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Original Research Article

Histopathological Study of Non-Neoplastic Space Occupying Lesions (SOLs) of Central Nervous System: A Study from a Tertiary Care Centre

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Abstract

Introduction: Unlike in other systems, CNS has predominantly neoplastic lesions in comparison with the non-neoplastic ones. However, non-neoplastic CNS lesions are a mimicto neoplastic lesions posing histopathological diagnostic challenge. In the present study we made an attempt to exclusively study the SOLs of CNS which were non-neoplastic. *Aim of the study:* To document the histopathological spectrum of non-neoplastic SOLs of the CNS. *Materials and Methods:* Atwo-year prospective study in the department of Pathology, Mediciti Institute of Medical Sciences, Ghanpur, Telangana analysed biopsies of the central nervous system. The non-neoplastic lesions were analyzed for incidence and histopathological spectrum. *Results:* A total of 255 CNS SOLs were received out of which 24 were non-neoplastic incidence being 9.4%. The patients age ranged from 8 to 70 years. There were 15 male and 9 female patients, the male to female ratio being 1.6:1. 45.8% cases were cystic lesions, 25% cases showed gliosis and 29.1% cases were of infectious etiology. *Conclusion:* Almost 10% of SOLs in the CNS are of non-neoplastic etiology ranging from cystic lesions to gliosis to treatable infectious causes. Histopathological examination of SOLs of CNS is mandatory to distinguish neoplastic versus non-neoplastic lesions. Often the infectious agent can be identified which helps to institute appropriate therapy.

Keywords: CNS; Cysts; Gliosis; Infections.

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Introduction

SOLs of the CNS can be caused by a variety of infections, neoplasms, inflammatory or vascular diseases. Identification of non-neoplastic causes from neoplastic lesions is important because a misdiagnosis can lead to unwarranted extended neurosurgery.[1] Non-neoplastic SOLs of CNS often mimic neoplastic conditions but the management and prognosis of these conditions is totally different.

The current advances in diagnostic and therapeutic modalities have led to detection of varied CNS neuropathologic processes with increasing frequency. This makes it all the more important to have correct diagnosis of the SOL. The gold standard being histopathological examination to institute appropriate therapy.[2]

Aim of the study

To study the spectrum of non-neoplastic SOLs of the CNS.

Materials and Methods

This prospective study was conducted in Mediciti Institute of Medical Sciences from August 2013 to August 2015. performed in the department of Neurosurgery. These tissue specimens were submitted to the department of Pathology for histopathological examination. All the tissue specimens were fixed in adequate amount of 10% neutral buffered formalin and were submitted for routine histopathological processing. The paraffin blocks were made and sections were cut at 5 microns thickness and examined for light microscopy. Special stains were used as and when necessary. The clinical details were noted from the request forms regarding the patient age, gender, presenting complaints, examination, various investigations done and also the imaging studies like computed tomography and Magnetic resonance imaging reports were noted. The non-neoplastic lesions were studied for incidence and patient demographics.

Observations and Results

A total of 255 biopsies of SOLs of Central Nervous System (CNS) were received. 24 (9.4%) cases were non-neoplastic while 90.5% were neoplastic. There were 15 males and 9 females; the male to female ratio was 1.6:1. The patients were aged 8 years to 70 years. Cystic lesions were predominant accounting for 45.8% cases, followed by gliosis in 25% cases. Infectious aetiology was seen in 29.1% cases (Table 1).

Table 1: Age distribution of non-neoplastic SOLs of CNS

Age in years	Infection/Inflammation/Gliosis		Cystic lesions		Total
	Males	Females	Males	Females	
1–10	–	–	1	–	1
11–20	2	–	2	1	5
21–30	1	3	3	2	9
31–40	2	1	–	-	3
41–50	2	–	1	1	4
51–60	1	–	–	–	1
61–70	–	1	–	–	1
Total	**8**	**5**	**7**	**4**	**24**

Most of the cases of non-neoplastic lesions were seen in the 11–30 year age group (Table 2).

