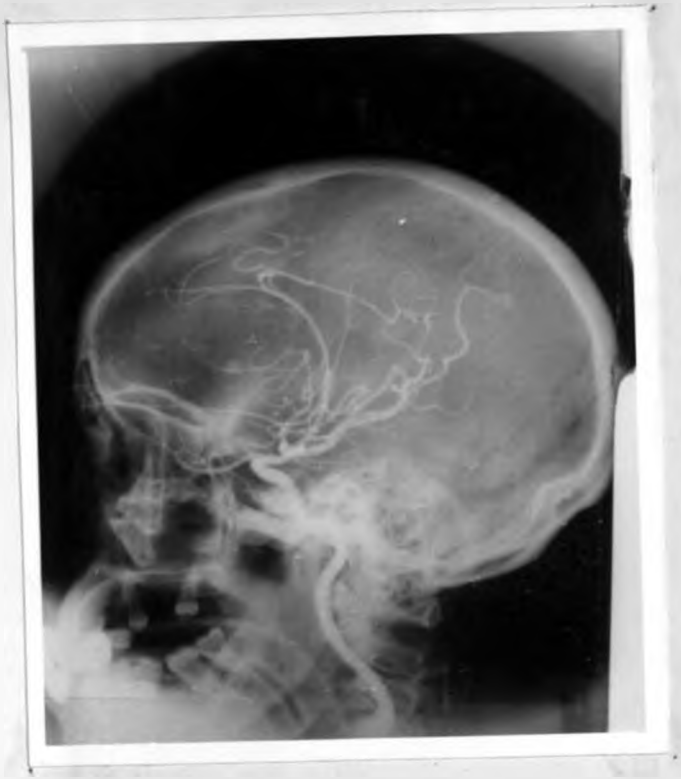
Photograph 11:



Photograph 12:

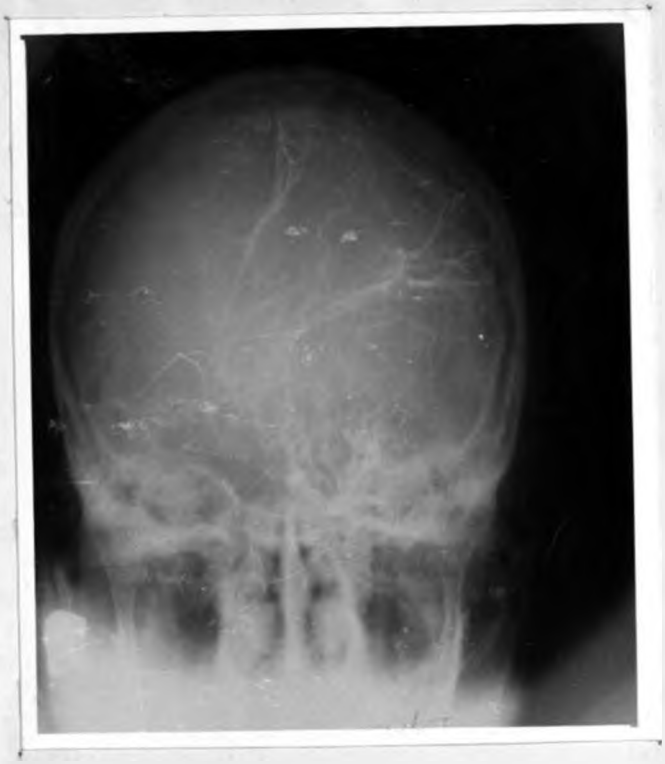


Photograph 13:



An example of an olfactory groove meningioma showing a posterior displacement and bowing of the anterior cerebral artery.

Photograph 14:



Antero-posterior view of a carotid angiogram showing the characteristic displacements of the anterior cerebral and middle cerebral arteries in a sphenoid ridge meningioma. A tumour blush is also noted.

