УДК 616.831-007:616.831.72

I. Cherian, H. Burhan
Nobel Institute of Neurosciences, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal

IPSILATERAL CEREBELLOPONTINE ANGLE CISTERN WIDENING – A RADIOLOGICAL INDICATION FOR TIMELY CISTERNAL DRAINAGE IN PATIENTS WITH TRAUMATIC BRAIN INJURY

Objective: *Cerebellopontine angle (CPA) cistern widening occurs as a result of herniating temporal lobe as it pushes the midbrain and thus the pons away from the petrous temporal bone throughout its descent. This is clinically observed as pupillary asymmetry (reactive or non-reactive) and as the herniation progresses, deterioration of neurological status follows. The aim of this study is to assess the radiological feature of ipsilateral CPA cisternal widening in patients with traumatic brain injury, as a prognostic indicator for timely cisternal drainage and bone flap replacement.*

Methods: *In this retrospective study, 31 patients undergoing cisternal drainage for traumatic brain injury were included. The presenting demographic, clinical and radiological signs were recorded and results were analyzed to assess the significance of intervention when CPA cisterns were widened, and its correlation with clinical presentation and prognosis.*

Results: *The overall mean age was 35.68 ± 8.95 years, with 61.3% males and 38.7% females. All patients presented with anisocoria and out them, 26 had unilateral obliterates suprasellar cisterns and widened CPA cisterns; with 2 of them showing unilateral pupil non-reactivity as well. The other 5 patients presented with bilaterally dilated fixed pupils and the corresponding scans showed complete obliteration of CPA cistern. These findings were statistically significant (p-value<0.05, Cramer's v=0.812). There was a significant association between CP angle cistern morphology and corresponding motor scores (p-value<0.005; Cramer's V: 0.759). The outcome in patients after 6 weeks follow up was significantly correlated to the CP angle cisternal widening and obliteration (p-value: 0.001; Cramer's V: 0.718) and the consequent changes in motor scores (p-value<0.05; Cramer's V: 0.880).*

Conclusion: *CP Angle cisternal widening is a clear indication of impending uncal herniation, identified clinically by pupil asymmetry. Timely surgical intervention using a cisternal drainage can prevent progression to involvement of more posterior structures, which otherwise result in a decreased motor score and a poor prognosis.*

Keywords: *Brain Herniation; Cerebellopontine Angle; Uncus; Parahippocampal Gyrus; Pupil Dilatation.*

Acknowledgements:

Ari G. Chacko,
Professor of Neurosurgery,
Christian Medical College, Vellore, Tamil Nadu, India
Conflicts of interest: none
Funding: None
(Portions of this manuscript were presented at the ISMINS Course, September 2018, Toronto, CA)

INTRODUCTION:

Brain herniation is a late event amongst the compensatory mechanisms for raised intracranial pressure due to an intracranial space occupying lesion. Supratentorial space occupying lesions usually displace the anteromedial temporal lobe (uncus) into the tentorial incisura, a phenomenon called uncal herniation. Anatomically the ambient cistern is located in both the supra and infratentorial compartments demarcated by the tentorial incisura. As supratentorial pressure increases, uncal herniation happens, displacing the midbrain and the pons, causing widening of the ipsilateral infratentorial ambient cistern and narrowing or obliteration of the contralateral ambient cistern and cerebellopontine angle cistern. As the herniation progresses it is possible that the uncus and para-hippocampal gyrus completely occupy and obliterate the entire ambient cistern and the cerebellopontine (CP) angle cisterns. As this progression happens, the brainstem is compressed as well as undergoes torsion, resulting in rapid clinical deterioration.

The consequent clinical findings would start with a constriction and then dilatation of the ipsilateral pupil due to oculomotor nerve compression [1, 2], however para-hippocampal gyrus herniation, causing further compression and torsion of the brainstem

Iype Cherian, email: drrajucherian@gmail.com

would worsen the picture and clinical deterioration would result, with bad prognosis.

Time is of the essence in such pathologies and early surgical intervention might result in a better prognosis [3]. In this study, we present the results of surgery in a group of patients with widened ipsilateral cerebellopontine angle cisterns.

PATIENTS & METHODS:

A total of 31 patients undergoing emergency Cisternostomy for traumatic brain injury were included in this study. The selection for cisternal drainage was based upon presenting neurological status and the corresponding CT imaging. Patient data including age, gender, pupillary asymmetry and reactivity, motor score and the asymmetry pre-operative CT scan findings were assessed and recorded. Patients were categorized based on their pupil status as asymmetric reactive and asymmetric non-reactive. All patients were followed prospectively over a 6 weeks period to determine the surgical outcome using the 5-point Glasgow Outcome Scale.

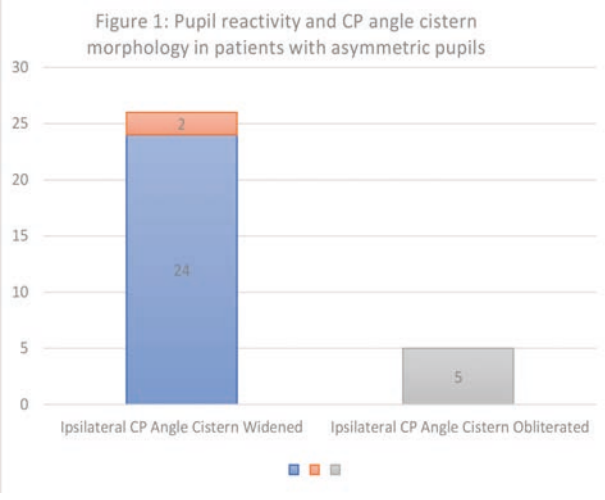
An analysis was conducted to determine the association of pupillary status with cerebellopontine angle cistern widening and obliteration. Motor score in the GCS was used as an association to determine the outcome of the immediate surgical intervention in the patients.

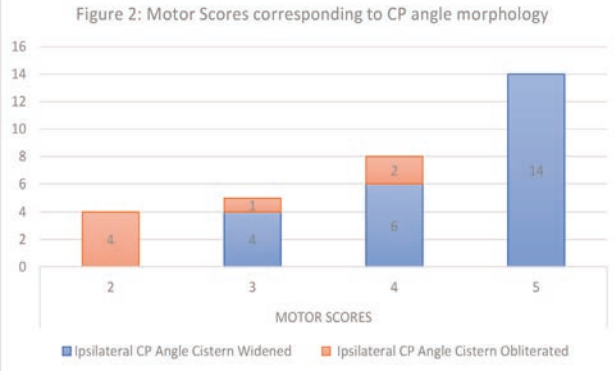
RESULTS:

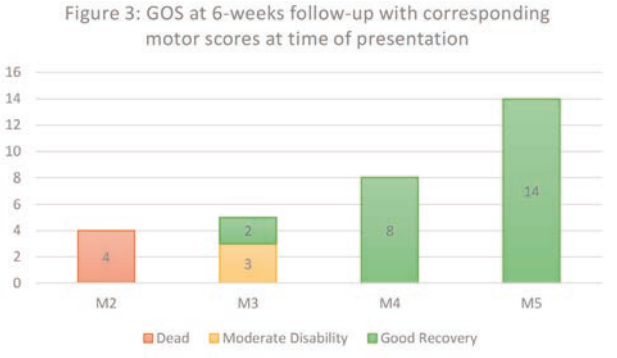
Out of the total population, 61.3% were male and 38.7% were females. Mean age of males and females was 36.84 ± 8.85 and 33.83 ± 9.18 respectively. Overall mean age was 35.68 ± 8.95 years.

