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Comparison of AVPU Scale and the Glasgow Coma Scale Score in Assessing Encephalitis in Children

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Abstract

Vietnam is a developing country with tropical climate where infectious diseases, especially encephalitis are common. Every year, in National Hospital of Pediatrics from 200 to 300 encephalitis patients is hospitalized due to encephalitis. A rapid assessment of consciousness level in encephalitis is of importance in treatment and prognosis for patients. Two scales are usually used in assessment of consciousness level, The Alert Verbal Painful Unresponsiveness (AVPU) scale and the Glasgow Coma Scale (GCS). The GCS score is one of the most commonly used methods. AVPU scale is a simple method for assessment of consciousness. We conducted this study to determine how the AVPU responsive scale corresponds with the GCS in children who have encephalitis.

Keywords: Encephalitis; Children; Patients; Respiratory failure; Brain

Research Questions

1. To review assessment and used of the AVPU and the GCS in prognosis of encephalitis patients aged less than 2 years.
2. To find the relationship between AVPU, GCS score, clinical and subclinical indicators and treatment outcome.

Methods and Design

Subjects: Patients from 2 to 15 years old were diagnosed of encephalitis from 2/2014 to 8/2014.

Sample size: 95

Inclusion Criterion: Patients who had encephalitis (2-15 years of age).

Exclusion Criteria: Children with motor and mental retardation, and mental illnesses: epilepsy, brain tumors, and those were previously treated in local medical centers.

Procedures

A descriptive study was prospectively candid and patients were monitored at the hospital vertically until discharge or death [1,2].

The Alert Verbal Painful Unresponsiveness (AVPU) scale: A (Alert), V (responds to Voice); P (responds to Pain); U (Unresponsive); GCS (The Glasgow Coma Scale).

Eligible subjects: Informed and asked the consent and enrolment, Interviewed (caregivers) for risk factors (predictors); all subjects were tracked to discharge or end of life: All data were entered into Excel; and analyzed with STATA Version 13.1.

Analytic methods: Binary and ordered logistic regression.

Predictor variables: Age, sex, seizures, paralysis, respiratory failure, brain CT/MRI, microbiological etiology.

Outcome variables: AVPU and Glasgow score on admission to NHP.

Relation between AVPU, Glasgow, clinical and subclinical indicators and treatment outcome.

Results

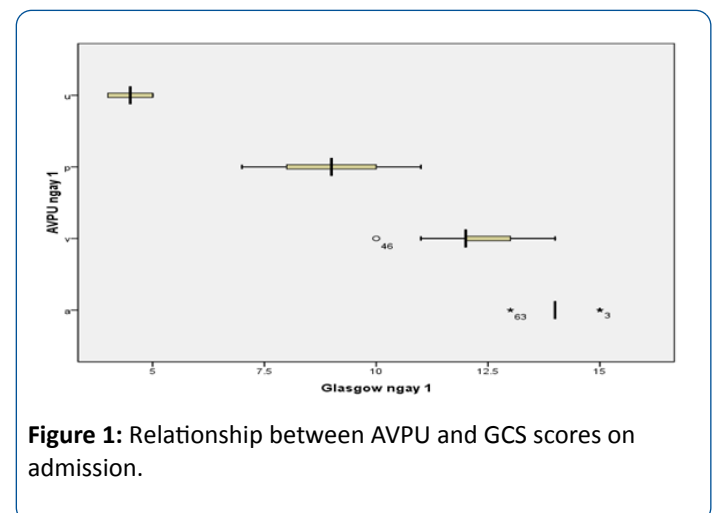


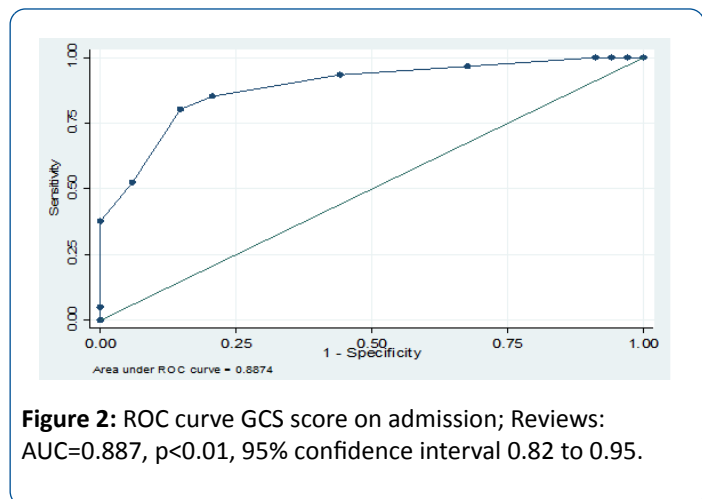
Figure 1: Relationship between AVPU and Glasgow scores on admission.

95 patients were diagnosed of encephalitis in a 6 month study period.

Perception of patients according to AVPU, GCS scores on admission (Table 1, Figures 1 and 2).

Table 1: Relation between AVPU scores on admission and treatment outcome.

AVPU	Treatment Outcome		P	OR (CI)
	Complete Recovery	Sequelae, Death		
	N	N		
A(n=24)	23	1	-	-
V(n=32)	27	5	0.22	4.3 (0.5-39.1)
P(n=37)	11	26	<0.01	54.4(9.3-145.9)
U(n=2)	0	2	<0.01	-



The relationship between AVPU, GCS score, clinical and subclinical indicators and treatment outcome (Tables 2,3 and 4).

Discussion

Assessment of AVPU scale and GCS scale

The study show that the average score of AVPU scale and GCS scale are 14/12/9/4 (Figure 1 and Figure 2). Although AVPU has been used for many years, but research assessing the two scales is limited. A study of Mackey demonstrates similar results [3,4]. Kelly CA and there is no guiderline for the choice of AVPU or GSC [5].