Of the 24 cases of non-neoplastic lesions, there were 2 cases of tuberculoma, 3 cases of fungal infections, 1 case each of cysticercosis and chronic non-specific infection, 6 cases of gliosis, 11 cases of cysts. The encountered 5 cases of colloid cysts, 2 cases of arachnoid cyst, 3 cases of neurenteric cyst and 1 case of epidermoid cyst (Table 3).

Table 2: Histopathological diagnosis of non-neoplastic CNS SOLs

Type of lesion	Males	Females	Total (%)
Tuberculoma	1	1	2 (8.3%)
Fungal infection	2	1	3 (12.5%)
Cysticercosis	1	0	1 (4.1%)
Chronic non-specific infection	1	0	1 (4.1%)
Gliosis	3	3	6 (25%)
Cysts	7	4	11 (45.8%)
Total	**15**	**9**	**24 (100%)**

Table 3 Cystic lesions of CNS

Age in years	Colloid cyst	Neurenteric cyst	Arachnoid cyst	Epidermoid cyst
1–10	1	–	–	1
11–20	1	–	1	–
21–30	2	2	1	
31–40	–	–	–	–
41–50	1	1	–	–
Total	**5**	**3**	**2**	**1**

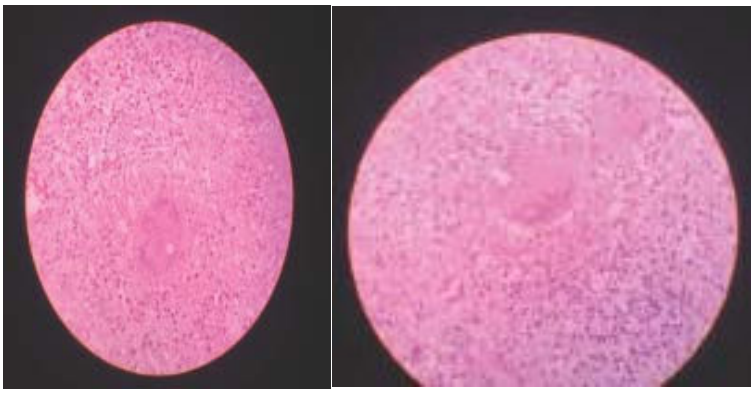

Fig. 1: Tuberculoma (Hematoxylin and eosin stain, 40X). Sections show ill-defined granulomas composed of epithelioid cells and Langhan's type giant cells.

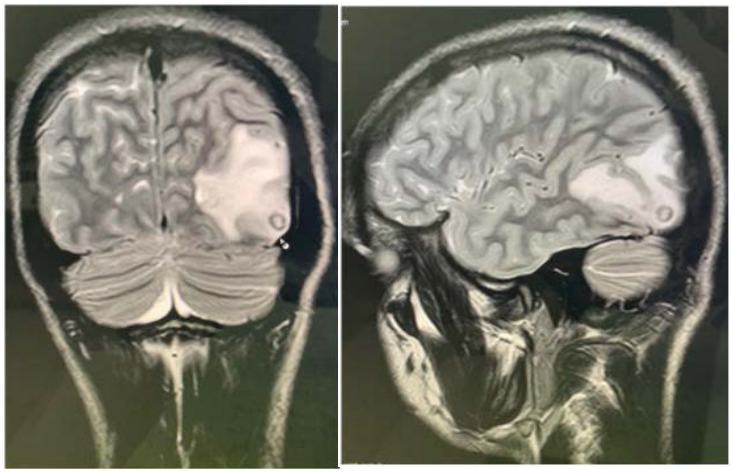

Fig. 2: Well defined T2/FLAIR with hyperintensity with hypointense rim in left parietal region, Most likely Tuberculoma.

