



ACCURACY OF MEASUREMENTS OF CALLOSAL ANGLE AND EVANS INDEX IN DIAGNOSING IDIOPATHIC NORMAL PRESSURE HYDROCEPHALUS.

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ABSTRACT

INTRODUCTION: Morphological imaging features are most commonly used in daily practice to support clinical suspicion of normal pressure hydrocephalus. The Evans index is the oldest and most frequently used measure of ventricular enlargement which is calculated as the ratio of maximum diameter of frontal horns to maximum diameter of skull on axial CT or MRI images. An evans index of 0.3 or more suggest NPH. Callosal angle is the angle between frontal horns measured in the coronal plane at the level of posterior commissure and is decreased in NPH. Callosal angle less than 90 suggest NPH. **AIM:** To study the reliability of callosal angle and Evans index measurements in diagnosing idiopathic NPH. **MATERIALS AND METHODS:** A total of 30 patients of age 60 to 80 years with symptoms of NPH and those underwent MRI brain in whom ventriculomegaly was incidentally detected using Phillips Multiva 1.5 T Machine in the department of Radiodiagnosis, KVG medical college hospital, Sullia, Karnataka. The follow up of these patients with MRI diagnosis of NPH was done and analyzed by knowing the symptomatic improvement and the response to ventricular shunt. **CONCLUSION:** From this study, it is found that both callosal angle and Evans index can be used as basic parameters for diagnosing NPH, However Evans index is more accurate comparatively.

KEYWORDS :

NORMAL PRESSURE HYDROCEPHALUS(NPH):

NPH is defined as Symptomatic occult hydrocephalus with normal CSF pressure. It accounts for approximately 5-6% of all dementias. The reported prevalence of NPH is 0.5-3.0% in the elderly population. Majority of cases are idiopathic.

NPH is characterized by ventriculomegaly with normal CSF pressure but altered CSF hydrodynamics. It can be Primary or idiopathic and secondary. Secondary can occur in traumatic brain injury, subarachnoid haemorrhage or meningitis.

If no secondary causes are identified for a communicating hydrocephalus then it is called as idiopathic normal pressure hydrocephalus. Clinically patients present with gait dysfunction, cognitive impairment and urinary incontinence.

Prevalence of NPH increases with age. Ventricular volumes in NPH are on average well above 100 ml.

Imaging Features in NPH:

- a) Enlarged lateral and 3rd ventricle out of proportion to cortical sulcal enlargement - Ventriculosulcal disproportion.
- b) Enlarged lateral ventricles with rounded frontal horns.
- c) Widening of temporal horns of lateral ventricles >6mm.
- d) Normal 4th ventricle.
- e) Periventricular hypodensity.
- f) Prominent hyperdynamic Aqueductal flow void on T2.
- g) Cerebral Convexity and medial subarachnoid spaces may appear decreased.
- h) Basal cisterns and sylvian fissures will be enlarged.
- i) Thinned corpus callosum.

Morphological imaging features are most commonly used in daily practice to support clinical suspicion of normal pressure hydrocephalus.

The Evan's index is the oldest and most frequently used measure of ventricular enlargement which is calculated as the ratio of maximum diameter of the frontal horns to the maximum diameter of skull on axial CT or MRI images. An Evan's index of 0.3 or more suggest NPH.

Callosal angle is the angle between frontal horns measured in the coronal plane at the level of posterior commissure and is decreased in NPH. A callosal angle less than 90° suggest NPH.

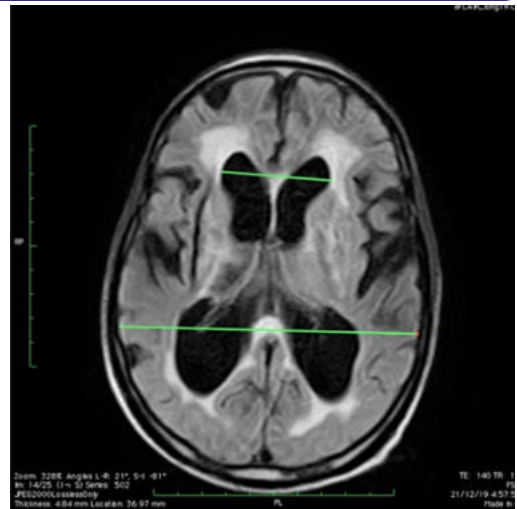


Fig 1. Axial FLAIR image shows measurement of Evan's index.