Among all the 31 patients with asymmetric pupils, 26 had had unilateral CP angle cistern widening with 2 of them showing unilateral pupil non-reactivity as well. The other 5 patients presented with bilaterally dilated fixed pupils and their corresponding scans showed a complete obliteration of CP angle cistern. These findings were statistically significant (p-value<0.05, Cramer's v=0.812) [FIGURE 1].

There was a significant association between CP angle cistern morphology and corresponding motor scores (p-value<0.005; Cramer's V: 0.759) [FIGURE 2].







The outcome in patients after 6 weeks follow up on 5-point GOS was significantly correlated to the CP angle cisternal widening and obliteration (p-value: 0.001; Cramer's V: 0.718) and the consequent changes in motor scores (p-value<0.05; Cramer's V: 0.880) [FIGURE 3].

DISCUSSION:

Brain herniation is a consequence of the mass effects due to trauma, tumor or cerebral abscess. A rise in the intracranial pressure leads to shift in the brain compartments giving rise to a series of anatomical distortions with clinical and radiological manifestations.

The tentorium cerebelli separates the occipital lobes of cerebral hemispheres from the cerebellum. It is attached anteriorly to the clinoid processes of the sphenoid bone, anterolaterally to the petrous part of the temporal bone, and posterolaterally to the internal surface of occipital and the parietal bone [4]. Superiomedially, tentorium cerebelli continues as falx cerebri; giving it a tent-like appearance. The tentorial notch or incisura is a semi-ovular opening through which the brain stem descends into the infratentorial compartment. The midbrain is located in the tentorial opening (incisura) and the uncus and para-hippocampal regions of the temporal lobe lie along the lateral margins of the tentorial incisura.

Trans tentorial herniation occurs when the temporal lobe herniates down the tentorial notch. Trans tentorial herniation can be categorized into ascending or descending depending upon the infratentorial or supratentorial location of expanding lesion, respectively. Descending tentorial herniation has further been classified by Azambuja et al [5] into three subtypes: anterior, posterior and complete herniations. In anterior herniation, only the uncus is involved and is herniated down into the ipsilateral crural cistern causing shifting and rotation of the brain stem. This anterior (uncal) herniation is the initial event in most cases of tentorial herniation, usually followed by herniation of more posteriorly located structures at a more advanced stage. A posterior herniation is present when the hippocampal gyrus (behind the uncus) has herniated down into the posterolateral part of the tentorial hiatus. The posterior herniations encroach upon the lateral part of the quadrigeminal plate cistern and will cause a displacement, rotation and compression of the brain stem. When both anterior and posterior herniations are present and join each other, the result is a complete herniation. Bilateral descending tentorial herniations, which correspond to the axial pressure cone syndrome of Liliequist [6], occur mostly with frontal and central tumors, while lesions that are temporal or parietal in location tend to produce unilateral herniations or, herniations that are considerably larger on one side than on the other [7].

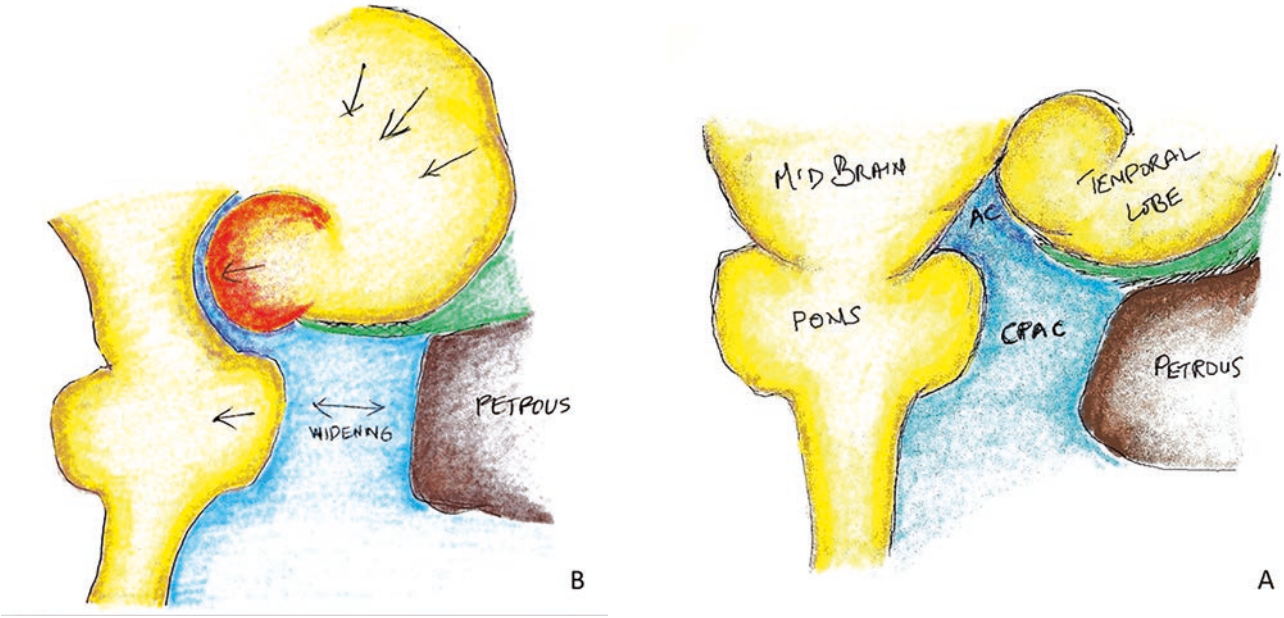


Figure 4 – Sequel of widening of Cerebellopontine angle cistern as the anterior temporal lobe begins to descend the tentorial notch. A: Normal Anatomy; B: Descent of anterolateral temporal lobe (uncal herniation), pushing the midbrain and pons on the contralateral side, notice widening of CP angle cistern, C: Trans-tentorial Herniation and complete obliteration of CP angle Cistern.