Discussion

SOLs of CNS were reported for the first time by Louis in 1774, a fungal infection of the Dura mater. Due to availability of more and more sophisticated techniques in the field of neurosurgery, more of such tissue is being submitted for histopathology.[3]

Non-neoplastic lesions in CNS are relatively rare but can mimic a neoplasm posing a diagnostic challenge.[4]

A variety of non-neoplastic lesions are encountered in neuropathology practice. Infection with fungal organisms manifest their histological features based on immune status of the host.[4] Histopathological diagnosis of majority of brain lesions is accurate and uniform, with minimalinter-observer variability and interpretation. The availability of full local clinical information is of considerable importance to the diagnostic process.[5]

Non-neoplastic mass lesions of the CNS mimic neoplasms clinically and radiographically. They cause mass effects and may also require surgical excision but preoperative diagnosis will obviate invasive wider resections.[6]

Incidence of non-neoplastic lesions: In the present study, the incidence of non-neoplastic CNS lesions was 9.4%. Sanjeev *et al*.[7] observed the incidence of non-neoplastic lesions to be 13.6%. Adnan *et al*.[8] from Lahore observed 22% cases of non-neoplastic origin.

Age and gender distribution: In the present study, the patient age ranged from 8 to 70 years and males predominated.

Infectious lesions: In the present study the incidence of CNS tuberculomas was 8.3%. India being one of the countries where tuberculosis is quite prevalent, CNS space occupying lesions having granulomatous inflammation of brain with AFB positive bacilli are more frequently encountered. The present study had 2 cases of tuberculosis.

Similar incidence has been reported by various studies (Table 4).

Table 4: Comparison of incidence of CNS tuberculomas with other studies

Study	Incidence of Tuberculomas in CNS
Jamjoom *et al*.[9]	5%
Butt *et al*.[10]	3%
Zimmerman *et al*.[11]	6.4%
Tandon *et al*.[12]	4.8%
Sanjeev *et al*.[7]	3.25%
Present study	8.3%

CNS TB can assume various forms such as tuberculous meningitis, tuberculous encephalopathy, intracranial tuberculoma, intracranial tuberculous abscess, Pott's spine with or without paraplegia, non-osseous spinal cord tuberculosis, spinal tuberculous meningitis, tuberculous arachnoiditis.[13]

Ashok Kumar *et al*.[14] studied 30 cases of CNS tuberculosis and observed it to be more common in young adults. The routine investigations, CSF and PCR in their study did not yield the correct diagnosis and they found CT scan yielded the correct diagnosis.

Tuberculomas are firm, avascular, spherical granulomatous masses, measuring about 2–8 cm in diameter. They are well delineated from adjacent brain tissue that shows variable edema and gliosis. The central part of granulomas may contain thick, purulent, cheesy necrosis in which tubercle bacilli can be demonstrated. In developing countries young adults and children are predominantly affected while in developed countries it affects older patients.[15-17]

Fungal infections in the brain are uncommon but are being increasingly reported in the last few decades'. Especially seen in transplant recipients who are on long term immunosuppressant therapy, patients on chemotherapy, HIV infected individuals, debilitated patients already having a primary fungal infection can develop hematogenous dissemination and patients having fungal infection of nearby areas like sinonasal and orbital infections.[18]

A variety of fungi cause infections of CNS, which can present with space occupying lesions. The type of pathology is determined by the morphology and size of the fungus and the host immune status.

Present study reported 3 cases of fungal infections among the SOLs. 2 cases had morphology comparable to mucormycosis and one that of cryptococcus. Butt *et al*.[10] reported similar number of fungal infections. Jain *et al*.[20] observed cryptococcus as the most frequently identified fungal infection, followed by Aspergillus and Candida. Aspergillus species is the most common agent to cause intracerebral granuloma or abscess as observed by Murthy *et al*.[19] study. They reviewed intracranial as pergillus granulomas and observed that most of the reported large series are from countries with temperate climate like India, Pakistan, Sudan, and Saudi Arabia. The histochemical stains like Gomori methenamine silver aid the diagnosis.

The present study had one case of neurocysticercosis which is comparable with Bashir A *et al*.[21] and Sanjeev *et al*.[7]

A cysticercus is a liquid-filled vesicle with a 3-layer wall and scolex, and can have three different presentations in the nervous system—cystic, racemose, and mixed form.

