Prospective Study of Intra Cranial Tumour

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Background and objective: A brain tumor or intracranial neoplasm occurs when abnormal cells from within the brain. There are two main types of tumors: malignant or cancerous tumors and benign tumors.[1] Cancerous tumors can be divided into primary tumors that started within the brain and those that spread from somewhere else known as brain metastasis tumors.[2]

Method: Fifty cases of intracranial tumours were studied These tumours were studied for their pathology, incidence in relation to age group, sex and sites of occurence.

Results: Histopathological examination of these tumours revealed that astrocytomas(28%) and meningiomas (22%) comprised a large majority of the total number of tumours. The incidence of each type of the tumour in the present study is compared to the incidence in other large published series.

Conclusion: The average age of the patients from whom the material was obtained was 42.99 years in our study. The highest incidence age group of astrocytoma which formed the majority of the total tumours in our study was 4th declade.There were 46% males and 54% females in our study, the female incidence being higher due to preponderance of meningiomas and Schwannomas in them.We found 64% supratentorial and 36% infra-tentorial lesions in our study. Intra operative squash preparations play an important role in early diagnosis of the tumours.

Keywords: Carcinoma, Intracranial, Prevalence

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INTRODUCTION

A brain tumor or intracranial neoplasm occurs when abnormal cells form within the brain.[1] There is two main types of tumors: malignant or cancerous tumors and benign tumors.[1] Cancerous tumors can be divided into primary tumors that started within the brain and those that spread from somewhere else known as brain metastasis tumors.[2] All types of brain tumors may produce symptoms that vary

depending on the part of the brain involved.[1] These may include headaches, seizures, problem with vision,vomiting, and mental changes.[2] The headache is classically worst in the morning and goes away with vomiting.[1] More specific problems may include difficulty in walking, speaking and with sensation.[23] As the disease progresses unconsciousness may occur.[3]

The cause of most cases is unknown.[1] Risk factors that may occasionally be involved include a number of genetic syndrome such as neurofibromatosis as well as exposure to the chemical vinyl chloride, Epstein-Barr virus, and ionizing radiation.[123] While concern has been raised about mobile phone use the evidence is not clear.[3] The most common types of primary tumors in adults are: meningiomas and astrocytomas such as glioblastomas.[2] In children the most common type is medulloblastomas.[3] Diagnosis is usually by medical examination along with computed tomography or magnetic resonance imaging.[1] This is then often confirmed bybiopsy.[2] Based on the finding the tumors are divided into different grades or severity.[2]

Treatment may include some combination of surgery, radiation therapy and chemotherapy.[2] Anticonvulsant medication is needed in those who have a seizure.[2] Dexamethasone and furosemide may be used to decrease swelling around the tumor.[2] Some tumors grow sufficiently slowly that all that is required is keeping an eye on it.[2] Treatments that use a person's immune system are being studied.[1] Outcome depends on the type of tumor.[3] Gliobastomas usually have poor outcomes while meningiomas usually have good outcomes.[3] The average five year survival rate for brain cancer in the United States is 33%.[4]

Brain tumors are the: second leading cause of cancer-related deaths in children (males and females) under age 20 (leukemia is the first). second leading cause of cancer-related deaths in males ages 20-39 (leukemia is the first). fifth leading cause of cancer-related deaths in females ages 20-39.

The facts and statistics here include brain and central nervous system tumors (including spinal cord, pituitary and pineal gland tumors). We continually update these statistics, as they become available. This material was last updated in November 2012. We thank the Central Brain Tumor Registry of the United States (CBTRUS) for their assistance with that update.

Prevalence Statistics: It is estimated that during the year 2010 more than 688,096 people in the United States were living with the diagnosis of a primary brain or central nervous system tumor. Specifically, more than 138,054 persons were living with a malignant tumor and more than 550,042 persons were living with a non-malignant tumor.

For every 100,000 people in the United States, approximately 221 are living following the diagnosis of a brain tumor. This represents a prevalence rate of 221.8 per 100,000 persons.

