A Study of the correlation between radiological and histopathological findings in intracranial lesions

Submission : 11-7-2020
Review : 15-11-2020
Acceptance 11-12-2020

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DOI: 10.47799/pimr.0803.08

Abstract

Objective: This study was conducted to formulate location-wise radiologic diagnostic algorithms and assess their concordance with the final histopathological diagnosis of intracranial mass lesions to evaluate their utility in a rural setting where only basic facilities are available.

Material and Method: In present study seventy two cases were analyzed.Histopathological evaluation was done from biopsy sample sent in formalin, tissue processing was done by standard procedure, tissue sections were routinely stained by H&E, immunohistochemical examination was performed in case of histopathological discrepancies. Radiological findings were correlated with histopathological diagnosis and concordances were calculated.

Statistical Analysis: Frequencies and crosstabs were used for calculation.

Result: This was a study of seventy-two patients with age ranging from 9months to 65 years. In these entire 72 cases, male patients were 42(58%), female patients were 30(42%). M: F was 1.38:1. Most of patient presented with headache, and frontal lobe was the most common location. In all these lesions, 88.8% cases were neoplastic lesions. Among all neoplastic lesions, 52.7% were malignant tumors and 34.7% were benign tumors. Among all malignant tumors, Astrocytoma was the most common malignant tumor.Meningioma was the second most commonly encountered lesion. In the present study radiological and histopathological correlation was present in84.7% of cases. IHC was performed wherever needed, to support diagnosis.

Conclusion: Radiological investigations are reliable diagnostic tools for space occupying central nervous system lesions, but histopathology is still the gold standard. So multidisciplinary approach is the ideal approach for space occupying lesions of central nervous system.

Keywords: Neuropathology, Immunohistochemistry, ICSOL

Introduction

An Intra cranial space-occupying lesion (ICSOL) is defined as a mass lesion in the cranial cavity with a diverse etiology like benign or malignant neoplasm, inflammatory or parasitic lesion, haematoma, or arterio-venous malformation.Central nervous system neoplasms represent a unique heterogenous population of neoplasms. Annual incidence of intracranial tumors is10 to17per/100000 person.[1]

A broad spectrum of non - neoplastic conditions can mimic a braintumor, both clinically and radiologically and these patients undergo biopsy. In such cases, the pathological examination can readily differentiate between neoplastic and non-neoplastic lesions. Space occupying lesions of brain is one of the importantcauses of neurological morbidity and mortality[2]. These lesions may follow serious clinical course even or when they are inflammatory lesions or benign neoplasm.Any CNS neoplasm without intervention, regardless of histological grade or classification, may have lethal consequences if situated in critical brain region.Early diagnosis is necessary to plan appropriate management.[3] Interpretation of histopathology of intracranial lesions is significantly aided when viewed in perspective of clinical, perioperative and radiological findings. Radiological imaging is an important component of diagnosis and planning treatment. Radiological diagnosis of intracranial space occupying lesion requires confirmation by histopathology.Radiological diagnosis is supportive but histopathology is considered as gold standard for diagnosis of intracranial space occupying lesions although, immuno histochemistry has to be resorted in odd cases for grading and differentiating the tumor entities.

The aim of this study to correlate clinical, radiological and histopathological findings of intracranial space occupying lesions in a tertiary care center in rural India.

Material and Methods

The present study was conducted in the department of pathology, in a tertiary level teaching institute in central India. The study includes prospective cases sent to Department of Pathology from 1stMarch, 2017 to 31stAugust, 2018 (18 months) from Neurosurgery Department of same institute. The material consisted of the biopsy specimens from intracranial mass lesions removed.

Tissue sample received in 10% formalin were allowed to fix for 24 hours. Gross examination was done and sections were given. Paraffin embedded sections were routinely stained by H&E.

Radiological diagnosis (CT scan or MRI) was compared with that of histopathology. Available clinical details, radiological and laboratory investigation data were documented.

For histological examination labeling of sample with unique identification number, fixation, dehydration, clearing, impregnation, embedding, section cutting, staining and mounting was done as per standard departmental protocols followed.

In case of histopathological-clinical discrepancy the blocks were sent for immunohistochemistry (IHC) to National institute of mental health and neurosciences (NIMHANS) Bangalore.

RESULT:-

Over the period of 18 months, post-operative histopathological examination was performed in the patients operated for ICSOL.

In our study total 72 cases were studied. In present study we observed that maximum number of cases belong to age group of 36-45 years(26.4%).In present study total male patients were 58% and females were 42%. It shows males are more affected than females. Male to female ratio (M: F) was 1.38:1.Headache was the most common presenting complaints of patients (31.9%) followed by vomiting. Frontal lobe was the most common site for lesions. Among all lesions neoplastic lesions were most common. Among all neoplastic lesions Astrocytomas were the most common lesions contributing 30.6% of all lesions, followed by meningioma (22.2%), which included various types like meningotheliomatous and transitional meningioma, psammomatousmeningioma etc. Pituitary adenoma, oligodendroglioma, ependymoma, schwannoma, Craniopharyngioma, glioblastoma multiforme,choroid plexus papilloma,subependymoma,hemangioblastoma,medulloblastoma, metastatic adenocarcinoma from thyroid also contributed.Non-neoplastic lesions were 11.1%, which include neurocysticercosis,hydatid cyst, tuberculoma, epidermoid cyst and brain abscess.