The cystic form has roughly 7 mm cysts, single or multiple, anywhere in the brain, most frequently found on leptomeninges and the cerebral cortex. The racemose form refers to the presence of multiple cysts in the basal cisterns where the vesicles can have different sizes, and the cysts can be attached to the meninges.[22]

Cysticercosis is a parasitic infection resulting from ingestion of eggs from the adult tapeworm, Taenia *solium* (T. *solium*). When cysticercosis involves the central nervous system, it is called neurocysticercosis and it is the most common

parasitic infection of the brain frequently presenting as epilepsy. It is a common disease in the developing world, including India.[23] It responds well to Albendazole and praziquantel and hence the importance of diagnosing these lesions which respond to medical treatment.

Adnan *et al*.[8] observed 6.5% casesof necrotizing granulomatous inflammation, 3.2% cases of fungal infection and 2.2% cases abscesses. Adnan *et al*.[8] observed dermoid cyst (2.2%), epidermoid cyst (1.6%), AV malformation (1.1%), arachnoid cyst (0.5%), colloid cyst (0.5%) and meningiocele (0.5%).

Jamjoom *et al*.[9] had 1 case of Gliosis, while the present study reported 6 cases.

Patty *et al*.[24] included 5 cases of cysts, while the present study reported 11 cases.

Cystic lesions

Cystic lesions in the CNS can be of different types like those containing cerebrospinal fluid (CSF), as seen in arachnoid cysts which have CSF secreting cells in their walls, cysts having non-neural epithelium like the colloid and epidermoid cysts, and craniopharyngiomas. Another large group of cysts is the one with infectious etiology such as hydatid cysts, fungal and parasitic cysts and brain abscesses due to various bacterial pathogens.[25]

Colloid cysts are non-neoplastic epithelium-lined cysts of the central nervous system that mostly arise from the anterior third ventricle roof. These epithelium-lined, mucin-containing cysts can be found in asymptomatic patients; however, depending on their location, size, and degree of cerebrospinal fluid (CSF) obstruction, patients may present with a variety of neurological symptoms such as headaches to acute hydrocephalus.[26]

Colloid cysts account for approximately 2% of primary brain tumors, and are mostly found in the fourth and fifth decade. Approximately 15–20% of all intraventricular masses are colloid cysts. Colloid cysts develop in the rostral aspect of the third ventricle in the foramen of Monro in 99% of cases, and despite their benign histology, they may carry high risks and neurologic complications, with a mortality reported from 3.1% to 10% in symptomatic cases or 1.2% in total.[26,27]

In the present study, the most common type of cyst was colloid cyst followed by arachnoid cyst and then by epidermoid cyst. Din *et al*.[28] from Karachi observed most common type of cyst to be epidermoid closely followed by the colloid and arachnoid cysts. Sanjeev *et al*.[7] also observed epidermoid cysts to be the most common cysts. The present study had three cases of neurenteric cysts.

Neurenteric (NE) cysts, also called enterogenous cysts, are rare benign endodermal lesions of the central nervous system (CNS). They are approximately 3 times more common in the spine compared with the brain.[29] Most are found in the posterior fossa, though rare supratentorial cysts have been reported.[29]

Preece *et al*.[30] observed squamous metaplasia and voluminous keratinous debris in two cases of neurenteric cysts.

Adnan *et al*.[8] observed dermoid cyst (2.2%), epidermoid cyst (1.6%), AV malformation (1.1%), arachnoid cyst (0.5%), colloid cyst (0.5%) and meningiocele (0.5%).

Gliosis: In the present study the incidence of gliosis was 25%. Gohil *et al*.[31] observed an incidence of 14.4% of gliosis. Gliosis is seen in response to disruption of blood brain barrier that allows non-CNS molecules, such as blood and serum components, to enter the brain.[32]

Conclusion

Histopathological examination of SOLs of CNS is mandatory to distinguish neoplastic versus non-neoplastic lesions.

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