Space occupying lesions secondary to traumatic brain hemorrhages present with significant mass effects resulting in a mid-line shift and an obvious herniation as detected by obliterated basal cisterns upon CT imaging [8]. Medial dislocation of uncus encroaches the lateral aspect of the suprasellar cistern indicating an impending tentorial herniation. In very early stages, the herniating anterior temporal lobe

pushes the midbrain and the pons away, and occupies the ambient cistern resulting in the increased distance between the petrous bone and the pons thereby widening the cerebellopontine angle cistern on the same side as the expanding lesion [9] [FIGURE 4]. This gives rise to clinical manifestations of third nerve paresis and indicates increased intracranial pressure [10]. These changes can be appreciated in very early CT imaging or Magnetic Resonance Imaging (MRI) [11]. Cranial CT is the mainstay of imaging and is preferred over magnetic resonance imaging (MRI) due to availability and speed of imaging [1, 4] [FIGURE 5 – 7].

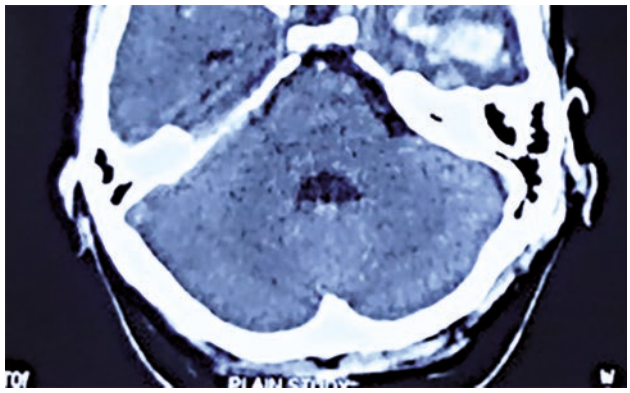
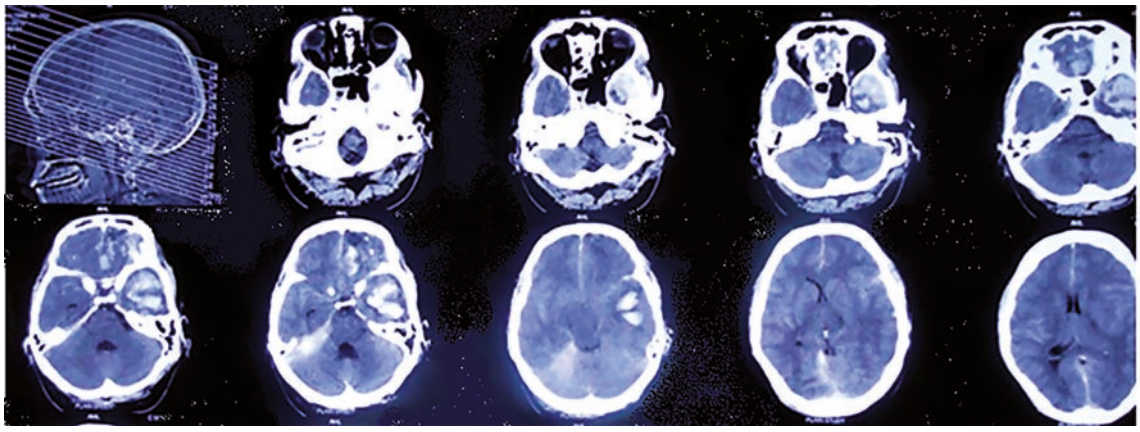


Figure 5 – Identifying CP angle cistern dilatation on CT imaging

(a)



(b)

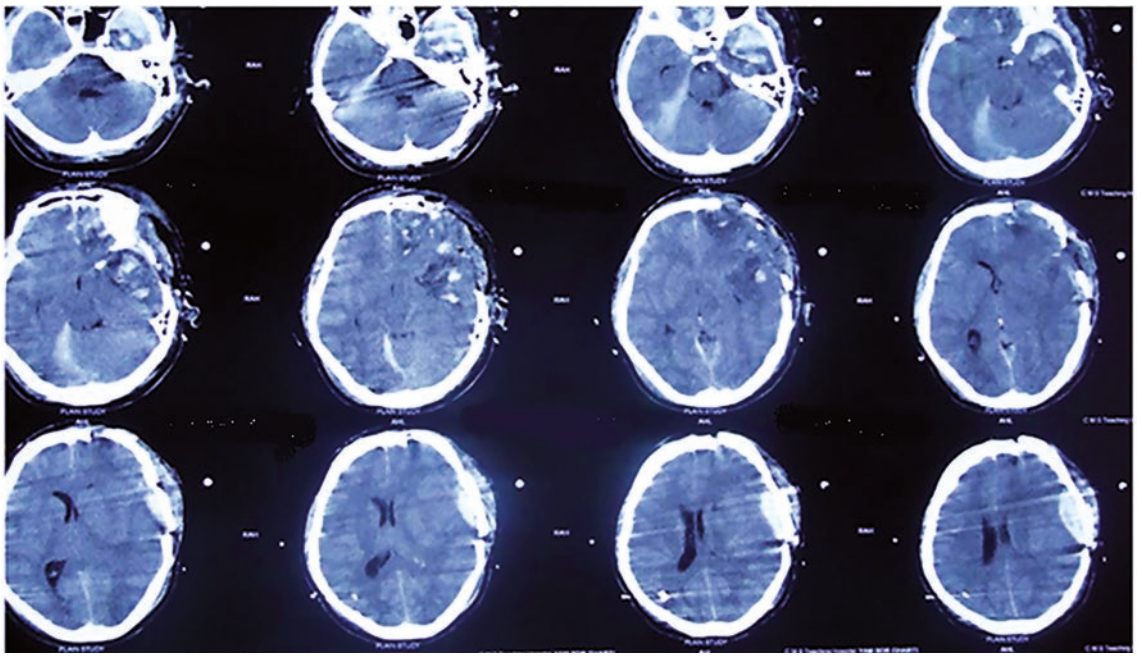


Figure 6 – (a) 25 years old male, GCS 8 (M4), Left Pupil dilated, reacting. Severe brain swelling preoperative. (b) Cisternostomy performed → extubated in 48 hours, 15 days in the department and 8 weeks later the patient came back walking (M6)

(a)

(b)

