Neuroendoscopic Management of Hydrocephalus and Associated Intracranial Lesions

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ABSTRACT

Objective — *To document the experience of intraventricular neuroendoscopy in the diagnosis and management of intracranial lesions causing hydrocephalus as well as endoscopic third ventriculostomy (ETV) in treating hydrocephalus,*

Study design — *Descriptive case series.*

Place & Duration of study — *Department of Neurosurgery, Peoples University of Medical and Health Sciences Nawabshah, from January 2009 to June 2011.*

Methodology — *Patients of hydrocephalus associated with intracranial lesions were enrolled. Lesions were resected using endoscopic approach or by microsurgical technique. Extra-axial lesions causing obstructive hydrocephalus were managed with microsurgical resection and ETV. Endoscopic third ventriculostomy was performed for persistent hydrocephalus.*

Results — *The study population consisted of 20 patients (13 males - 65% and 7 females - 35%). The age ranged from 6 months to 70 year with the mean age of 21.6 year. Colloid cysts (n=2) and cystic craniopharyngioma (n=1) in third ventricle were completely excised. Third ventricular ependymoma was partially excised and referred for radiotherapy. Hydrocephalus was treated by ETV in 10 cases (50%), complete resection of the intraventricular lesions in 3 (15%) cases and ventriculoperitoneal (VP) shunt placement in 7 (35%) cases. VP shunt was avoided in 13 (65%) cases.*

Conclusions — *ETV is an effective method of treating hydrocephalus associated with intracranial lesions. Intra-cranial extra-axial lesions can be effectively managed with microsurgical method. Intraventricular lesions can be resected or biopsied with neuroendoscopy providing a better minimal access with good illumination. VP shunt can be avoided in most of the cases.*

Key words — *Hydrocephalus, Neuroendoscopy, Endoscopic third ventriculostomy, Ventricular surgery, intracranial lesions.*

INTRODUCTION:

The endoscopic neurosurgery or endoscopic assisted surgery has now become standard of care in the treatment of hydrocephalus and intracranial lesions. Endoscopic third ventriculostomy is replacing VP shunts as a treatment of choice in hydrocephalus.[1] Non-communicating hydrocephalus associated with intracranial lesions can be effectively managed with proper management of obstructing lesions. Oppido PA et al had reported a success rate of 65% in CSF diversion by ETV and septum pellucidotomy.[2]

Shunting or making third ventriculostomy is an alternate option in cases of partial resection, recurrence and persistent hydrocephalus.[3,4] Lesions projecting from ependymal surface like colloid cysts, ependymoma and pineal gland tumors are better amenable with neuroendoscope for biopsy or resection.[5] Biopsy can be done before ETV to avoid blood spillage into pre-pontine cistern. Extrinsic obstructing lesions can be dealt with microsurgical methods. In case of partial resection or persistent hydrocephalus, ETV is favorable.

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The purpose of this study was to describe our experience of neuroendoscopy in the diagnosis and management of intracranial lesions; and role of concurrent ETV in treating hydrocephalus associated with these cases.

METHODOLOGY:

This descriptive case series was conducted in Neurosurgery Department at Peoples University of Medical and Health Sciences Nawabshah, from January 2009 to June 2011. Patients with hydrocephalus associated with intracranial lesions diagnosed on CT scan or MRI were included. Patients with co-morbidities like uncontrolled diabetes, uremia or cardiac diseases were excluded. Intraventricular lesions projecting over ependymal surface were planned for endoscopic resection and third ventriculostomy where partial resection was possible. Extra-axial lesions were resected by microsurgical method and associated hydrocephalus was managed by simultaneous ETV.

Aesulip rigid rod lens 0 degree neuroendoscope was used. Warm Ringer's solution was used for irrigation. Fogarty catheter balloon was used for ETV. Hemostasis was achieved with irrigation, temponade or coagulation. ETV was labeled successful when features of raised intracranial pressure (ICP) were improved clinically and ventricular size decreased on postoperative CT scans. Tissues removed were submitted for histopathological examination.

RESULTS:

Twenty patients with male to female ratio of 1.85: 1 were managed. Age ranged from 0.5 year to 70 year with a mean of 21.8+17.76 year. There were 10 (50%) cases of posterior fossa lesions. Third ventricular lesions were found in eight (40%) cases while lateral ventricular lesions noted in two (10%) cases. The lesion in posterior fossa were excised with open microscopic method and hydrocephalus associated with these lesions was managed with ETV. Dandy Walker cyst in one patient was successfully treated with ETV. Colloid cysts (n=2) and cystic craniopharyngioma (n=1) in 3rd ventricle were completely excised with endoscope and hydrocephalus resolved. A case of 3rd ventricular ependymoma was partially excised and subsequently referred for radiotherapy. Pineal gland tumors were not resected because of vascularity and only biopsy was taken with endoscope. Third ventricular floor was obscured in these cases and ETV was not possible therefore hydrocephalus was treated with VP shunt. There were only 2 cases with lateral ventricular lesions (septal glioma, thalamic glioma) which were biopsied and VP shunt was required to treat hydrocephalus.

