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Intracranial Space Occupying Lesions Detection

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Abstract

"There is a wide variety of lesions that may fill the intracranial space. Early identification is essential for planning the action necessary to avoid Intracranial Space Occupying Lesions and their associated greater morbidity and death.". [1]

"Imaging of intracranial space occupying lesion has taken on new meaning with the advent of CT and MRI scanning, allowing for good anatomical detail in the axial, sagittal, and coronal planes and allowing for the characterisation of tumour tissue. The development of MR angiography has allowed for the noninvasive creation of a three-dimensional virtual vascular map of tumour blood supply, which has aided in the early diagnosis and localization of the SOL and, in conjunction with cutting-edge neurosurgical techniques, has improved the prognosis of mass lesions." [2]

"Combined with MR angiography, these modalities give the neurosurgeon a virtual roadmap by which the feasibility and approach to surgery can be decided. [3] On the other hand, CT being less expensive modality is readily available. Also it is better for acute bleed, calcification and bone destruction." [1]

Introduction

"Advantages of MRI over CT are to know the exact characteristic of the lesion, whether diffuse or focal, residual tumor or recurrence, localization of multiple lesions, relation and extent to the spine, and exactly differentiate doubtful CT tumors. MRI is also useful by virtue of multi-planar imaging &MR angiography". [4]

"The term space occupying lesions of brain is conveniently applied to localized intracranial

lesions whether of neoplastic, vascular or chronic/ acute inflammatory origin, which due to its space occupying nature within the skull leads to raised intracranial tension. As skull has capacity to accommodate a fixed amount of tissue, anything which is extra within it will produce symptoms of raised intra cranial tension." [5]

"As there are numerous conditions which contribute to intracranial space occupying lesions it is important to assess the patient clinically as well as differentiate between neoplastic & non-neoplastic nature of the lesion as detected on neuro-imaging e.g.CT/MRI,etc".

In the present study ,"those cases were included which were either clinically suspected cases brain space occupying lesions or already diagnosed cases of brain space occupying lesions on cross sectional imaging of MRI."

OBJECTIVES OF THE STUDY:

1. To study the number and distribution of various intracranial spaceoccupying lesions (SOL) and its impact on surrounding structures.

2. To study MRI features of different intracranial space occupying lesions.

Literature Review

The term "intracranial space occupying lesions" is defined as "any neoplasm, benign or malignant, primary or secondary, as well as any inflammatory or parasitic mass lying within the cranial cavity. It also includes haematomas, different types of cysts, & vascular malformations. [6] Different authors have reported that majority of patients of ICSOL had neoplasms followed by infective & traumatic etiology". [7,8] "Gliomas are more common followed bymeningiomas, abscesses, pituitary tumors &tuberculoma". [9]

Brain Tumours:

The term "brain tumours" refers to a "mixed group of neoplasms originating from intracranial tissues and the meninges with degrees of malignancy ranging from benign to aggressive. Each type of tumour has its own biology, treatment, and prognosis and each is likely to be caused by different risk factors." Even "benign" tumours can be lethal due to "their site in the brain, theirability to infiltrate locally, and their propensity to transform to malignancy. This makes the classification of brain tumours difficult sand creates problems in describing the epidemiology of these conditions." [11]

Investigation

- "CT is often the first test performed to assess presenting symptoms"
- "MRI is the investigation of choice to characterize the tumor"
- "MRI may be used with symptoms of headaches or seizures"

Treatment

- "Parenchymal brain tumors generally have a poor prognosis"
- "Treatment should be in specialist centers"
- "Anti-epileptic agents may help for those with seizures"
- "Steroids may alleviate symptoms caused by edema"
- "A biopsy may be performed neurosurgically"
- "Some tumors may be removed, e.g. Pituitary tumors"
- "Stereotactic radiotherapy can be used for small lesions"

Material and Methods

The study was conducted in the MRI SECTION OF Department of Radio- diagnosis at Krishna Hospital after obtaining ethical committee clearance. The patients included in the study were referred from the various clinical departments of Krishna Hospital**.**

STUDY DESIGN- Observational Study.

SAMPLE SIZE- 90 patients

SAMPLING TECHNIQUE-Convenience Sampling **STUDY DURATION** – November 2017 to November 2019**INCLUSION CRITERIA:**

- Patients of adult age group (age>18years) and both sexes willing togive consent for examination.
- Clinically suspected cases of intracranial SOL which were confirmed onCT.

EXCLUSION CRITERIA:

- Patients with contraindications to MR Imaging: patients with ferromagnetic implants, cochlear implants, etc.

- Critically ill patients who are on life support.
- Patients with claustrophobia.
- Patients with known allergy to contrast agent.

METHODOLOGY

Informed consent was taken from the patient/attendant/legally acceptable representative for inclusion in the study as per the proforma attached.

Computed Tomography:

CT was performed on 16 slice Multi-detector CT Siemens Somatom Emotion machine in our institute or done outside with high suspicion of intracranial space occupying lesion and were found positive.