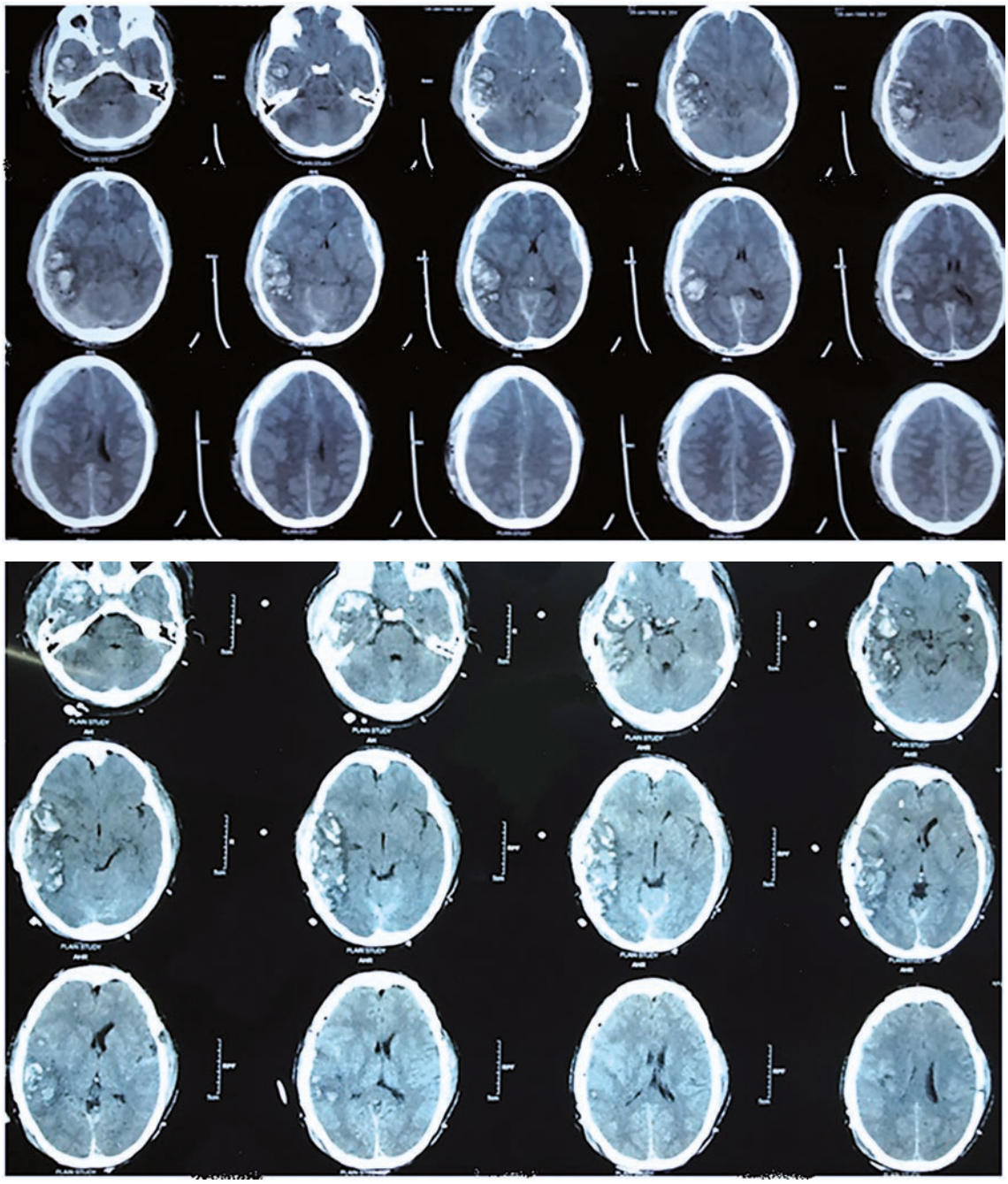


Figure 7 – (a) 25 Y/O Male, GCS 7 (E2V1M4), Right pupil dilated; right temporal contusion and temporo-parietal acute SDH; small craniotomy for SDH; severe brain swelling; (b) Conversion to trauma flap and cisternostomy, brain lax. Post-Op GCS 15. Residual CN III palsy

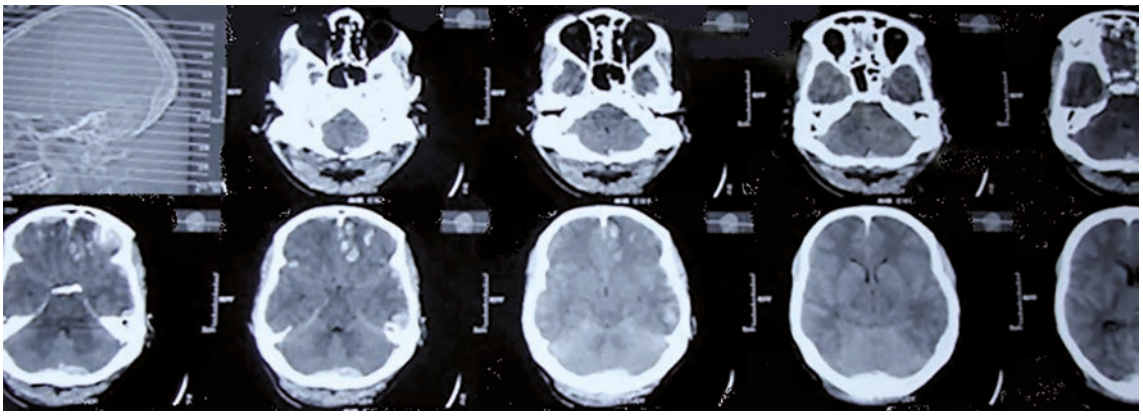
The earliest sign of uncal herniation is the ipsilateral dilation of the pupil. A depressed state of consciousness is not a reliable early sign, but the patient may be confused or agitated [12]. Other signs include contralateral or ipsilateral hemiparesis, resulting from compression or displacement of brainstem affecting ascending arousal pathways, oculomotor nerve (III), and corticospinal tract by the displaced medial temporal lobe [4, 13]. Once the brainstem is compromised, the conscious state may deteriorate rapidly to a deep coma.

Once the herniation prevails more posteriorly involving the para-hippocampal gyri, as observed in a small subset of our patient population, the motor score dropped rapidly whereas the pupil reactivity remained more or less the same. These factors have a high prognostic value described by a study in Austria, where GCS motor score and pupillary reactivity were

assessed in the field and at hospital admission to assess their prognostic value for 6-month mortality in patients with moderate or severe TBI [14]. Bilateral dilated pupils, and a decreased GCS with a motor score of 3 defines the progression to an advanced stage of herniation with the para-hippocampal gyrus involvement, that causes effacement of cisternal spaces at the tentorial level and compressing the contralateral anterior cerebral peduncle (crus cerebri) against the tentorium, resulting in ipsilateral hemiparesis (Kernohan's false localizing sign) [15]. The herniation of para-hippocampal gyrus should not however be mis-interpreted as a posterior fossa tumor on radiological imaging [16, 17]. These findings were consistent with the pre-operative CT scans in more severe patients, with accompanied complete third nerve palsy and took a longer time for improvement in clinical status.