Tumor-Specific Statistics : Meningiomas represent 34% of all primary brain tumors, making them the most common primary brain tumor. Gliomas, a broad term which includes all tumors arising from the gluey or supportive tissue of the brain, represent 30% of all brain tumors and 80% of all malignant tumors. Glioblastomas represent 17% of all primary brain tumors, and 54% of all gliomas. Astrocytomas represent 7% of all primary brain tumors. Astrocytomas and glioblastomas combined represent 76% of all gliomas. Nerve sheath tumors (such as acoustic neuromas) represent about 9% of all primary brain tumors. Pituitary tumors represent 13% of all primary brain tumors. Lymphomas represent 2% of all primary brain tumors. Oligodendrogliomas represent 2% of all primary brain tumors.

Medulloblastomas/embryonal/primitive tumors represent 1% of all primary brain tumors. The majority of primary tumors (34%) are located within the meninges, followed by those located within the frontal, temporal, parietal and occipital lobes of the brain (22%). Metastatic brain tumors are the most common brain tumor. Although statistics for brain metastases are not readily available, it is estimated that there are more metastatic than primary malignant brain tumors per year. The cancers that most commonly metastasize to the brain are lung and breast

Keeping in mind above background we have done present study with following aim and objectives

1. To study the pathology of large range of intracranial tumor
2. To study intracranial tumor in relation with age, sex and other clinical data
3. To interact with clinician for prognosis and subsequent post op therapy

MAMATERIAL AND METHOD:

All the specimens analyzed were received as biopsy material from tumor mass or the whole excised tumor mass. Gross examination of all the specimens was done and

following points were note: size, shape, consistency, margins, externals, surface and cut surface appearance, area of haemorrhage, necrosis and calcification etc. specimens were collected in 10% formalin solution and were allowed to fix overnight.

After proper fixation, the tissue was processed by paraffin sectioning stained by Haematoxylin and Eosin stain, mounted propearly and then subjected to histopatholocal examination. Crush preparations were also made in some of cases which were immediately fixed in cytofix and stained after 10 minutes by routine Haematoxylin and Eosin stain.

RESULTS:

TABLE 1: This table gives the breakdown of various intracranial tumours of present study.

Type	Total No.	percentage %
Astrocytoma	14	28.00
Meningioma	11	22.00
Oligodendroglioma	04	8.00
Pituitary adenoma	04	8.00
Embryonal tumours	04	8.00
Neurilemmoma	03	6.00
Hemangioblastoma	03	6.00
Epidermoid cyst	02	4.00
Pleomorphic xanthoastrocytoma	01	2.00
Mixed glioma	01	2.00
Metastatic carcinoma	01	2,00
Pineocytoma	01	2.00
Lymphoma (NHL)	01	2.00
	50	100 %

The table shows that astocytoma comprised the highest percentage of the total tumours. 14 cases of Astrocytoma were reported as Cases Grade -I: 02, Grade -II: 01, Grade-III: 00, Grade-IV:11, 11 Cases of meningioma were reported as Psammomatous : 04, Meningothelial : 03, Transitional: 02, Fibroblastic : 02, 10 Cases were of Grade- I meningioma (Classic meningioma), 1 Case was of Grade-II meningioma (atypical meningioma)

TABLE 2: This table gives breakdown of various intracranial tumours according t6o various age groups.

Type	Age							
	0-10	11-20	21-30	31-40	41-50	51-60	>60	Total
Astrocytoma	-	01	-	04	03	03	03	14
Meningioma	-	-	01	-	04	04	02	11
oligodendroglioma	-	-	01	01	01	-	01	04
Pituitary adenoma	-	-	01	01	-	-	02	04
Embryonal tumours	02	01	01	-	-	-	-	04
Neurilemmoma	-	01	-	01	-	-	01	03
Hemangioblastoma	-	-	01	-	01	-	01	03
Epidermoid cyst	-	01	-	01	-	-	-	02
Pleomorphic xanthoastrocytoma	-	01	-	-	-	-	-	01
Mixed glioma	-	01	-	-	-	-	-	01
Metastatic carcinoma	-	-	-	-	-	-	01	01
Pineocytoma	-	-	-	-	-	01	-	01
Lymphoma (Nonhodgkin's)	-	-	-	-	-	01	-	01
Total	02	06	05	08	09	09	11	50

As shown in Table 2, the highest incidence age group for astrocytoma is 31-40 years, while for meningioma, it is 41-60 years, for embryonal tumours, it is 1-10 years & for metastatic carcinoma , it is more than 60 years. The highest incidence age group for intracranial neoplasms as a whole is 41 to more than 60 years.