Diagnostic Accuracy of Plain Skull Film and Carotid Angiography in Meningiomas:

By reviewing the Radiologists's reports on plain skull films and carotid angiograms it was possible to assess the diagnostic accuracy of these methods of examination. On plain skull films a definitive diagnosis of meningioma could be made in 14 (25%) of the patients while a diagnosis of a space occupying lesion was made in another 22 (40%) patients. The remaining 20 patients (35%) had normal plain skull films.

On carotid angiography a definitive diagnosis of a meningioma was made in 41 patients (75%) while a diagnosis of a space occupying lesion was made on 14 patients (25%). Not a single carotid angiogram was reported as normal.

Prognosis:

Of the 56 patients, 30 recovered completely post-operatively which represents 53.5% of the patients. Six patients had a permanent disability mainly blindness or grossly reduced visual acuity despite the surgical excision of the tumour. Approximately 25% of the patients died at operation or soon after operation. Recurrence was noted in a total of 5 patients, 2 of whom had malignant transformation of the tumour while 2 patients were lost to follow up.

DISCUSSION:

The first major studies on meningioma were carried out by Harvey Cushing in 1922 and again by Harvey Cushing and Eisenhardt in 1938[2]. Since then an enormous quantity of literature has been written on this tumour. This is understandable for this is a benign tumour that rarely turns malignant and when favourably placed is amendable to cure by excision. However nothing has been written on this particular tumour in this hospital and this is the first study on meningiomas in Kenyatta National Hospital.

The incidence of intracranial meningiomas in the Western countries, Japan and India among other neoplasms originating within the cranium is given as 14% by Russell and Robinstein in London 1963, 13.4% Zulch in 1967, 15.9% Katsura in Japan 1959 and 13.1% Dastur in India [8]. On the African continent Adeku and Adeloye in 1973 in their article "Cranial Meningiomas in the Nigerian African" found meningioma to constitute 27.1% of all primary neoplasms of the cranium [8]. Froman and Lipschitz in 1970 found meningiomas to constitute 30.3% in the Bantu population in the Transvaal in South Africa[10]. In Ivory Coast Giordano et al found meningiomas to constitute 33% of all intracranial neoplasms while Dumas et al in Senegal West Africa put the figure at 15.9% [12,14]. Adeku and Jonata in a similar study in Ibadan Nigeria, found meningiomas to constitute

26.7% of all intracranial primary neoplasms. A similar study has not been done at Kenyatta National Hospital. However, Dr. Onyango Akena reviewing 105 patients referred to Kenyatta National Hospital X-ray Department for carotid angiography in one year found 5 meningiomas out of 17 intracranial neoplams which works out to about 33% [21]. These figures above tend to suggest that on the whole meningiomas are more common among the African population as compared to the Western population, Japan and India. On the contrary however Billinghust J.R. in Kampala 1966, found meningiomas to constitute 8.7% of all intracranial neoplasms [9]. Furthermore Murphy N.B. reviewing 100 consecutive patients referred for carotid angiography at Mulago Hospital Kampala found only 2 cases of meningiomas and even then in Asian women, and none in African patients [13]. It is doubtful whether these 2 studies by Murphy and Billinghurst potray the true situation as regards meningiomas in Uganda.

The presentation of meningiomas in this study is comparable to that in other studies elsewhere. For example the tumour was slightly more common in females and has a peak incidence in the 5th decade. There appears to be a relationship between pregnancy and development of a meningioma. H. Cushing in his series found that in many cases the tumour was found at the exact situation where a stunning blow had been received on the skull years

before the onset of symptoms [2]. Such an association was not found in this study.

The symptoms in these patients were those of a space occupying lesion and those referable to pressure effect on the part of the tumour on adjacent structures such as the cranial nerves. In most reports, meningiomas have been characterised by along duration of symptoms. This however, was not the case in this study for most of the patients presented with a relatively short duration of symptoms, less than 3 years in 80% of cases while most of Cushing's patients gave a history of 5-10 years [2]. Furthermore there was no relationship between the site of the tumour and the duration of the symptoms. It would therefore appear that this tumour grows rapidly among the Kenyan population. An example of this is born out in one case of a 40 year old lady who had a normal carotid angiogram but a repeat carotid angiogram a year later demonstrating a large spenoid ridge meningioma.