The magnitude of rise in intracranial pressure secondary to traumatic brain injury can be observed by the edematous brain per-operatively. In our setup, all patients presenting with signs of impending herniations as identified by widened CP angle cisterns on the same side as the expanding lesion, underwent Cisternostomy to let out Cerebrospinal Fluid from the basal cisterns and reduce the cisternal pressures at atmospheric levels [18]. This rapidly decreased cerebral edema, getting the brain lax enough for bone flap re-apposition at the end of the procedure. This not only allowed for a rapid reversal of the CSF shift edema [19] that occurs as a consequence of increased cisternal pressure but also prevented progression to herniation of the edematous brain into an artificial cavity, stretching of axons and neural structures and probably high intra-parenchymal pressure despite decrease in intracranial pressure which later would contribute to a higher morbidity and vegetative patient outcome otherwise seen in traditional Decompressive Hemicraniectomy [20, 21, 22] [Figures 6 – 10].

(a)



(b)

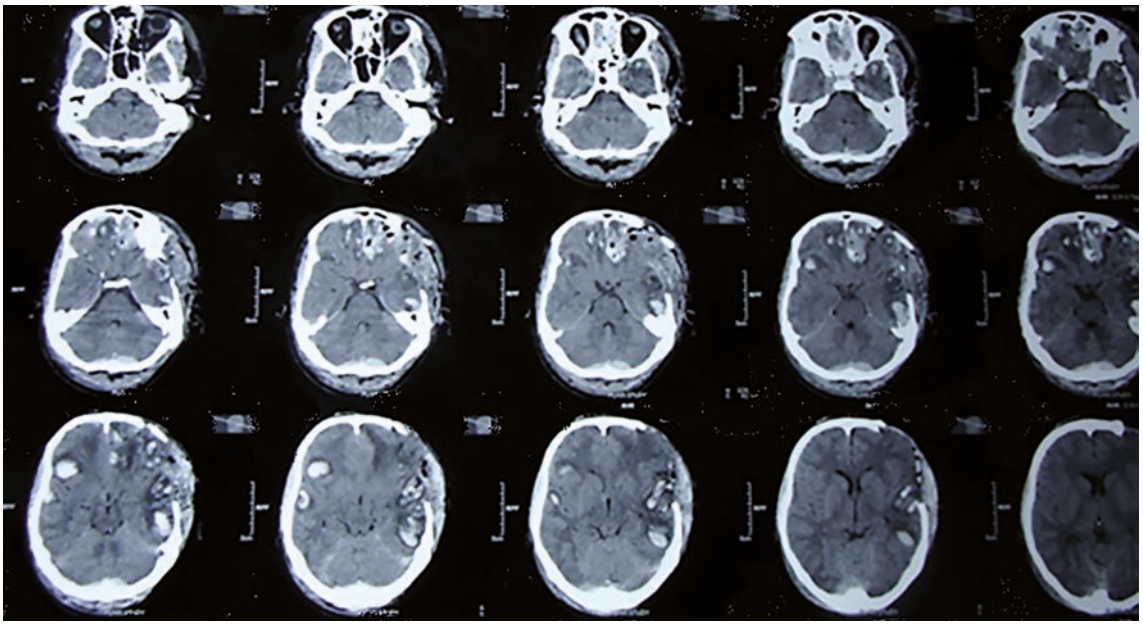
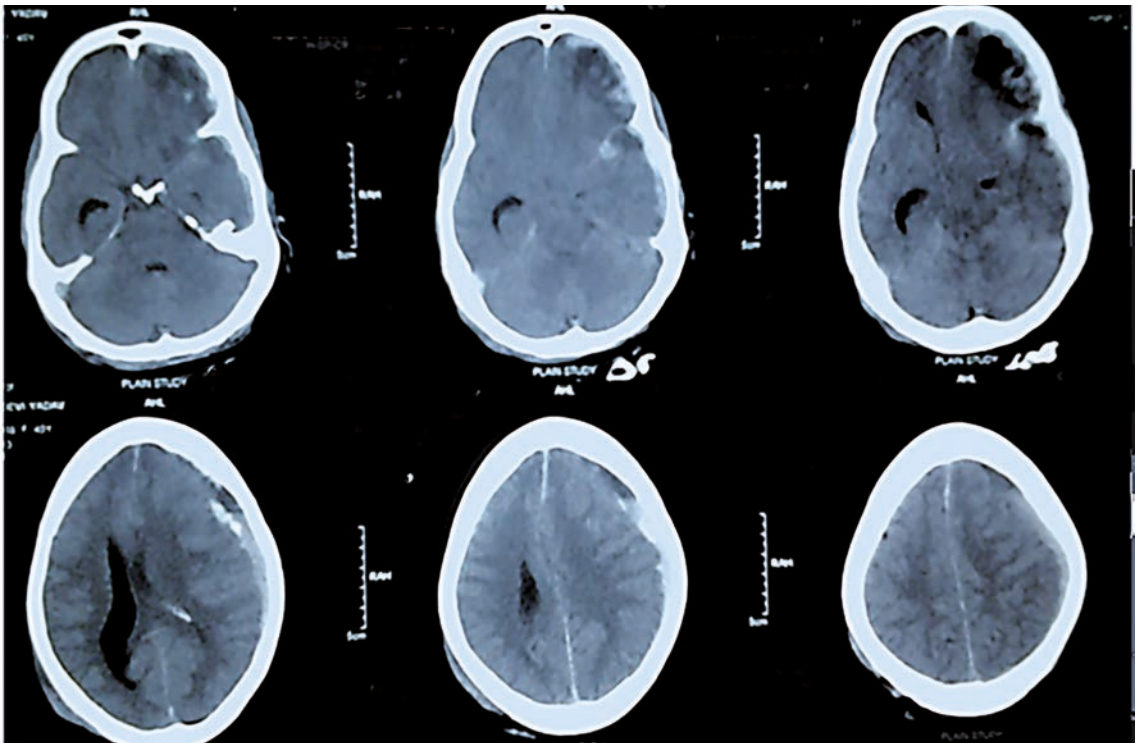


Figure 8 – 23 Y/O Male, GCS 4 (M2), left pupil dilated; decompression of temporal bone to the MCS floor, reapposition of frontal bone flap. Post-op GCS 15, and talking

(a)



(b)