TABLE 3: Breakdown of various intracranial tumours according to Gender

Type	Male	Female	Total
Astrocytoma	08	06	14
Meningioma	01	10	11
Oligodendroglioma	03	01	04
Pituitary adenoma	02	02	04
Embryonal tumours	03	01	04
Neurilemmoma	-	03	03
Hemangioblastoma	03	-	03
Epidermoid cyst	02	-	02
Pleomorphic xanthoastrocytoma	01	-	01
Mixed glioma	-	01	01
Metastatic carcinoma	-	01	01
Pineocytoma	-	01	01
Lymphoma (NHL)	-	01	01
Total	23	27	50

As shown in table 3, gliomas are common in males while meningiomas and neurilemomas predominate in females. Male to female ration is 0.85 :1

Table 4 & 5: Breakdown of various intracranial tumours according to different intracranial sites:

TABLE 5

TYPE	SITE												
	F	P	T	F-P	T-P	F-T	P-0	C-P∠	3rd vent	seller	B.S.	Cere	Total
Astrocytoma	2	4	-	4	2		1	-	-	-	1		14
oligodendroglioma	2		1	-	-	1	-	-	-	-	-	-	04
Pituitary adenoma	-	-	-	-	-	-	-	-	-	04	-	-	04
Embryonal tumours	1	--	-	-	-	-	-	-	1	-	-	2	04
Neurilemmoma	-	-	-	-	-	-	-	3	-	-	-	-	03
Hemangioblastoma	-	-	-	-	-	-	-	-	-	-	-	3	03
Epidermoid cyst	-	-	1	-	-	-	-	1	-	-	-	-	02
PXA	-	-	-	-	1	-	-	-	-	-	-	-	01
Mixed glioma	-	-	-	-	-	-	-	-	-	-	-	1	01
Metastatic carcinoma	-	-	1	-	-	-	-	-	-	-	-	-	01
Pineocytoma	-	-	-	-	-	-	-	-	1	-	-	-	01
Lymphoma (Nonhodgkin's)	-	1	-	-	-	-	-	-	-	-	-	-	01
Total	5	5	3	4	3	1	1	4	2	4	1	6	39

TABLE 5: Meningiomas

Site	No	%
Convexity	2	18.18
Sphenoid ridge	2	18.18
Olfactory groove	2	18.18
Parietal region	3	27.27
C-P angle	1	9.09
Parasagital	1	9.09
Total	11	99.99

F = Frontal; P=Parietal; T = Temporal; F-P = Fronto – parietal; T-P= Temporo parietal; F-T= Fronto- Temporal; P-O = Parieto Occipital; C-P angle =Cerebello –pontine angle; Vent =Ventricle; B.S – Brain stem; Cere =Ce rebellum; PXA =Pleomorphic xanthoastrocytoma

TABLE 6 : This table shows breakdown of cerebello-pontine angle tumours

Type	No	%
Neurilemoma	03	60
Epidermoid cyst	01	20
Meningioma	01	20
Total	05	100

This table shows that neurilemoma is the commonest tumour occuring in cerebello – pontine angle.

DISCUSSION:

Till very recently, the experience of pathologists working in medical college and S.S.G.H. Baroda with intracranial space occupying lesion was limited to an occasional autopsy case. In the late 80's , the neurosurgery unit started functioning in the Department of surgery and with that the Department of Pathology started receiving the biopsy specimens and excised specimens of brain tumours.

The present study, comprising of 50 cases, though modest in its scope, provided an opportunity to study the morphological features of various intracranial tumours from the standpoint of assigning them into prognostically different categories.

All the diagnosis in our study are based on light microscopic findings on Haematoxylin and Eosin stained smears as immunohistochemistry and other ancillary investigations are not done in our institution.

We have come across 13 different types of intracranial tumours in our study out of which gliomas presented the highest incidence of intracranial neoplasms in our study.

Astrocytomas comprised of 28 % of the total tumours in our study. According to Daumas – Duport [5] Classification, we have divided astrocytomas into 4 grades. Grading of gliomas in extremely important to predict their aggressiveness and therefore their prognosis.

