

APP Placement of ICP Monitors

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Can midlevel providers place external ventricular drains safely and accurately?

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Disclosures

Research grant from Boston Scientific



Objectives

- Review Data on EVD accuracy and complications rates
- Report most recent results from Spectrum Health experience using MLP
- Go over protocol employed for training



Background

- EVD's used to treat a variety of pathology:
 - TBI, hemorrhage, hydrocephalus, cerebral edema
- Pressure transducer currently gold standard for ICP measurement
- At most level 1 trauma centers placement is by:
Neurosurgeon or Resident



Background

Due to the urgency of neurosurgical pathologies and the lack of qualified residents at most hospitals, midlevel practitioner (MLP) placement of EVDs would be advantageous.

No studies addressing the safety and accuracy of EVD placement by mid-levels



Evidence for Bolt monitor's?

- Successful placement of ICP bolts by MLP's , Neurointensivists, and trauma surgeons has been shown to be safe (Kaups et al., 1998; Ekeh AP et al., 2012; Sadaka F et al., 2013)
- EVD placement is significantly more technically challenging.
 - Placement into lateral ventricular system near foramen of Monroe
 - Higher complications rates including infection and hemorrhage compared to bolt (Lo CH et al, 2007)



EVD complication

- 7% hemorrhage rate (meta analysis of 2428 patients)
- 0.6 % hemorrhage requiring surgery
- Infections rates: 0-40% (4.3% with abx impregnated EVDs placed in the ICU)



Spectrum experience

Our first PA had extensive experience in placing EVDs at her practice

As new PA's joined the group they would place at least 5 EVD's under direct supervision of senior PA or attending neurosurgeon

Up to 3 attempts.

Neurosurgeons evaluate imaging and interpret history on all patients prior to placement

All PA's have involvement in OR cases



Study Objective

To assess the accuracy and complication rates of MLP and neurosurgeon EVD placement.



Methods

Retrospective Cohort of all patients with EVD placed from Jan 2012-Sept 2016

Safety and accuracy compared

Safety: hemorrhage, infection, CSF leak

Accuracy: tip in lateral ventricular system: yes/no, Does the EVD function appropriately Y/N

Demographics

	Midlevel Practitioner (MLP) n=238	Neurosurgeon (NS) n=70	Total n=308
Age (y), mean \pm standard deviation	54.5 \pm 18.4	51.5 \pm 15.5	53.8 \pm 17.8
Male, n (%)	128 (53.8%)	37 (52.9%)	165 (53.6%)
Admission Diagnosis, n (%)			
TBI	48 (20.1%)	12 (17.1%)	60 (19.5%)
Aneurysmal SAH*	65 (27.3%)	31 (44.3%)	96 (31.2%)
Non-aneurysmal spontaneous hemorrhage	90 (37.8%)	15 (21.4%)	105 (34.1%)
Other	35 (14.7%)	12 (17.1%)	47 (15.3%)
Location site of placement			
Right Frontal	197 (82.8%)	54 (77.1%)	251 (81.5%)
Left Frontal	38 (16.0%)	15 (21.4%)	53 (17.2%)
Right Occipital	3 (1.3%)	0 (0.0%)	3 (1.0%)
Left Occipital	0 (0.0%)	1 (1.4%)	1 (0.3%)

Accuracy

Functioning EVD placed within the lateral ventricular system

PA (n=238) 87.4%

Attending (n=70): 90.0%

$P = 0.5557$

Complications

	Initial MLP Placement n=238	Initial Neurosurgeon Placement n=70	Placement Following Abandoned MLP Attempts n = 14
GCS Scores			
Pre-procedure, mean ± standard deviation	10.10 ± 4.52	10.13 ± 4.93	8.67 ± 4.18
Post-procedure, mean ± standard deviation	10.31 ± 4.50	10.39 ± 4.76	8.11 ± 4.26
Complications, n (%)			
All hemorrhages	16 (6.7%)	3 (4.3%)	1 (7.1%)
IVH	4 (1.7%)	0 (0%)	0 (0%)
IPH	8 (3.4%)	2 (2.9%)	0 (0%)
SDH	3 (1.3%)	1 (1.4%)	1 (7.1%)
SAH	1 (0.42%)	0 (0%)	0 (0%)
Infection	2 (0.84%)	1 (1.4%)	0 (0%)
CSF Leak	1 (0.42%)	1 (1.4%)	0 (0%)

Experience?

	n	Accuracy
Experience, months		
0-9	90	79/84 (94.0%)
10-19	80	69/77 (89.6%)
20+	55	50/52 (96.2%)

$P = 0.3195$



Study weakness

Retrospective

Did the MLP's require more passes? 1.2/placement similar to literature at 1.4/placement

Did neurosurgeons place the EVD's in patient they deemed to be more difficult?

can not rule this out given patients with SAH were more likely to have EVDs placed by neurosurgeon