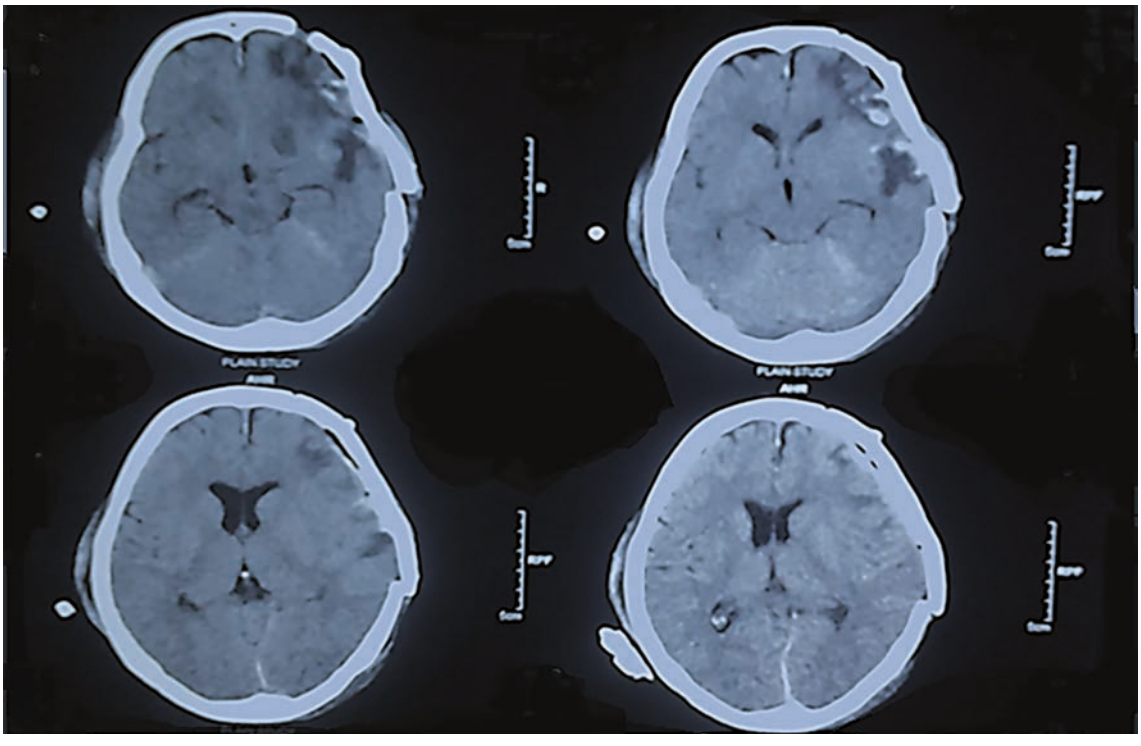


Figure 9 – 43Y/O Female, GCS 6 (E1V1M4), left pupil dilated. (a) Tentorial herniation. (b) Extubated in 4 days with GCS 14, residual hemiparesis, CN III palsy

(a)

(b)

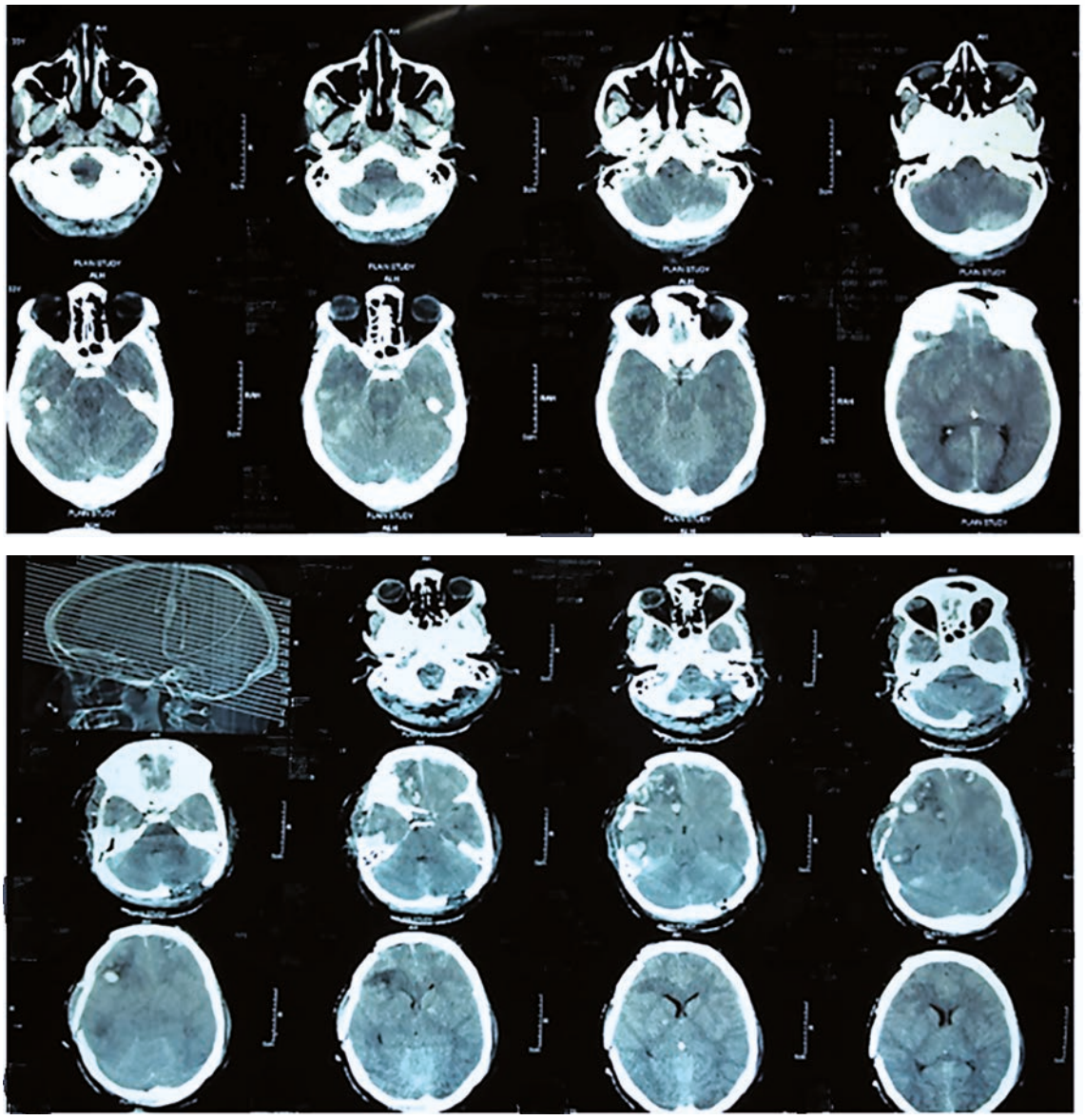


Figure 10 – 33 Y/O Female, GCS 4 (E1V1M2), bilateral fixed pupil; posterior fossa hematoma evacuated and cisternostomy performed. Post-Op GCS 14/15

One important factor in management of cerebral herniation is the time lapsed before presenting to the ED. Majority of the patients presenting to our department had very early signs of brain injury, and hence, widened CP Angle cisterns were well appreciated in the images obtained upon arrival. Clinical presentation of almost all these patients involved unilateral (ipsilateral) pupil dilation at the which corresponded to the same side as the widened CP angle cisterns. The initial events of anterior temporal lobe herniation present with a GCS above 8 and a motor score of 5 and 4 only in some patients. This determines a good prognostic value as seen by our post-operative outcomes.