The most common abnormal clinical finding in these patients was decreased visual acuity, regardless of the site of the tumour. While most patients would seek medical attention as soon as they noticed their failing sight, it is unfortunate in that the defect be it a reduced visual acuity or blindness, is permanent.

The site distribution of these tumours in thist study was similar to findings elsewhere. The most frequent site was at the convexities of the skull followed by the sphenoid ridge region.

The diagnostic value of hyperostosis of the skull has been demonstrated in many articles such as that by K. Francis in 1976 and Gold et al in 1969 [16,22]. Hyperostosis was found to be the most common and reliable indicator of the presence of a meningioma on plain films. Markedly increased vascular markings on plain films tended to support the highly vascular nature of this tumour. The typical tumour "blush" or "cloud" was demonstrated in a higher proportion of patients enabling improved definite diagnosis of a meningioma. The typical tumour "cloud" was demonstrated in 63.6% of the patients as opposed to 42.9% in H.G. Jacobson's series of 126 patients [15]. The tumour characteristically tended to persist through the arterial, capillary and venous phases and it is thought that this is the real distinction between a meningioma and other tumour circulations [17].

It is generally accepted that plain films will diagnose 30-63% of intracranial meningiomas though it may raise the suspicion of the presence of a tumour in 73-78% of the cases Jacobson et al 1959 and Gold et al 1969[15,16]. In this study however a definitive diagnosis of meningioma was made on plain films in very few cases, the radiologist reporting on the films committing himself to only saying that there is a space occupying lesion. Angiography enables a definitive

diagnosis of meningioma in 70% of cases while the presence of a tumour should be diagnosed in 90% of the cases according to Wickbom M I. et al 1958 and Bonna et al 1969 [18,19]. A comparable definitive diagnostic accuracy at 75% was found in this study while a diagnosis of a space occupying lesion was made in all of the patients. Computerized Axial Tomography (C.A.T.) is thought to be the most accurate method of diagnosis of meningioma and besides it is a non-invasive procedure. L.E. Claveria in 1977 found that a C.A.T. - Scanner provides a specific diagnosis of meningioma in 86% of cases and diagnoses the presence of a tumour in 96% of cases [20]. Given these figures with regard to this tumour the introduction of a C.A.T. - Scanner to Kenyatta National Hospital would be of little extra benefit in as far as the diagnosis of intracranial meningiomas is concerned.

CONCLUSION:

Meningiomas appear to constitute a higher proportion of primary intracranial neoplasms than is generally found in the Western countries, Japan and India. The age group affected in the Kenyan population appears to be a decade younger. Although the incidence in females is not significantly higher than in males there appears to be an association between pregnancy and the development of meningioma and perhaps more research should be instituted on this aspect of this tumour. The tumour appears to grow more rapidly among the Kenyan population than elsewhere. The symptomatology and clinical features do not otherwise differ significantly from that found elsewhere. Plain skull films and carotid angiography are quite adequate in the diagnosis of a meningioma and in demonstrating the site of the tumour as well as its blood supply.

REFERENCES

1. The Surgery of the Central Nervous System
by D.W.C. Northfield
1st Edition 1973
PP. 229-262.

2. H. Cushing:
The Meningioma (Dural Endotheliomas):Their Source and Favoured Seats of Origin
Brain - 1922
PP. 252-316.

3. D.S. Russell:
Meningiomas - Journal of Clinical Pathology
3: 191, 1950.

4. J. Kempes:
Electron Microscopic Studies of Meningioma
American Journal of Pathology
VOL. 39: 499, 1961.

5. Stein, Opalla and Schilp:
Fatty Acid Analysis of Meningioma by Gas-phase Chromatography.
Journal of Neurosurgery
Vol 20: 435, 1963.

