

The evaluation of the clinical usefulness of the preexisting diagnostic criteria for hemorrhagic shock encephalopathy.

Tsuyoshi Aihara, Itaru Hayakawa, Yuichi Abe

Department of Neurology, National Center for Child Health and Development, Tokyo, JAPAN

INTRODUCTION

Hemorrhagic shock encephalopathy syndrome (HSES) is a severe form of acute encephalopathy marked by symptoms such as fever, shock, diarrhea, and disseminated intravascular coagulation. Its course leads to irreversible brain damage and a poor prognosis, underscoring the critical importance of early diagnosis and intervention. Despite this urgency, prior investigations have not delved into the examination of diagnostic criteria for early detection post-onset.

OBJECTIVES

The objectives of this study are (1) to determine the usefulness of existing diagnostic criteria (Bacon's criteria) in the early detection of the disease and (2) to describe in detail the course of the disease and develop useful criteria for its early detection.

Bacon's Criteria
Shock
Encephalopathy
Diarrhea (may be bloody)
Falling hemoglobin concentration and platelet count
Disseminated intravascular coagulation
Renal function impairment
Raised hepatocellular enzymes
Acidosis
Negative cultures of blood and cerebrospinal fluid

* Abnormal values were defined more than ± 2 SD greater than mean for age

Bacon CJ and Hall SM. Arch Dis Child. 1992

METHODS

A retrospective observational study was conducted at the National Center for Child Health and Development in Japan to investigate cases of HSES. Cases were selected from those admitted to the center's intensive care unit between January 2014 and December 2023, and data were collected from medical records. We analyzed the time of diagnostic confirmation and the fulfillment of each diagnostic criterion, with convulsion onset as the reference point (time point 0: t0).