Presenting GCS was similar



Protocol Utilized

At least 5 independent procedures under supervision by senior MLP or Neurosurgeon until deemed safe by senior MLP

Neurosurgeons evaluated all cases including imaging prior to placement of EVD's

Neurosurgeons within 20 mins of hospital

At our hospital MLPs have considerable procedural involvement, including training within the operating room in regard to sterile technique, hemostasis, and fundamental wound closure technique



Conclusion

EVD placement by adequately trained MLPs is accurate and safe, with similar rates of hemorrhage and infection, to that of neurosurgeons if a training protocol involving supervision is implemented

Allows for more prompt delivery of treatment without disruption of the neurosurgeons clinical and operative schedule in busy trauma centers without resident coverage



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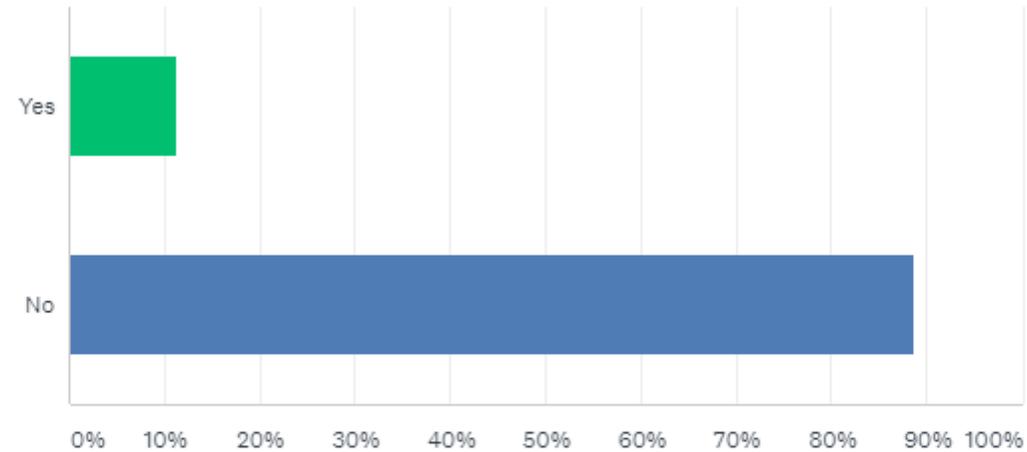


Questions

Question 19

Do you utilize advanced practitioners (PA or NP's) at your hospital to insert ICP monitors or ventriculostomies?

Answered: 44 Skipped: 3

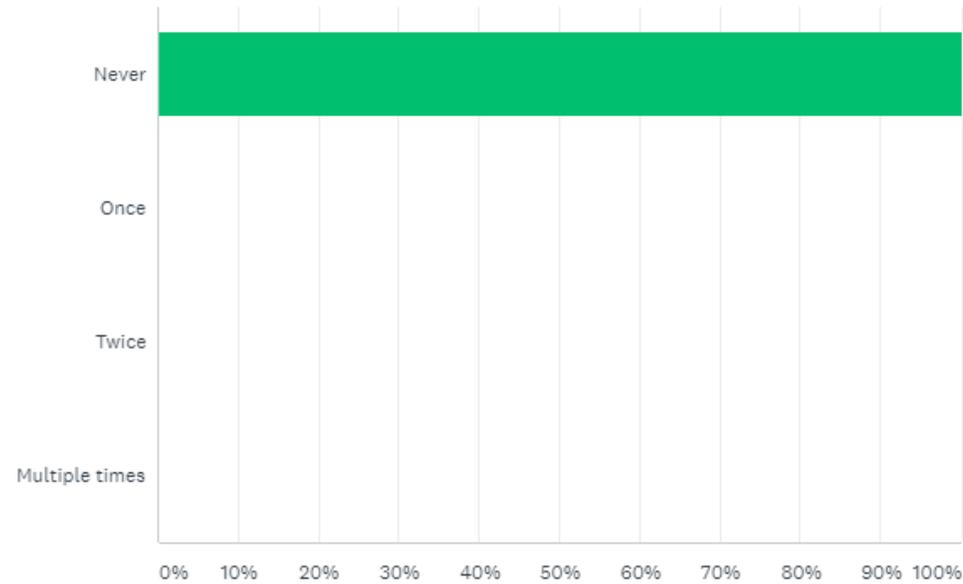


ANSWER CHOICES	RESPONSES
Yes	11.36% 5
No	88.64% 39
TOTAL	44

Question 20

Have you received a notice of intent or been sued for issues regarding placement of an ICP monitor by an Advanced Practice Provider (PA/NP)?

Answered: 42 Skipped: 5



ANSWER CHOICES	RESPONSES
▼ Never	100.00% 42
▼ Once	0.00% 0
▼ Twice	0.00% 0
▼ Multiple times	0.00% 0
TOTAL	42