6. An Atlas of Anatomy Basic to Radiology -
By I. Meshan
3rd Edition, 1975.
PP. 350-410.

7. A Colour Atlas of Neuropathology -
By C.S. Treip
1st Edition 1978
PP. 170-171.

8. E.L. Adeku and A. Adeloye:
Cranial Meningiomas in the Nigerian African -
African Journal of Medical Sciences.
VOL. 4: 275-291, 1973.

9. J.R. Billinqhust:
Intracranial Space Occupying Lesions in African
Patients at Mulago Hospital Kampala
East African Medical Journal Vol. 43: 385, 1966.

10. C. Froman and R. Lipschitz:
Demography of Tumours of the Central Nervous
System Among the Bantu Population of the Transvaal
Republic of South Africa.
Journal of Neurosurgery Vol. 32: 660, 1970.

11. E.L. Adeku and Jonata:
Intracranial Masses in Ibadan
West African Medical Journal
Vol. 16: 31, 1967.

12. C. Giordano and M. Lamouche:
Meningioma in Ivory Coast
African Journal of Medical Sciences
Vol. 4: 259, 1973.

13. N.B. Murphy:
Carotid Cerebral Angiography in Ugan
East African Medical Journal
Vol. 45: 49-52, 1968.

14. M. Dumas, P.L. Girard and H. Collomb:
Intracranial Meningiomas in Senegal
African Journal of Medical Sciences
Vol. 4: 251-158, 1973.

15. H.G. Jacobson, J.H. Shapiro, H.W. Lubetsky and
C.A. Carton:
Intracranial Meningiomas
A Roentgen Study of 126 Cases.
Radiology Vol. 72: 356, 1959.

16. L.H. Gold, S.A. Kieffer and H.O. Peterson:
Intracranial Meningiomas
A Retrospective Analysis of the Diagnostic
Value of the Plain Skull Films.
Neurology Vol. 19: 873, 1969.

17. Cerebral Angiography by:
H.A. Krayenbuhl
2nd Edition, 1968
PP. 295-310.

18. I. Wickbom and S. Stain:
5th Symposium Neurodialogique
Acta Radiologica
Vol. 50: 175, 1958.

19. M. Bonna and A. Appleby:
Some Observations on the Angiography of
Supratentorial Meningiomas
Clinical Radiology Vol. 20: 375-386, 1969.

20. L.E. Claveria, D. Sutton and B.M. Tress:
The Radiological Diagnosis of Meningiomas -
The Impact of E.M.I. Scanning
British Journal of Radiology
VOL. 50: 15-22, 1977.

21. Dr. Onyango - Akena:
Radiologist Kenyatta National Hospital
(Personal Communication).

22. K. Francis:
The Diagnostic Value of Hyperostosis in Midline Sub-frontal Meningiomas.
Radiology 119: 121-130, Apr. 1976.

ACKNOWLEDGEMENTS

I wish to express my sincere thanks and appreciation to the following:-

- Dr. J.M.K. Kitonyi, my Supervisor for the valuable guidance, advice and suggestions given throughout the preparation of this paper.

- Dr. R.S. Raja, formerly Chairman and Senior Lecturer, Department of Diagnostic Radiology for the encouragement during the initial stages of this work.

- The Clerical Staff of the Records Department and Radiology Department for the assistance rendered in the collection of the material.

- To my Dear Wife, Dr. A.W. Imalingat and my sweet little Son Herbert Michael Imalingat without whose patience and encouragement this paper may not have been completed.

- Dr. Malik, Radiologist Aga Khan Hospital, for valuable suggestions and material.

- Professor Kaare Lindqvist for constant encouragement.

- Mrs. R.I. Muturi and Miss M.B. Wangima for their valuable secretarial services.