Conciousness lever evaluated by glasgow scale

Figure 2 shows that patents with Glassgow scaler of fewer than 10 can have a higher risk of death and complications with a fairly high sensitivity (85.2%) and specificity (79.6%), with AUC of

0.887. A study of Bhutto E assessing patients with acute encephalitis by Glasgow demonstrates a score of less than 10 points accounting for 47.7% [6], which is similar to our results.

Analyng multiple variables

There is a relationship between a glasgow score under 10 and convulsion with p<0.01. Patients who have Glasfow score under 10 and convulsion are more likely to have complicatins and die (Table 2). When glasgow score is under 10, the damage in the brain is more severe, and convulsion may makes the damage worse due to hypoxia and metabolic disfunction. Mirsa UK found that the lower the Glasgow score is, the more change of convulsion occures (71.8%) [7].

Glasgow score under 10 relates to paralyse. Patients who have less than 10 points of GCS and paralyse are 306 times more likely to be death or to have complications compare to the group without paralyse. When paralyse occures, there could be perment damage in the brain tissues and it is difficult to recover.

Glasgow score less than 10 and respiratosy disstress. The risk of death and complications increases 50 times in the patients with glasgow under 10 and respiratosy disstress, and 19 times in the group glasgow score over 10 and respiratosy disstress; and 4 time in the group with GCS over 10 without respiratosy disstress. When patients have reduction of conciousness levers and respiratosy disstress (not because of respiratosy diseases), the damage may develop in the center of respiratosy.

In patients with Glasgow score under 10 and damage in the CT/MRI, the risk of complication and death increases 35 times compare to the group without damage in the CT/MRI and GCS over 10 (Table 3). Depending on the location of the damage in the CT/MRI as well as the severity, the complications and levers of conciousness are different. Small patients with encephalitis, cortex injury in the CT/MRI and low Glasgow should be treated with anti-epilepsy medication for a short period [7].

In patients with encephalytis due to JE, HSV, EV and Glasgow under 10, the risk of complications and death is the highest (Table 3). In our study, in most of the case, the cerebral spinal fluid is positive with JE. The damage is severe and the chance to a fully recovery is poor. The damage includes edema, buise, heamorrhage, necrotise, grey tissues. In the study, when analyzing multi-variables (convulsion, paralysis, respiratosy distress, causes of encephalitis, damage in the CT/MRI, and Glasgow under 10), we find that only Glasgown and respiratosy distress independently relates to outcomes of treatment. The relationship is statistically significant.

Table 2: Relationship between GCS score, clinical indicators and treatment outcome

Related Factors	Treatment Outcome			P	OR
		Sequelae, Death	Complete Recovery		
		N	N		
GCS ≤ 10	Seizures (n=30)	24	6	<0.01	53.3(12.2-233.2)
	No (n=6)	3	3	0.02	13.3 (1.8-96.9)
GCS>10	seizures (n=16)	4	12	0.057	4.4(0.9-22.7)
	No (n=43)	3	40	-	1
GCS ≤ 10	Paralysis (n=19)	18	1	<0.01	306(29.9-3132)
	Normal (n=17)	9	8	<0.01	19.1(4.3-86.08)
GCS>10	paralysis (n=5)	4	1	<0.01	68(5.7-813)
	normal (n=54)	3	51	-	1
GCS ≤ 10	Respiratory failure (n=14)	12	2	<0.01	50(8.9-279.2)
	Respiratory normal (n=22)	15	7	<0.01	15.9(5.2-61.3)
G>10	Respiratory failure (n=3)	1	2	0.32	4.2(0.3-53.1)
	Respiratory normal (n=56)	6	50	-	1

Table 3: Relationship between GCS score, brain CT/MRI, microbiological etiology and treatment outcome.

Related Factors	Treatment Outcome			P	OR(95% CI)
		Sequelae, Death	Complete Recovery		
		N	N		
GCS ≤ 10	CT abnormal (n=26)	20	6	<0.01	35.6(7.9-158.4)
	CT Normal (n=10)	7	3	<0.01	24.9(4.1-150.1)
GCS>10	CT abnormal (n=24)	4	20	0.427	2.1(0.4-10.5)
	CT Normal (n=35)	3	32	-	1
GCS ≤ 10	Microbiology identified (n=21)	15	6	<0.01	43.8(7.9-242.1)
	None identified (n=15)	12	3	<0.01	70(10.4-470.6)
GCS>10	Microbiology identified (n=22)	5	17	0.09	5.2(0.9-29.3)
	None identified (n=37)	2	35	-	1

Table 4: Factors related encephalitis as multivariate regression analysis.

Related factors	OR	95% CI	P univariate	P multivariate
GCS ≤ 10	22.3	7.5-66.4	<0.01	0.023
P-U/AVPU	21.2	7.1-63.5	<0.01	0.02
Seizure	11.2	3.4-31.5	<0.01	0.587
Paralysis	54.1	11.2-261.3	<0.01	<0.01
Microbiology	2.4	1.0-5.6	<0.05	0.62

CT/MRI abnormal	3.2	1.3-7.9	<0.01	0.91
respiratory failure	8.8	2.6-30.1	<0.01	0.015
R=0.788; R2=62.1				

Conclusion

Our data would suggest that A/V/P/U corresponds with median GCS score of 14/12 /9/ 4, respectively. When patient's AVPU score was V-P-U, the risk of sequelae and death was 34.7%. On admission if GCS score \leq 10, the risk of sequelae and mortality were 85.2% sensitivity, 79.6% specificity. In term of prognosis Factors: GCS score \leq 10 or AVPU score of P-U, paralysis and respiratory failure were independent factors related to treatment outcome.

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