Out of all astrocytomas , 78.57% (11 out of 14) were encountered as astrocytomas grade – IV. According to WHO Classificatioin, grade – IV astrocytomas is regarded as glioblastoma multiforme.[6]

Endothelial proliferation has been a required criterion for the diagnosis of glioblastoma multiforme, without a requirement of necrosis but tumour necrosis has

importance in predicting prognosis. The absence of necrosis predicts longer survival.[6] In our study, all (11) Glioblastoma multiforme cases showed endothelial proliferation while 9 cases showed presence of necrosis.

Out of 11 glioblastoma multiforme cases, one tumour also showed better differentiated astrocytic areas suggesting that this tumour is secondary glionblastoma. It is important to differentiate primary from secondary glioblastoma as prognosis is better with secondary glioblastoma. [7]

7.41 % of astrocytomas were grade –II & 14.28 % were grade – I, fulfilling the criteria enunciated by Daumas – Duport. [5]

In one of the astrocytoma grade –I cases, we received only biopsy material rather than the total tumour mass. This tumour might be of higher grade if the areas suggestive of higher grade might not have been included in the biopsy material. So whenever tumour is removed partially / subtotally, possibility of tumour being of higher grade always exists.

We also encountered one case of pleomorphic xanthoastrocytoma. The tumour showed lipidized spindle cells with some degree of pleomorphism, tumour giant cells, some bizarre cells and presence of eosinophilic hyaline globules. We have kept in mind that there is absence of necrosis in the entire tumour mass which forms an important differentiating point between pleomorphic xanthoastrocytoma and glioblastoma multiforme.

Oligodendroglioma constituted about 8 % of the total tumours. All were well – differentiated tumours.

Mixed glioma comprised of 2 % of the total tumours in our study. What constitutes mixed glioma has been a long standing problem. To arrive at concessus is problematic. There is no excepted definition of mixed glioma even the percentage of various components vary. Neoplastic oligodendrocytes due to variation in morphology can pose a problem. According to Andrew Kaye[7]. Mixed gliomas are defined as tumours in which minor cell population is more that 30 % . Before terming a tumour a 'mixed glioma', all the tissue must be sampled.

The menningiomas (22 %) constituted the next largest group in our study. Adopting morphological classification of meningioma by WHO[7] , syncytial, transitional, psammomatous and fibroblastic varieties were recognized.

Histological grading of meningiomas is also important in determining prognosis and deciding further plan of treatment. WHO[8, 9, 10] has proposed 6 criterias forgrading of meningiomas : hypercellularity, nucleawr plemorphism, mitosis, necrosis, loss of architecture and brain invassion, Jasaskelainen et al & Rohringer et al proposed that each of the WHO parameters to be given a score from 0-3 & partial scores added for the totalscore. According to these authors, tumours with a total score of 0-2 are classified as benign (Grade – I) . 3-6 as atypical (Grade – II), 7-11 as anaplastic(Grade –III) & >11 as sarcomatous (Grade- IV). [8,9]

In our study, 10 out of 11 meningiomas scored between 0-2 & therefore regarded as grade – I tumours, while one tumour scored 4 & therefore regarded as grade – II or atypical meningioma. Tumours having more than one grade require radiotherapy.[7]Pituitary tumours amounted to 8 % of the total. All the tumours were pituitary adenomas.

Out of 4 embryonal tumours, 2 were classical medulloblastomas, I was ependymobiastoma and 1 was neuroblastoma. We could not find any variant of medulloblastoma.

The tumour next in order of frequency was schwannomas with an incidence of 6 % . Cerebellar hemangioblastomas also constituted about 6 % of the total tumours, out of which one case was associated with polycythemia suggesting the possible relationship with Von Hippel – Lindau disease, however, no other findings of Von- Hippel – Lindau diseases were sen in that particular case.

We also found two epidermoid cysts. One was located in cerebello – pontine angle and another was cerebral epidermoid located in right temporal lobe, more popularity misnamed as cholesteatoma which is believed to be the tumour of remnants of invanginated necroectoderm. [11]

Metastatic intracranial tumours comprised only 2 % of the total. This small figure is however, a reflection of the predominantly neurosurgical material as the incidence in a general hospital is believed to be much higher. the tumour was squqmous cell carcinoma. We could not identify the primary site because the patient dies within few hours after surgery.