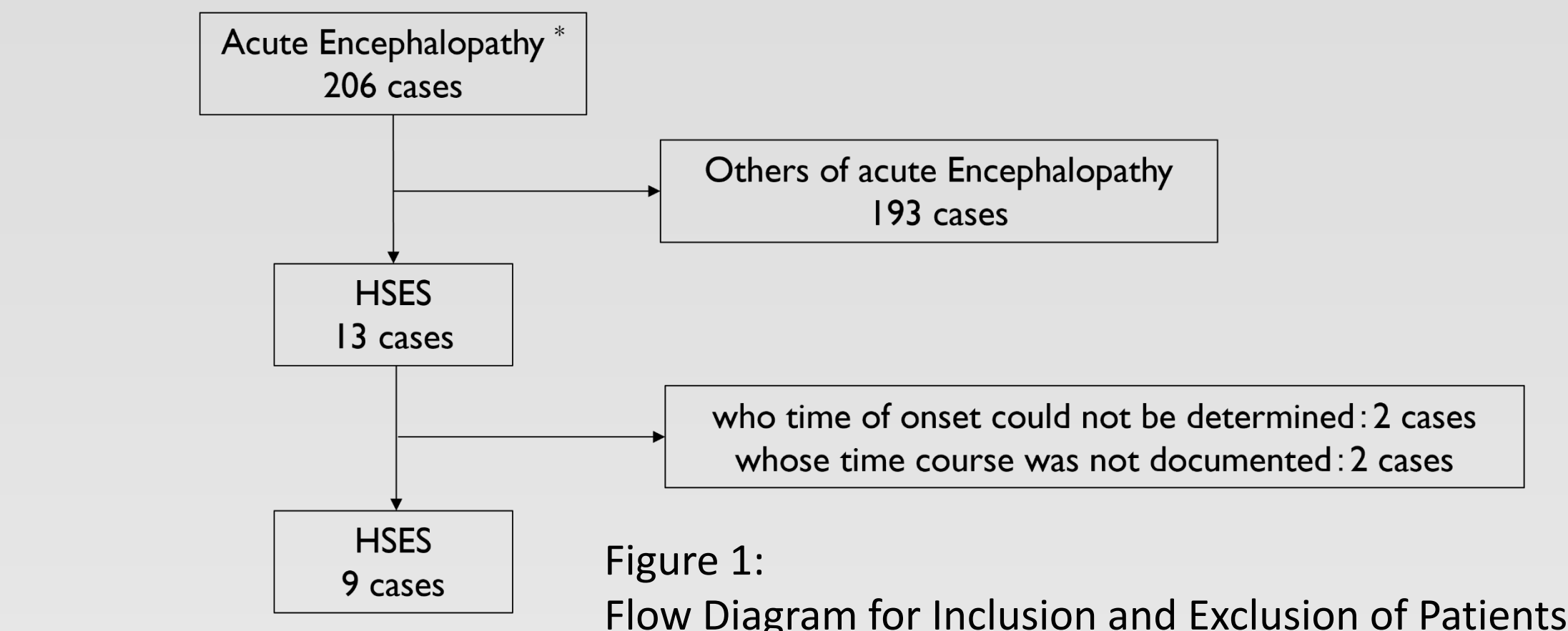


Figure 1: Flow Diagram for Inclusion and Exclusion of Patients.

	N	Before convulsion	After convulsion
Hypotensive shock	9 (100%)	0 (0%)	9 (100%)
Coma	9 (100%)	3 (33%)	6 (67%)
Hemorrhage	2 (22%)	1 (11%)	1 (11%)
Diarrhea	4 (44%)	1 (11%)	3 (33%)
Oliguria	1 (11%)	0 (0%)	1 (11%)

• Few cases present with characteristic symptoms before convulsions.