Postoperative fever occurred in two patients. CSF leak developed in one patient that was managed by serial lumbar punctures. There was no operative mortality. ETV worked successfully in treatment of hydrocephalus in 10 (50%) cases and all were with posterior fossa lesions. Hydrocephalus associated with colloid cysts and cystic craniopharyngioma resolved after complete endoscopic resection. VP shunt was required in seven (35%) cases and avoided in 13 (65%) cases.

DISCUSSION:

The obstructed hydrocephalus associated with intra-ventricular or para-ventricular lesions provides a cavity for the introduction of endoscope to take biopsy or excise the lesion and concurrently make ETV through single burr hole with same trajectory to internally divert the excessive fluid in the ventricles and thereby achieve goals of being less invasive procedure and avoiding shunts in most of the cases.[6] Cystic intraventricular lesions can be resected completely.[6-10] In our series colloid cysts and cystic craniopharyngioma were completely excised. Solid intraventricular lesions due to vascularity and hemostatic reasons were not completely resectable in majority of the cases.

In the posterior fossa, extra-axial or para-ventricular lesions are better amenable with microsurgical resection. Obstructed hydrocephalus associated with these lesions can be managed with third ventriculostomy.[11,12] In this series ten such lesions were excised by microscopic method and hydrocephalus treated by ETV. The only danger in doing ETV in these cases is high basilar artery projection which can be plunged. In this study we had a case of Dandy Walker cyst in a 6 month baby which was successfully treated by ETV. Hu CF et al[13] have also reported such a case treated with ETV.

The third floor anatomy gets distorted in pineal gland tumors and due to vascularity hemostatis is difficult. Complete resection becomes difficult in such cases. Morgenstern PF et al has biopsied these lesion through single or dual trajectory and were successful in making ETV.[14] Cipri S et al had 4 objectives in doing endoscopy for pineal region tumors i.e. to perform ETV, take biopsy, CSF for markers and cytology. [15] In our series we were able to partially resect or take biopsy from these lesions (n=4). ETV was not possible because of obscure third floor structures and VP shunt was inserted to treat

Table I: Causes of Hydrocephalus Associated with Intracranial Lesions and Procedures Performed

Diagnosis	No. of Cases (n)	Percentage	Procedure
Posterior Fossa Lesions (n=10 - 50%)			
Dandy Walker malformation	1	5	ETV
Cerebellar Astrocytoma	2	10	Microscopic Resection and ETV
Medulloblastoma	3	15	Microscopic Resection and ETV
Acoustic Neuroma	3	15	Microscopic Resection and ETV
Ependymoma	1	5	Microscopic Resection and ETV
Third Ventricular Lesions (n=8 - 40%)			
Colloid cysts	2	10	Endoscopic Complete Excision
Cystic craniopharyngioma	1	5	Endoscopic Complete Excision
Third ventricular ependymoma	1	5	Endoscopic Partial Excision (Referred for Radiation)
Pineal gland tumors	4	20	Endoscopic Biopsy and VP Shunt
Lateral Ventricular Lesions (n=2 - 10%)			
Septal glioma	1	5	Endoscopic biopsy and VP Shunt
Thalamic glioma	1	5	Endoscopic biopsy and VP Shunt
Total	20	100%	

hydrocephalus.

Oppido PA et al had reported multicentric experience of endoscopic biopsy of ventricular tumors; and found meaningful data in 90% of patients making subsequent therapy feasible.[2] Partial resection or taking biopsy in our patients also helped in planning further treatment. Lateral ventricular lesions were usually managed with open microscopic method. We had two such cases in the lateral ventricle for endoscopy (a septal glioma and thalamic glioma). In both the cases only biopsy was possible. ETV could not be done because anatomy at foramen of Monro was distorted.

Neuroendoscopy is emerging as better tool in managing intracranial lesions for diagnosis and treatment. Associated hydrocephalus can also be treated with minimal invasion. In this study we were able to diagnose these cases and avoided shunt in 65% of cases. Oppido PA et al had similar experience of success rate of 65% of cases in CSF diversion by ETV and septum pellucidotomy.[2] There is a great room for future advances in neuroendoscopic resection of intracranial lesions especially with the help of flexible and steerable scopes. Haemostatic difficulties need to be addressed.

CONCLUSIONS:

Minimally invasive neuroendoscopy is a useful tool in diagnosing and treating most of the intraventricular lesions. Intra-cranial extra-axial lesions can be dealt with open microscopic method and ETV is an effective method of treating obstructed hydrocephalus associated with these intracranial lesions.

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