Those cases were sent to MRI section of department of Radio-diagnosis.

Clinical evaluation:

A detailed history was taken with complete physical and systemic examination of thepatient. Relevant biochemical investigations were done wherever required.

Magnetic Resonance Imaging:

MRI was performed on **MAGNETOM AVANTO 1.5 –TA Tim+Dot MR System (SIEMENS).** Patients were positioned in the gantry with all precautionary measures. Scout images in axial, sagittal and coronal planes were taken. Basic sequences for brain,e.g.,T1W,T2W,FLAIR,DWI,ADC& HEMO were taken in different planes. Additional sequences,e.g., SWI,Mag,PHASE,T1FS pre and post contrast images, CISS and MRS were taken as per the requirement of the study . The contrast used was Gadolinium based (i.e. gadobenetedimeglumine 0.5M solution-10ml vial). The dose given was 0.2mmol/kg. Dynamic contrast imaging was also done wherever needed.

Acquired images were analysed and then entered in the master chart.

Observation and Results

The present study was carried out in the MRI section of Department of Radio- diagnosis, Krishna Hospital, Karad, among a total of 90 cases suspected of having ICSOL on the basis of history and/or suspected on CT.

Lesions:

There were 62 patients with single lesions (68.89%) and other 28 patients hadmultiple lesions (31.11%).

Table 5: Distribution of patients according to the number of lesions

LESIONS	FREQUENCY	%
MULTIPLE	28	31.11
SINGLE	62	68.89
TOTAL	90	100

Side of lesion

Majority of the lesions were unilateral lesions, seen in 45 patients (50.00%) , bilateral in 35 out of 90 cases (38.89%) while midline lesions were seen in 10 cases(11.11%).

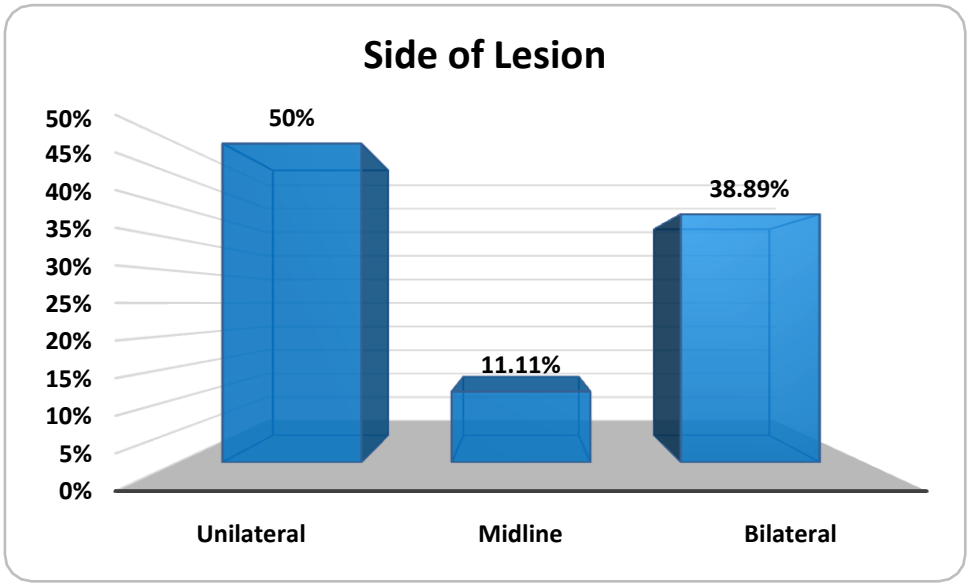

Fig. 6: Distribution of patients according to the side of lesions

Intra/extra axial:

Majority were intra axial lesions seen in 51 out of 90 patients (56.67%), rest39 patients (43.33%) had extra axial lesions.

Table 7: Distribution of patients according to the location (intra- axial/extra-axial) of lesions

INTRA/ EXTRA AXIAL	FREQUENCY	%
EXTRA AXIAL	39	43.33
INTRA AXIAL	51	56.67
TOTAL	90	100

	FREQUENCY	%
PRESENT	61	67.8
ABSENT	29	32.2
TOTAL	90	100

Discussion

The mean age observed in our study was 48.37 ± 14.64 years. Most common age group decade was 41-50 years with 27 patients (30%), followed by 51 — 60 years with 16 patients (17.78%) and 41-50years with 16 patients (17.78%).

B Karpagam et al.[88]did a similar study in 50 cases of ICSOL in 2015, they found the highest prevalence in two decades, 21-30 years and 41 – 50 years(16% each), followed by 31 — 40 years and 61 -70 years age groups (14% each). 41- 50 years decade was also seen most common in our study.

Kaki RR et al. [89] in their prospective cohort study on 50 patients**,** found that the most common decade was 6th that is 50-60 years (28%), which was the second most common decade in our study.

A Irfan et al. in their study on 386 cases of ICSOL, found that the most common age group was 11-20 years (23.30%) followed by 21-30 years (21.2%), which is different from our study.

