Surgical Intervention Versus Observation for Pediatric Patients with Epidural Hematomas

Joshua J Loya BA; Brian Flaherty MD; Alan Schroeder MD; John Scherk MD; Roland A. Torres MD, FACS

Stanford University School of Medicine

Departments of Neurosurgery, Pediatrics, and Radiology

Stanford, CA 94305 USA

Introduction

Epidural hematomas (EDH) are a potentially lethal complication of closed head injury ocurring in 3% of head traumas. While classical practice was once to evacuate all EDH, the advent of CT imaging identified numerous EDH patients with minimal or no clinical symptoms. In the CT scan era, operative rates for pediatric EDH range widely, from 20-70%. Research on adult EDH provides guidelines for which patients with EDH can be managed without surgery GCS >8, EDH thickness < 15mm, EDH volume < 30mL, midline shift < 5ml, no focal neurological deficits. However, similar guidelines are lacking in the pediatric literature.

Study Aim

To identify clinical and radiographic characteristics of pediatric EDH patients who can be safely observed.

Methods

Pediatric patients 18 years and younger diagnosed with EDH at our center from 2001–2011 were identified from the trauma database. Medical charts were reviewed and clinical and radiographic data were compared between patients who underwent evacuation of the EDH and those who were observed without surgery. Head CT imaging was reviewed by a panel of radiologists to gather additional data.

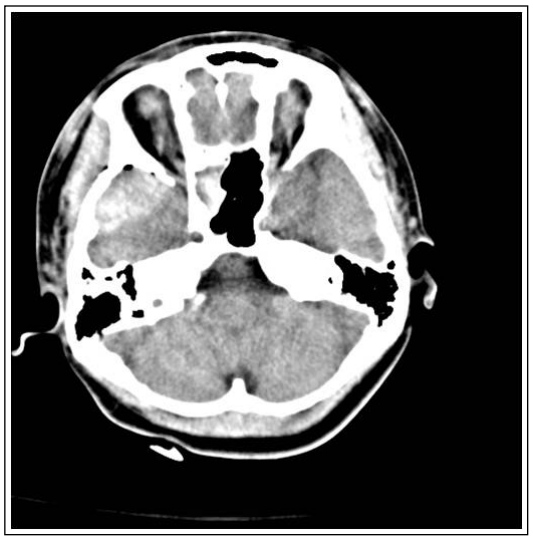

Figure 1: 14yo female MVvP presented with a GCS of 15. EDH thickness 21.4 mm. She was observed and discharged with no neurological deficits.

Results

Forty-seven eligible cases of EDH were identified and reviewed. The observation rate was 62%. There was no significant difference in gender or age between groups with a 75% male population and a mean age of 9.7.

Table 1: Initial Clinical Data

		Observed (%) n=29	Surgery (%) n=18	p-value
Initial GCS (SD)		12.9 (3.8)	11.5 (4.3)	0.12
Initial Loss of Consciousness	+	15 (52)	6 (33)	1.0
	-	10 (34)	9 (50)	
	Unknown	4 (14)	3 (17)	
Altered Mental Status	+	5 (17)	13 (72)	0.0005
	-	24 (83)	5 (28)	
Seizure	+	1 (3)	2 (11)	0.55
	-	28 (97)	16 (89)	
Intubated on Admission	+	3 (10)	4 (22)	0.40
	-	26 (90)	14 (78)	
Pupillary Deficit	+	0	3 (17)	0.054
	-	28 (97)	15 (83)	
	Unknown	1 (3)	0	
Emesis	+	10 (34)	9 (50)	0.37
	-	19 (66)	9 (50)	
Focal Weakness	+	0	2 (11)	0.14
	-	28 (97)	15 (83)	
	Unknown	1 (3)	1 (6)	
Sensory Deficit	+	0	2 (11)	0.13
	-	28 (97)	14 (78)	
	Unknown	1 (3)	2 (11)	

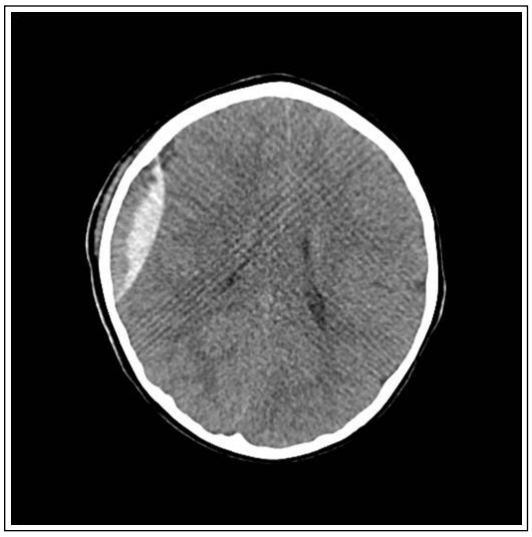

Figure 2: Presenting CT scan of a 2yo male who presented after a fall with GCS of 15. EDH thickness 18.7mm. He was observed and discharged with no neurological deficits.

Falls were the most common mechanism of injury (MOI), and patients who had falls were less likely than other mechanisms to undergo surgery (p = 0.040). Patients with altered mental status (AMS) were more likely to undergo surgery (p < 0.001). The mean EDH thickness and volume were 8.0mm and 8.6mL in the observed group and 15.5 mm and 35mL in the surgical group, respectively (p < 0.001 for both comparisons).

Table 2: Initial Radiological Data

		Observed (n=29)	Surgery (n=18)	p-value
Thickness (mm) (SD)		8.0 (4.4)	15.5 (8.4)	0.0002
Volume (mL) (SD)		8.6 (9.9)	35.0 (38.1)	0.0002
Midline Shift (mm) (SD)		0.6 (1.6)	4.1 (4.0)	0.0002
Midline Shift (%)	+	4 (14)	13 (72)	<0.0001
	-	25 (86)	5 (28)	
Herniation (%)	+	2 (7)	14 (78)	<0.0001
	-	27 (93)	4 (22)	
Skull Fracture (%)	+	26 (90)	18 (100)	0.28
	-	3 (10)	0	
Additional Intracranial Injury (%)	+	14 (48)	12 (67)	0.25
	-	15 (52)	6 (33)	
Basal Cistern Effacement (%)	+	0	5 (28)	0.0056
	-	29 (100)	13 (72)	
Location (%)				0.45
Temporal		17 (59)	7 (39)	
Parietal		4 (14)	4 (22)	
Frontal		5 (17)	5 (28)	
Occipital		3 (10)	1 (6)	
Posterior Fossa		0	1 (6)	

The presence of mass effect (p < 0.001), herniation (p < 0.001), midline shift (MLS) (p < 0.001) as well as the degree of MLS (p < 0.001) also significantly differed between the groups. Initial GCS score, skull fracture, emesis, seizure occurrence, and location of EDH did not significantly differ between surgical and non-surgical groups.Multivariate analysis showed that EDH thickness =10mm, absence of MLS, and absence of AMS were most predictive of successful observation (c = 0.94). There were 3 patients in the surgical group who were discharged with a residual neurological deficit and 1 in the observed group. No patients died.

Conclusion

We present our eleven-year experience of treating pediatric epidural hematomas. There exists a population of patients who do not require surgical intervention and have a good outcome. AMS, hematoma thickness =10mm, and absence of MLS may best identify those patients who can be safely observed.

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