In present study the correlation of radiological and histopathological diagnosis of ICSOL is 84.7%. Intracranial space occupying lesions comprise of a diverse group of lesions. With the introduction of CT and MRI scanning, imaging of lesions has acquired a new dimension whereby excellent anatomical detail in axial, sagittal and coronal planes as well as lesion characterization has become possible. These modalities have helped in the early diagnosis and localization of the ICSOL and in complement with advanced neurosurgical techniques, have improved the prognosis of patients of mass lesions. It may be considered as an important supportive and complimentary tool to histopathological diagnosis.Radiological similarity of the lesions and presence of interfering factors are important contributory factors for misdiagnosis. So histopathological diagnosis remains gold standard and superior to radiological diagnosis in the context of space occupying lesions of brain.

Hence by this study it is concluded that a multidisciplinary approach is the ideal for space occupying lesions of the central nervous system. The neurosurgeon, neuroradiologist and neuropathologist form a triad that is essential for diagnosis, management and follow up of these cases.

TABLE NO. - 1

AGE WISE DISTRIBUTION OF INTRACRANIAL LESIONS

Age	Frequency	Percent
<15 yrs	7	9.7
15-25 yrs	12	16.7
26-35 yrs	12	16.7
36-45 yrs	19	26.4
46-55 yrs	13	18.1
56-65 yrs	9	12.5
Total	72	100.0

TABLE NO. - 2

GENDER DISTRIBUTION

Gender	Frequency	Percent
Male	42	58.3
Female	30	41.7
Total	72	100.0

TABLE NO. - 3

NEOPLASTIC LESIONS / NON NEOPLASTIC LESIONS

	Frequency	Percent
Neoplastic Lesions	64	88.8%
Non Neoplastic Lesions	08	11.2%
Total	72	100.0%

TABLE NO. - 4

RADIOLOGICAL DIAGNOSIS

Radiological Diagnosis	Frequency	Percent
Astrocytoma	24	33.3
Meningioma	15	20.8
Pituitary Adenoma	9	12.5
Glioblastoma multiforme	5	6.9
Oligodendroglioma	1	1.4
Ependymoma	1	1.4
Medulloblastoma	1	1.4
Astrocytoma Pilocytic	1	1.4
Schwannoma	2	2.8
Hydatid cyst	1	1.4
Neurocysticercosis	1	1.4
Epidermoid cyst	2	2.8
Brain abscess	2	2.8
Pleomorphic xanthoastrocytoma	1	1.4
Hemangioblastoma	1	1.4
Rathkes cyst	1	1.4
Subependymoma	1	1.4
Frontal Cavernoma	1	1.4
Choroid plexus papilloma	1	1.4
Tuberculoma	1	1.4
Total	72	100.0

TABLE NO. - 5

HISTOPATHOLOGICAL DIAGNOSIS

Diagnosis	Frequency	Percent
Astrocytoma	22	30.6
Astrocytoma Gemistocytic	1	1.4
Glioblastoma multiforme	3	4.2
Meningioma	16	22.2
Pituitary Adenoma	9	12.5
Schwannoma	2	2.8
Oligodendroglioma	2	2.8
Acute suppurative encephalitis	2	2.8
Pilocytic astrocytoma	1	1.4
Medulloblastoma	1	1.4
Craniopharyngioma	1	1.4
Subependymoma	1	1.4
Neurocysticercosis	1	1.4
Hydatid cyst	1	1.4
Adenocarcinoma thyroid	1	1.4
Ganglioglioma	1	1.4
Cavernoma	1	1.4
Ependymoma	1	1.4
Epidermoid cyst	2	2.8
Hemangioblastoma	1	1.4
Choroidplexus papilloma	1	1.4
Tuberculoma	1	1.4
Total	72	100.0

TABLE NO. - 6

CORRELATION BETWEEN RADIOLOGICAL AND HISTOLOGICAL DIAGNOSIS

	Frequency	Percent
Correlation Present	61	84.7
Correlation Absent	11	15.3
Total	72	100.0

Discussion:

Present prospective study comprises 72 cases of radiologically diagnosed intracranial space occupying lesions and their correlation with histopathological diagnosis.Histopathology is considered as the gold standard investigation for the evaluation of CNS lesions. Radiological techniques help to localize CNS lesions and plan surgery. Radiological diagnosis of ICSOL requires confirmation by histopathology. Space occupying lesions of CNS have a wide spectrum of histopathological patterns. The present study emphasizes the significance of correlation between pre-operative radiological diagnosis and histopathological diagnosis.