There were 54 females (60%) and 36 males (40%) in our study. Male to female ratio in our study was 0.67: 1.

Most common symptom was seizures seen in 42 patients (46.67%), followed by headaches in 32 patients (35.56%), Neurodeficit in 20 patients (22.22%),

giddiness in 11 patients (12.22%), vomiting in 5 patients (5.56%), fever in 4 patients (4.44%) & H/O TB in one patient (1.11%).

Kaki RR et al. [89]found that out of 50 patients under their study, there were 31 intra axial (62%) and 19 extra axial (38%) lesions.

Majority of the lesions were solid seen in 64 patients (71.11%), some were solid- cystic in 14 patients (15.56%) and few were cystic in 12 patients (13.33%). Calcification was seen in 18 patients (20%).

Associations

There was no any significant association between the different categories of lesions and sex, age, presence of symptoms like fever, vomiting and neurodefecit (all $p > 0.05$).

Significant association is seen between the lesions being single or multiple & type of lesion. Primary neoplasms are found more to be single (44 of 45 — 97.78%) as compared to secondary neoplasms (5 of 22 – 22.73%) and other lesions. (13 of 23 – 56.52%).

Summary and Conclusions

- The most common category of lesion was primary neoplasm seen in 45 patients (50.00%) followed by secondary neoplasm in 22 patients (24.44%). Rest 23 patients had other diagnosis (25.56%) which included conditions like parasitic infections, inflammatory and benign lesions each seen in 5 patients (5.56%). some less common lesions were vascular seen in 2 patients (2.22%) and demyelinating seen in 1 patient (1.11%).
- We categorised patients into three parts, those who are having primary neoplasms seen in 45 patients (50.00%), those having secondary neoplasms in 22 patients (24.44%). Rest 23 patients had other diagnosis (25.56%), for analysis purpose.
- There was no any significant association between the different categories of lesions and sex, age, presence of symptoms like fever, vomiting and neurodefecit (all $p > 0.05$).

For diagnosing and evaluation of intracranial space occupying lesion with a reasonable degree of the diagnostic accuracy, magnetic resonance imaging still remains the first line investigation along with the advancement of newer modifications of MRI such as MR spectroscopy and the newer techniques like MR perfusion.

IMAGES

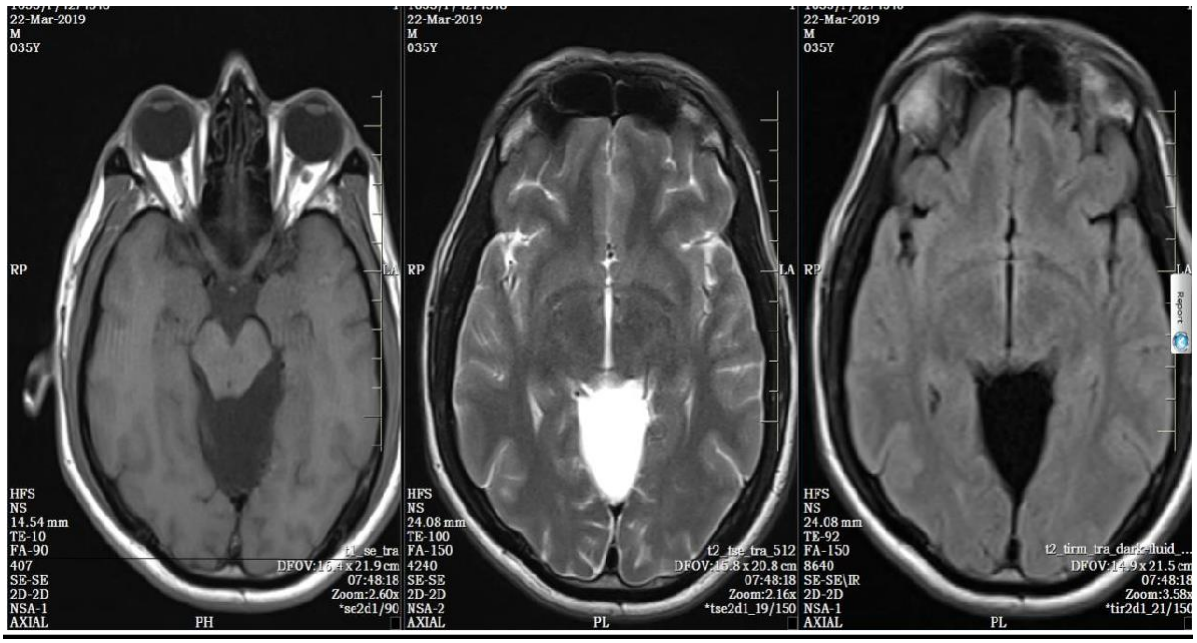

Illustration 1: A 35 years old male with complaints of giddiness.

AxialT1W, T2W and FLAIR images show a well defined cystic lesion of CSF signal intensity in infratentorial region involving superior cerebellar cistern and quadrigeminal plate cistern causing mass effect on the left side of mid brain posteriorly suggestive of **Superior cerebellar arachnoid cyst.**

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