Our study contains one case of primary central nervous system lymphoma (PCNSL), situated in the posterior parietal regioin, eroding the skull bone and extending

upto scalp. This case was misdiagnosed as an infarct because of presence of diffuse distribution of lymphocytes and particularly its perivascular arrangement. The tumour recurred at the same site within 9 months of surgery and at this time we could identify those lymphocytic, non cleaved cell non- hodgkin;s lymphoma. Because this tumour was restricted to brain and meninges with local extension into scalp without involvement of liver, spleen, lymph nodes or bone marrow, it was regarded as primary central nervous system lymphoma.

The following table shows the incidence of various intracranial neoplasms of the present study in comparision with other series.

Neoplasma of glial series, neurous series and pinest parencyhmal neoplasms as well as choroid plexus papilloma and colloid cysts are included in this group

The proportion of neuroclodermal tumours in the total material is quite high in the present study as well as in the study of V.S.Lalitha et al & it is low in Katura's serioes from Japan. The proportion of meningomas is highest in the present series when compared with the other series.Schwannomas seem to be more frequent in V.S. Lalitha's series and Japanese series than in the western series and present study. The proportion of pituitary tumours in the present study is lower than that in Japanese and in Fan et al serioes. Tumours of maldevelopmental origin seem to occur much more frequently in Japanese series than rest of the series.

AGE: Coming now to the distribution according to age, we found the average age of the total number of patients in this study to be 42.99 years which is much higher than what found is Dastur et al series (26.4 years)

This table shows comparision of average age in years in the present study with that in Dastur et al series.

Average in years			
No	Type of tumour	Present study	Dastur et al series[11]
1	Astrocytoma	46.64	28.7
2	Meningioma	49.8	34.7
3	Schwannoma	38.6	33.3
4	Pituitary tumour	48.25	37.9
5	ısoformative tumour	48.0	29.8
6	Oligodendroglioma	46.75	37.4
7	Medulloblastoma	4.75	15.8
8	Epidermoid	25.5	29.2
9	Neuroblastoma	14.0	32.0
10	Pieocytoma	55.0	23.2

The total astrocytoma group presented with the average age of 46.64 –years with a range of 11-70 years in our study. The average age for glioblastoma multiforme in our study was 47.54 years. Burger et al (1985) reported mean age of 56 years for this neoplasm. The higher mean age in the western countries can be attributed to greater relative proportion of older people in those countries.

Meningiomas, Oligodendrogllomas and pituitary adenomas presented with the average age of 49.8, 46.75 and 48.25 years respectively. These tumours occured in younger age group in Dastur et al series as compared to present study. The youngest patient was with medulloblastoma with 2.5 years of age, while metastatic tumour was encountered in older age group in our study.

Gender: As regards distribution according to sex, in present study, 46% of the patients were males while 54 % of the patients were females. Female preponderance in our study is due to increased incidence of meningiomas and Schwannomas in them. With astrocytomas, Oligodendrogliomas, embryonal tumours and heamngioblastomas, males constituted the largest proportion. Only astrocytomas and meningiomas have been compared as in this particular study, the incidence of rest of the tumours is too small.

Astrocytomas M.F: 1.3:1 (Present study)

While M.F: 2.4:1 (Dastur et al[11])

Meningiomas M.F: 1:10 (Present study)

While M.F: 1.4:1 (Dastur et al[11])

In case of meningiomas, females predominated in our study Predominance of females for meningiomas as well as rapid enlargement of some examples during pregnancy and luteal phase of menatrual cycle indicate that the growth of meningiomas is subject to hormonal influence.[5]

LOCATION: Astrocytomas were seen almost anywhere in the brain. The sites involved in decreasing order of frequency were parietal, frontoparietal, grontal and temporoparietal region. Meningiomas were seen in parietal, frontal and temporoparietal region. Commonest sites found were convexities, sphenoid ridge and olfactory groove. Sites of meningiomas in our study are compared with that in the study of Martin Rohringer et al.[10]

Site	Present study %	Martin Rohringer[35] et al
Convexity	18.18	34
Sphenoid ridge	18.18	17
Olfactory groove	18.18	3
Parietal region	27.27	-
cerebello-pontine angle	9.09	2
Parasagittal	9.09	22

All schwannomas were seen in cerebellopontine angle of the brain. In the study of S.K. Biswas et al[12]. 77.7% of cerebello-pontine angle tumours were schwannomas. In present study, 64% of the tumours were supratentorial and 36% were ubfratentorial in Location, while in study of Dastur et al,[11] 58% of the tumours were supratentorial and 41 % were infratentorial in location. In both studies Schwannomas and medulloblastomas were exclusively infratentorial.