Fig 2. Coronal T1 sequence showing callosal angle measurement.

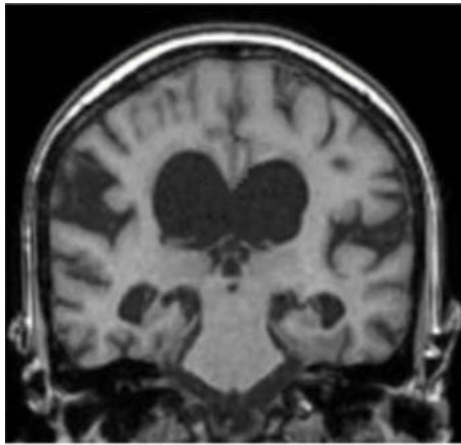


Fig 3. Case of NPH.

AIM OF THE STUDY:

To study the reliability of callosal angle and Evans index measurements in diagnosing idiopathic NPH.

MATERIALS AND METHODS:

Sample size: 30 patients (age 60 to 80 years)

Inclusion criteria: Patients who presented with Disorientation, dementia, gait abnormalities and who underwent MRI brain for other nonspecific symptoms.

MRI Brain is performed with Philips Multiva 1.5 T machine. Evans index and callosal angle were measured in all the cases on axial T1 and coronal T1WI respectively.

Follow up of these cases were done and the clinically confirmed cases were identified based on normal CSF pressure and response to ventricular shunting.

Table 1. Measurements of Callosal angle and Evan's index.

S no	CALLOSAL ANGLE	EVANS INDEX	NPH +/-
1	71	0.36	+
2	97	0.36	-
3	88	0.37	+
4	119	0.37	+
5	116	0.34	+
6	84	0.54	+
7	110	0.35	+
8	85	0.37	+
9	89	0.36	+
10	80	0.4	+
11	74	0.22	-
12	82	0.42	+
13	108	0.38	+
14	79	0.35	-
15	80	0.4	+
16	82	0.39	+
17	86	0.36	+
18	110	0.38	-
19	78	0.4	+
20	82	0.22	-
21	84	0.38	+
22	78	0.4	+
23	88	0.4	+
24	86	0.42	+
25	100	0.39	+
26	84	0.28	-
27	86	0.38	+
28	87	0.36	+
29	82	0.28	-
30	85	0.42	+

RESULTS:

Out of 30 Radiologically diagnosed cases, 23 cases had normal CSF pressure and showed symptomatic improvement after ventricular shunt. Out of these 23 positive cases, All cases showed Evans index >0.3 and and 18 cases showed callosal angle less than 90°. Out of 7 clinically negative cases, 3 cases showed Evans index > 0.3 and 5 cases showed callosal angle < 90°.

Evans index	Diagnosed NPH	Not NPH	Callosal angle	Diagnosed NPH	Not NPH
+ve (>0.3)	23	3	+ve (<90°)	18	5
-ve (<0.3)	0	4	-ve (>90°)	5	2

Sensitivity = $\frac{23}{(23 + 0)} \times 100$
= 100 %

Specificity = $\frac{4}{7} \times 100$
= 57%.

Sensitivity= $\frac{18}{23} \times 100$
= 78%

Specificity= $\frac{2}{7} \times 100$
= 28.5%

DISCUSSION:

This study compared the accuracy of traditional measures of NPH namely Callosal angle and Evans index. Results yielded cut-offs for CA (<90°) and Evans index (>0.3). Patients who meet one of these criteria is categorized as probable NPH

Sensitivity and specificity of the callosal angle and Evans index were calculated after follow up of the diagnosed cases. Evans index is found to have more sensitivity than callosal angle.

In previous study done by Miskin N, Patel H, Ades-Aron B, Le A, Stanton C, Serulle Y, Golomb J, Gonen O, et al. EI showed 93.4% and Callosal angle showed 89.6% accuracy, and is proved that both can be used as screening tools by using cut-offs 100° for CA and 0.32 for EI.

CONCLUSION:

From this study it is evident that both Evans index and callosal angle can be used as screening parameters for diagnosing Normal pressure hydrocephalus.

In this study, Evans index have 100 % sensitivity and 57% specificity and Callosal angle have 78% sensitivity and 28.5% specificity.

Evans index and callosal angle combined showed good diagnostic accuracy. However, it is evident that Evans index is more accurate than callosal angle.

REFERENCES:

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