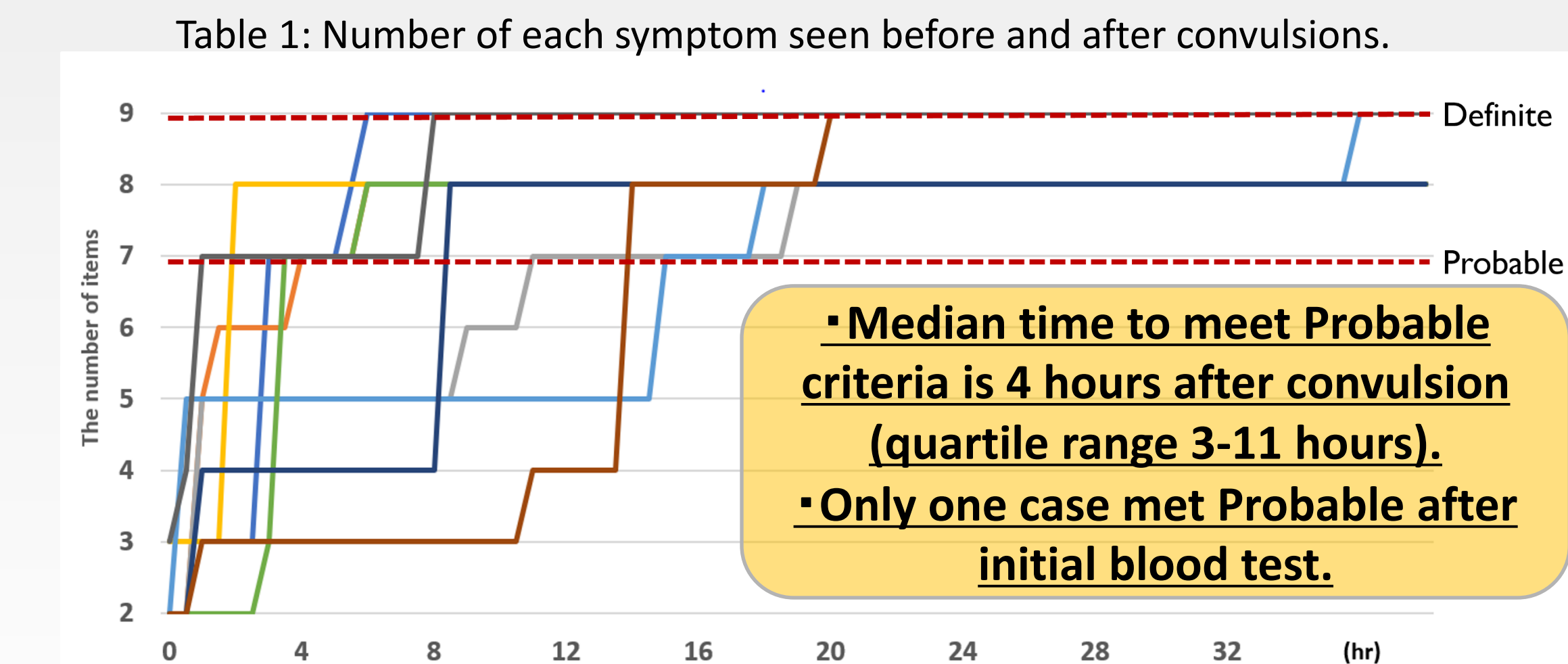


Figure 2: Relationship between the number of items and time course in the Bacon's criteria.

RESULTS

	0	6	12	18	24 hr	N	Time from seizure median(25%tile-75%tile)
Time of visit to other hospitals/clinics	↓					7	47.5 (45-50) min
Time of visit to our hospitals	↓	↓	↓	↓	↓	9	720 (380-1005) min
Methylprednisolone pulse was initiated	↓	↓	↓	↓	↓	9	690 (300-1110) min
Plasma Exchange was initiated		↓		↓		3	540 (522.5-870) min
Hypotensive shock confirmed	↓	↓	↓	↓	↓	9	405 (156-720) min
Brain edema confirmed by CT	↓	↓	↓	↓	↓	9	420 (210-945) min
Pupil dilatation fixation confirmed		↓	↓	↓	↓	9	810 (600-1200) min
EEG was flattened		↓	↓	↓	↓	6	600 (450-1785) min

Figure 3: Time since seizure for each treatment and examination.

• Possibility of irreversible changes occurring early in the disease onset and before treatment begins.

	0	6	12	18	24 hr	1	2	3	days	Detected on initial inspection	Detected at some point	Time to identify abnormal values(min)
LDH	↓	↓	↓	↓	↓					9/9	9/9	60
HCO3-	↓	↓	↓	↓	↓					9/9	9/9	60
AST	↓	↓	↓	↓	↓					7/9	9/9	105
Cre	↓	↓	↓	↓	↓					6/9	9/9	180
PT-INR	↓	↓	↓	↓	↓					9/9	9/9	360
FDP	↓	↓	↓	↓	↓					3/3	3/3	360
APTT	↓	↓	↓	↓	↓					7/9	9/9	480
D-Dimer	↓	↓	↓	↓	↓					8/9	9/9	480
Plt	↓	↓	↓	↓	↓					3/9	9/9	480
Fib	↓	↓	↓	↓	↓					5/7	7/7	510
ALT	↓	↓	↓	↓	↓					4/9	9/9	540
BUN	↓	↓	↓	↓	↓					2/9	8/9	630
Hb	↓	↓	↓	↓	↓					1/9	4/9	750

Figure 4: The time at which each test item first became abnormal (Convulsions at 0 hr)

• These items that may be useful for early diagnosis.

CONCLUSION

• The existing Bacon criteria proved insufficient for the early diagnosis of HSES.
• Notably, abnormal blood coagulation, particularly a prolonged prothrombin time, manifested early in the course of the syndrome, suggesting its potential as an early diagnostic marker.

CONTACT

Tsuyoshi AIHARA
Department of Neurology,
National Center for Child Health
and Development, Tokyo, JAPAN
aihara-t@ncchd.go.jp

1. Febrile
2. Seizure or loss of consciousness
3. hypotensive shock
4. Abnormal test results for more than 2 out of 3 (AST, Cre, and PT-INR)

* If all are met, transport to a higher medical institution immediately.

Table 2: Criteria we propose that may allow early detection of HSES