SYMPTOMS: Headache was the most common symptom in the present study. It was present in 36 patients. This symptom was mainly associated with gliomas and meningiomas. Other symptoms such as Vomiting, convulsion & paresis were also noted in relation to these tumours. Unsteadiness of gait of ataxia, vertigo, visual disturbances etc. were the symptoms observed in patients with the tumours located in cerebellum.

In patients with cerebello – pontine angle tumours (5 cases), common symptoms were vertigo, decrease or loss of hearing, ataxia etc.

In patients with pituitary tumours (4 cases), the commonest symptom was diplopia or other visual disturbances. Acromegaly is the clinical feature of pituitary adenomas producing growth hormone (GH) and prolactin (PRL)[5] which was present in one patient of pituitary adenoma whose GH level was 88 ng/ml (normal value : 0-7.0 ng/ml) and PRL level was 18.08 ng/ml (normal value : 3.5 -16.3 ng/ml). One patients of pituitary adenoma presented with secondary amenorrhoea, hoarsenes of voice, increased cutaneous pigmentation and weight gain. However, detail hormonal profile was not available to us to make cliniopathological correlation.

RADIOLOGICAL FEATURES: Neuroradiologic techniques play an important role in diagnosis of various tumours. Majority of astrocytomas (10 out of 14) in our study appeared in CT Scan & / or MRI as regions of diminished density that were not enhanced by contrast media employed to define foci of blood-brain barrier disruption. This is because astrocytomas do not usually provoke significant neovascularization. 6 out of 11 of the glioblastoma multiforme in our study were characterized by a bright enhancing ring(representing intact, abnormally vascularized tumour tissue in which blood - brain barrier is disrupted) that surrounded a region of hypodensity (central necrosis). Significant peritumoral oedema was also present in most of these tumours. Pleomorphic xanthoastrocytomas typically manifested as a superficial cystic lesion with solid, diffusely enhancing mural nodule. One of the cases of oligodendroglioma showed partial calcification on CT scan which is commonly seen in case of oligodendroglioma but its absence doesn't rule it out. Medulloblastomas (2 cases) presented as solid, intensely and homogeneously enhancing masses in vermis of the cerebellum of CT Scan. In our study, most of the menin- giomas (6 out of 11) presented as solid, lobulated or globose mass with intense and hormogeneous contrast enhancement. Few of the tumours (4 out of 11) permeated the neighbouring skull provoking hyperostosis. Few of the tumours (5 out of 11) showed calcificatioin.

All hemangioblastomas (3 cases) presented as brightly enhancing and sharply delimited mural nodules projecting into sizable cysts, located in the cerebellum. We also tried intraoperative squash preparations in 6 of our cases namely astrocytomas, meningiomas and pituitary adenomas. Our diagnosis on the basis of crush smears have

well been correlated with the histopathological diagnosis of a particular case. In crush smears of astrocytomas (2 cases of grade – I astrocytomas), we found the cells invested with delicate processes that taper from a modest perinuclear expanse of eosinophilic cytoplasm or are represented only as a background fibrillar meshwork in which "naked " nuclei appear to lie embedded. In one of the crush smears of pituitary adenoma, we found the oval cells with acidophilic cytoplasm and eccentric nuclei. Nuclear pleomorphism, binucleated and multin-ucleated cells were rapidly detected. This may be mistaken for plasma cell myeloma.[5]

CONCLUSION

The average age of the patients from whom the material was obtained was 42.99 years in our study. The highest incidence age group of astrocytoma which formed the majority of the total tumours in our study was 4th declade.There were 46% males and 54% females in our study, the female incidence being higher due to preponderance of meningiomas and Schwannomas in them.We found 64% supratentorial and 36% infra-tentorial lesions in our study. Intra operative squash preparations play an important role in early diagnosis of the tumours.

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