Various studies have been carried out on the intracranial space occupying lesions extensively in the past. We tried to compare our results with the previous studies done so far. In present

study the classification proposed by W.H.O. (2016) has been followed. In this study the cases which were included were clinically & radiologically proven for ICSOL and were admitted and operated in department of neurosurgery in a tertiary level teaching institute in central India catering mainly rural population. In our study we observed that maximum numbers of cases belong to age group 36-45 years (26.4% cases).Male patients were 58% and females were 42%. It shows males are more affected than females.Male to female ratio (M: F), 1.38:1.

Radha rani et al 2017[4] and Sunila et al 20185observed that most of the cases were seen in sixth to seventh decade in their study. Dogar et al 2015[6] documented that CNS lesions were common in fourth decade in their study.V.Rathod et al[7] shows most of cases in second to fifth decade, the present study also showed clustering of cases in the third to fourth decade.

Sajjad et al 2018[8]observed male predominance in their study. Our study also shows male predominance. In our study the commonest symptoms were headache. These results were corroborated by the findings of Chishty et al9 and Dogar et al 20156.

The studies conducted by Dogar T et al[6]showedparietal region was the most common site of involvement of CNS lesions. In contrast, Enduaro et al[10],Anadure Neelakantaiah hema et al[12] Radha rani et al[4], Sunila et al[5] and the present study documented frontal region as the most common site of involvement of CNS lesions. The distribution pattern of various CNS lesions in the present study was compared with other studies Ahmed Irfan et al[12]conducted study on 386 cases, out of these 386 cases,298 cases were neoplastic, out of which 32.2% cases were glioma.V Rathod et al[7] included 52 cases out of which 61.5% cases were neoplastic,Neelakantaiah Anadure hema etal[11] conducted a study on 62 cases in which 80.6% lesions were neoplastic,and glioma was the most common primary tumor in their study

Radharani et al[4]The study was done on 50 cases, out of 50 cases 40 cases were neoplastic lesions.Sunila et al5 study conducted on 78 cases and 62 cases were diagnosed with Neoplastic lesions.

In all the studies, neoplastic lesions were more common than non-neoplastic lesions. Among neoplastic lesions, neuroepithelial tumors were commonest followed by meningeal tumors. Dogar T et al[6] and Sunila et al[5]documented similar observations in their studies. In contrast, Radha rani et al[4]found meningeal tumor as the commonest neoplastic lesion in their study. Among non-neoplastic lesions, Inflammatory lesions were the most common lesions in the present studyand in most of the studies except in Sunila et al[5];where Cystic lesion was commonest non-neoplastic lesion.In Present study neoplastic lesions were 64cases(88.8%).and non-neoplstic lesions were 8 cases (11.2%)

In our study radiological findings correlated with histopathological findings in 84.7% of cases(complete correlation).However two studies V Rathod et al[7] and Dogar et al[6] have shown partial correlation between radiological and histopathological diagnosis.

In our study 88.8% lesions were neoplastic and 11.2 % were non- neoplastic. Out of all neoplastic lesions39 cases (54.2%) were malignant tumors. Out of all malignant tumors only one case of secondary from thyroid was seen.Rest all 38 cases (52.7%) were primary intracranial tumors.

V Rathod et al[7],Ishtiaq chisty et al[9],Ishita pant et al[13],Sunila et al5 showed results which are consistent with result of present study.

Out of 72 cases, 11 cases (15.7%) were misdiagnosed on radiology. Misdiagnosis of cases is probably due to radiological similarity of the lesion. In our study tumour presenting as ill-defined nodular lesion with mass effect near fourth ventricle was misdiagnosed as medulloblastoma, which on histopathological examination diagnosed as anaplastic glioma, craniopharyngioma was misdiagnosed as Rathke's cyst due to cystic nature and similar location. Anaplastic glioma was misdiagnosed as medulloblastomas because of areas of haemorrhage and infiltrative growth pattern. In present study various limiting factors were haemorrhage, necrosis andedema.

Sunila et al[5]and Ishita pant et al[13]had also analysed misdiagnosed cases on radiological examination in their study. Ishita Pantet al[13] had documented that low-grade astrocytoma and medulloblastomas were misdiagnosed as ependymoma. Low-grade astrocytoma and ependymoma may be considered as close differentials depending on the location. Several studies opined and concluded in their study that varying degree of perilesional edema seen in meningioma is also a feature of gliomas, metastasis and infection.

Conclusion:

Radiological investigation is a reliable diagnostic tool for space occupying central nervous system lesions. It may be considered as an important supportive and complimentary tool to histopathological diagnosis. Radiological similarity of the lesions and presence of interfering factors are important contributory factors for diagnostic pitfalls. Radiological investigation has high sensitivity and is highly efficacious for the diagnosis of neoplastic CNS lesions. However, in view of low specificity, multimodality approach may be beneficial for management of the patient.

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How to cite this article : Parihar M, Mishra R,Parihar V . A Study of the correlation between radiological and histopathological findings in intracranial lesions.Perspectives in Medical Research 2020; 8 (3):34-38.

DOI: 10.47799/pimr.0803.08

Sources of Support: Nil, **Conflict of interest:** None declared