In a later sequel, trans tentorial herniation may cause ipsilateral cerebral infarction due to occlusion of the posterior cerebral artery and the Duret hemorrhage, which typically occurs in the ventral and paramedian midbrain/pons following rapid downward herniation. Other signs of uncal herniation on computed tomography (CT) include shift of mesencephalon, obliteration of suprasellar cisterns, aqueductal compression, hydrocephalus and Descending tentorial herniation (DTH) [23]. It is of extreme importance to correlate the clinical signs with the radiological findings [24], as seen by the strong association seen in our study.

CONCLUSION

Our results indicate that widening of ipsilateral CP angle cisterns on CT imaging strongly correlates clinically with ipsilateral pupil asymmetry (reactivity and dilatation). Widening of CP angle cisterns on the same side as the expanding lesion should be considered as an early sign of impending herniation. The presenting motor score is a significant predictor of prognosis and a decrease in motor score by 1 point leads to a poor prognosis. It should be clear that ipsilateral pupil dilatation is an early indication of impending or on-going herniation and timely management using a cisternal drainage is required to prevent progression to a complete trans-tentorial herniation and thus poor prognosis.

REFERENCES

1. Feldmann E., Gandy S.E., Becker R., Zimmerman R., Thaler H.T., Posner J.B., Plum F. MRI demonstrates descending transtentorial herniation // Neurology. – 1988. – 38(5). – P. 697-701. [PMID:3362364]
2. Katzir M., Attia M., Sviri G.E., Zaaroor M. Uncal herniation in a fully conscious patient – The sliding uncus syndrome // Br J Neurosurg. – 2015. – 29(2). – P. 308-9. doi: 10.3109/02688697.2014.977779. [PMID:25375327]
3. Stevens R.D., Shoykhet M., Cadena R. Emergency neurological life support: intracranial hypertension and herniation // Neurocritical Care. – 2015. – 23(2). – P. S76–S82. http://doi.org/10.1007/s12028-015-0168-z
4. Gray H. Gray's Anatomy. Philadelphia: Running Press; 1974. – p 512-523.
5. Azambuja N., Lindgren E., Sjogren S.E. Tentorial herniations: II. Pneumography // Acta Radiol. – 1956. – 46. – P. 224-231.
6. Liliequist B. Encephalographic changes in the axial pressure cone syndrome // Acta Radiol. – 1960. – 54. – P. 369-378.
7. Stovring J. Descending tentorial herniation: findings on computed tomography // Neuroradiology. – 1977. – 14. – P. 101-105.
8. Athiappan S., Muthukumar N., Srinivasan U.S. Influence of basal cisterns, midline shift and pathology on outcome in head injury // Ann Acad Med Singapore. – 1993. – 22(3 Suppl). – P.452-5. [PMID:8215199]
9. Ropper A.H. Syndrome of transtentorial herniation: is vertical displacement necessary? // Journal of Neurology, Neurosurgery, and Psychiatry. – 1993. – 56(8). – P. 932-935.
10. Kalita J., Misra U.K., Vajpeyee A., Phadke R.V., Handique A., Salwani V. Brain herniations in patients with intracerebral hemorrhage // Acta Neurol Scand. – 2009. – 119(4). – P. 254-60. doi: 10.1111/j.1600-0404.2008.01095.x. [PMID:19053952]
11. Pearce J.M.S. James Collier (1870–1935) and uncal herniation // Journal of Neurology, Neurosurgery, and Psychiatry. – 2006. – 77(7). – P. 883–884. http://doi.org/10.1136/jnnp.2006.087544
12. Rosenfeld J.V., Lennarson P.J. Coma And Brain Death // Neurology and Clinical Neuroscience. – 2007. – P. 97-116, ISBN 9780323033541. https://doi.org/10.1016/B978-0-323-03354-1.50012-2
13. Kim J.J., Gean A.D. Imaging for the diagnosis and management of traumatic brain injury // Neurotherapeutics. – 2011. – 8(1). – P. 39–53. http://doi.org/10.1007/s13311-010-0003-3
14. Majdan M., Steyerberg E.W., Nieboer D., Mauritz W., Rusnak M., Lingsma H.F. Glasgow coma scale motor score and pupillary reaction to predict six-month mortality in patients with traumatic brain injury: comparison of field and admission assessment // Journal of Neurotrauma. – 2015. – 32(2). – P. 101-108. doi:10.1089/neu.2014.3438
15. Larner A.J. False localising signs // J Neurol Neurosurg Psychiatry. – 2003. – 74. – P. 415-418.
16. Horowitz M., Kassam A., Levy E., Lunsford L.D. Misinterpretation of parahippocampal herniation for a posterior fossa tumor: imaging and intraoperative findings // J Neuroimaging. – 2002. – 12(1). – P. 78-9.
17. Yavarian Y., Bayat M., Brøndum Frøkjær J. Herniation of uncus and parahippocampal gyrus: an accidental finding on magnetic resonance imaging of cerebrum // Acta Radiologica Short Reports. – 2015. – 4(1). 2047981614560077. doi:10.1177/2047981614560077. [PMID:11826606]
18. Giammattei L., Messerer M., Oddo M., Borsotti F., Levivier M., Daniel R.T. Cisternostomy for refractory posttraumatic intracranial hypertension // World Neurosurg. – 2018. – 109. – P. 460-463. doi: 10.1016/j.wneu.2017.10.085. [PMID:29081393]
19. Cherian I., Beltran M., Landi A., Alafaci C., Torregrossa F., Grasso G. Introducing the concept of «CSF-shift edema» in traumatic brain injury //

J Neurosci Res. 2018. – 96(4). – P. 744-752. doi: 10.1002/jnr.24145. [PMID:28836291]
20. Cherian I., Yi G., Munakomi S. Cisternostomy: Replacing the age old decompressive hemicraniectomy? // Asian J Neurosurg. – 2013. – 8. – P. 132-8.
21. Cooper D.J., Rosenfeld J.V., Murray L., et al. Decompressive craniectomy in diffuse traumatic brain injury // N Engl J Med. – 2011. – 364. – P. 1493-502.
22. Fung C., Murek M., Z'Graggen W.J., Krähenbühl A.K., Gautschi O.P., et al. Decompressive hemicraniectomy in patients with supratentorial intracerebral hemorrhage // Stroke. – 2012. – 43(12). – P. 3207-11. doi: 10.1161/strokeaha.112.666537. [PMID:23111437]
23. Marincek B., Dondelinger R.F. Emergency Radiology: Imaging and intervention. Springer Science & Business Media, 2007. – p.120.
24. Lame F.J., Shedden A.I., Dunn M.M., Ghatak N.R. Acquired intracranial herniations: MR imaging findings // AJR. – 1995. – 165. – H. 967-973.

I. Cherian, H. Burhan
Нобель нейроғылым институты, Нобель медициналық колледжі мен оқу ауруханасы, Биратнагар қ., Непал

МИШЫҚ КӨПІРІ ЦИСТЕРНАСЫНЫҢ ИПСИЛАТЕРАЛЬДЫ ҰЛҒАЮЫ – БАС МИЫНЫҢ ЖАРАҚАТЫ БАР ПАЦИЕНТТЕРДІҢ ЦИСТЕРНАЛАРЫН УАҚТЫЛЫ ДРЕНАЖДАУДАҒЫ РАДИОЛОГИЯЛЫҚ ИНДИКАТОР

Мақсаты: Мишық көпірі цистернасының (МКЦ) ұлғаюы – ортаңғы ми мен көпірдің тасты сүйекпен қысылғаннан самайлық үлестің жарық ретінде шығып тұруының нәтижесі болып табылады. Бұл жағдайда клиникалық тұрғыдан көз қарашықтарының асимметриясы байқалады және дислокациялық синдромның күшеюінің салдарынан неврологиялық жағдай нашарлайды. Зерттеудің мақсаты – цистернаны уақтылы дренаждаудың және сүйек кесіндісін алмастырудың болжамдық факторы ретінде бас миының жарақаты бар пациенттерде МКЦ-ның ипсилатеральды ұлғаюының радиологиялық ерекшеліктерін бағалау.

Әдістері: Бұл ретроспективтік зерттеуге бас миының жарақатына байланысты цистернаның дренаждалуы жасалған 31 науқас енгізілді. Демографиялық, клиникалық және радиологиялық деректер МКЦ-ның ұлғаюы кезіндегі хирургиялық араласудың маңыздылығын, оның клиникалық көріністермен және болжаумен байланысын бағалау үшін талданды.

Нәтижелері: Жалпы орташа жасы 35,68 ± 8,95 жасты құрады, оның ішінде ерлер 61,3% және әйелдер 38,7%. Барлық науқастарда анизокория болды, оның 26-нда супраселлярлы цистерналардың бір жақты қысылуы және МКЦ-ның ұлғаюы болды; 2 науқаста қарашық реакцияларының бір жақты болмауы тіркелді. 5 науқаста радиологиялық зерттеулердің деректеріне сәйкес МКЦ-ның қысылуы мен қарашықтардың екі жақты фиксацияланған ұлғаюы байқалды. Бұл нәтижелер статистикалық маңызды болды (p-мәні<0.05, Крамер бойынша v=0.812). МКЦ морфологиясы мен қозғалыс функцияларының тиісті көрсеткіштері (p-мәні<0.005, Крамер бойынша v: 0.759) арасында айтарлықтай корреляция болды. 6 аптадан кейінгі науқастардағы клиникалық нәтижелер МКЦ-ның ұлғаюымен және облитерациясымен (p-мәні: 0.001), Крамер бойынша v: 0.718) және қозғалыс көрсеткіштерінің өзгеруімен (p-мәні<0.05, Крамер бойынша v: 0.880) айтарлықтай деңгейдеді корреляцияда болады.

Қорытынды: МКЦ-нің ұлғаюы – самайлық-тенториалды сыналанып кірудің даму мүмкіндігінің айқын индикаторы болып табылады, ол клиникалық тұрғыда қарашықтардың асимметриясы арқылы көрінеді. Цистерналарды дренаждау түріндегі уақтылы хирургиялық араласу оның анағұрлым каудалық құрылымдарға дамуына жол бермейді, яғни бұл қозғалыс функцияларының нашарлауының және қолайсыз нәтижелердің алдын алады.

Негізгі сөздер: дислокациялық синдром; мишық көпірінің цистернасы; ункус; парагиппокампалды қатпар; қарашықтардың ұлғаюы.

(Бұл мақаланың кейбір бөліктері ISMINS курстарында ұсынылған, 2018 жылғы қыркүйек, Торонто, Канада)

I. Cherian, H. Burhan
Нобелевский институт нейронаук, Нобелевский медицинский колледж и учебная больница, г. Биратнагар, Непал

ИПСИЛАТЕРАЛЬНОЕ РАСШИРЕНИЕ МОСТОМОЗЖЕЧКОВОЙ ЦИСТЕРНЫ – РАДИОЛОГИЧЕСКИЙ ИНДИКАТОР ДЛЯ СВОЕВРЕМЕННОГО ДРЕНИРОВАНИЯ ЦИСТЕРНЫ У ПАЦИЕНТОВ С ТРАВМОЙ ГОЛОВНОГО МОЗГА

Цель: Расширение мостомозжечковой цистерны (ММЦ) является результатом грыжевого выпячивания височной доли сдавливания среднего мозга и моста от каменистой части. При этом клинически наблюдается асимметрия зрачков, и как следствие прогрессирования дислокационного синдрома ухудшается неврологический статус. Целью данного исследования является оценка радиологических особенностей ипсилатерального расширения ММЦ у пациентов с травматическим повреждением головного мозга как прогностического фактора своевременного цистериального дренирования и замены костного лоскута.

Методы: В данное ретроспективное исследование было включено 31 пациент с травматическим повреждением головного мозга, которым произвели дренирование цистерны. Проанализированы демографические, клинические и радиологические данные с целью оценки значимости вмешательства при расширении ММЦ, и его корреляции с клинической картиной и прогнозом.

Результаты: Общий средний возраст составлял 35,68 ± 8,95 года, из них 61,3% мужчин и 38,7% женщин. У всех пациентов отмечалась анизокория, из которых у 26 были одностороннее сдавление супраселлярных цистерн и расширение ММЦ; у 2 отмечалось одностороннее отсутствие зрачковых реакций. У 5 пациентов отмечалось двустороннее фиксированное расширение зрачков с полным сдавлением ММЦ по данным радиологических исследований. Эти результаты были статистически значимыми (значение $p<0,05$, значение по Крамеру $v=0,812$). Отмечалась значительная корреляция между морфологией ММЦ и соответствующими показателями моторных функций (значение $p<0,005$; значение по Крамеру v: 0,759). Клинические исходы у пациентов после 6 недель наблюдения в значительной степени коррелировали с расширением и облитерацией ММЦ (значение p: 0,001; значение по Крамеру v: 0,718) и последующими изменениями двигательных показателей (значение $p<0,05$; значение по Крамеру v: 0,880).

Заключение: расширение ММЦ является четким индикатором возможного развития височно-тенториального вклинения, которое клинически проявляется зрачковой асимметрией. Своевременное хирургическое вмешательство в виде дренирования цистерны способствует предупреждению прогрессирования в более каудальные структуры, которое приведет к ухудшению моторных функций и неблагоприятному исходу

Ключевые слова: дислокационный синдром; мостомозжечковая цистерна; ункус; парагиппокампальная извилина; расширение зрачков.

(Части этой статьи были представлены на курсах ISMINS, сентябрь 2018 г., Торонто, Канада)