Original Research Article

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20204946

Evaluation of Babinski reflex in term neonates with hypoxic ischemic encephalopathy: a cross sectional observational study

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Received: 07 October 2020 Accepted: 28 October 2020

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ABSTRACT

Background: Assessment of primitive reflexes is one of the earliest, easiest and most frequently used method among health care workers for newborns and young infants. Babinski reflex is one of the infantile reflexes. Our aim was to study Babinski reflex in a term neonates with hypoxic ischemic encephalopathy (HIE).

Methods: This study is a cross-sectional observational study. 100 consecutive neonates fulfilling criteria of HIE according to Sarnat and Sarnat classification, admitted in our neonatal intensive care unit (NICU) were included. It was elicited from 12 hours after birth to 72 hours of birth. Babinski response was assessed using thumb nail drag method.

Results: 78% babies are term babies. 22% babies are post term babies. Male to female ratio is 1.5:1. 38% neonates belong to HIE stage I, 39% and 33% neonates belong to HIE stage II and III respectively. In HIE stage I, planter grasp was elicitable in 89%. It remain non-elicitable in 44% and 91% in HIE stages II and III respectively.

Conclusions: Absence of Babinski reflex can be correlated with the increase in severity of HIE. It is important to include the assessment of Babinski reflex along with other primitive reflexes in the newborn generally and especially

Keywords: Babinskis reflex, HIE, Sarnat and Sarnat

INTRODUCTION

The advances in medical sciences and improved neonatal care have significantly increased the survival of high-risk neonates. Pediatricians are encountering smaller and sicker newborns with extremely low birth weight and serious health conditions in the neonatal intensive care unit (NICU). High-risk newborns experience higher mortality and greater risks of various health and developmental problems. Early health assessment is critical. Assessment of primitive reflexes is one of the earliest, easiest and most frequently used methods for newborns and young infants.

Plantar grasp reflex is very primitive in the sense that they can be elicited in all normal preterm infants at as early as 25 weeks of gestational age. 1 During routine ultrasound examination, fetal palmar grasp along with plantar grasp has been repeatedly observed, which first appears at 16 weeks gestation.²⁻⁴ This reflex is easy to elicit but have been proved to be of distinctive clinical significance for the early detection of infants with neurodevelopmental abnormalities.5-8

Babinski sign, also known as the great toe sign, is the most sensitive and important indicator of an upper motor neuron lesion and was first described by Joseph Babinski in 1896. The sign consists of extension of the large toe and fanning of the other toes during and immediately after the lateral plantar surface of the foot is stroked.

The legendary neurologist, Joseph Jules Francois Felix Babinski deserves re-introduction to a younger generation immersed in neuro imaging that they often fail to properly elicit or document the plantar response. In this study, Babinski reflex is studied in term neonates with hypoxic ischemic encephalopathy (HIE).

METHODS

Place of study

The study was conducted in the department of paediatrics, Sapthagiri institute of medical sciences and research centre, Bangalore.

Type of study

The study was an observational cross sectional study on babies delivered in our hospital and requiring active resuscitation.

Duration of study

The study was conducted from January 2018 to March 2020.

Sample collection

100 consecutive asphyxiated neonates who were admitted in our neonatal unit and fulfilled the inclusion criteria were studied. Clinical information were collected retrospectively from maternal records such as maternal age, antenatal checkup, place of delivery, gravida, person who conducted delivery, type of delivery, presence of meconium, induced or spontaneous labour, pregnancy complications, type of resuscitation and mode of delivery were documented. NICU records and referral notes were considered. Both inborn and outborn babies were included.

Methodology

One hundred consecutive neonates with birth asphyxia during that period (Apgar 0-3 at 5-minute of age) were studied. Detailed antenatal and natal history of the mother was obtained. Detailed history and examination of babies was performed at the time of admission.

Detailed neurological examination of asphyxiated newborns including staging of HIE was done. HIE was assessed according to Sarnat and Sarnat staging i.e. mild (HIE stage I), moderate (HIE stage II), and severe (HIE stage III). Resuscitation if needed, then it was carried out as per the neonatal resuscitation program by American heart association (AHA) and further management was given as per the national neonatology forum protocol.

Babinski reflex was examined by keeping the child in supine position and pressing a thumb against the sole just behind the toes in the foot which results in flexion of toes. It was elicited from 12 hours after birth to 72 hours of birth to overcome the effect of stress due to delivery and proper manifestation of clinical signs of HIE.

Babinski response was assessed using thumb nail drag method. For uniformity we checked planter grasp over right foot but among non-elicitable group we checked it on both sides.

Inclusion criteria

Apgar score <3 at 5 minutes of life and term babies with gestational age >37 weeks were included.

Exclusion criteria

Neonates were excluded if they are suffering from major congenital anomalies or syndromes, e.g. anencephaly, cleftpalate with cleftlip, encephalocele, omphalocele, gastroschisis, spina bifida; incomplete documentation (no maternal or fatal measurement parameters); mothers who took general anaesthesia; neonates less than 37 weeks.

Ethical considerations

Ethical clearance was obtained from the institutional ethics committee.

Statistical methods

The results obtained were tabulated and analyzed using appropriate statistical method.

RESULTS

Maternal characteristics

87% of the babies are born to 18-35 years and 13% born to elderly gravid as in Table 1.

Table 1: Distribution according to maternal age.

Maternal age	%
18-35	87
>35	13

54% born to primigravida, 44% born to multigravida and 2% born to grand multigravida (Table 2).

Table 2: Distribution according to parity.

Parity	%
Primigravida	54
Multigravida	44
Grand multigravida	2

Table 3: Mode of delivery.

Mode	%
Normal vaginal delivery	55
Lower segment C section	45

55% are delivered through normal vaginal delivery and 45% to LSCS (Table 3).

Neonatal characteristics

Majority were low birth LBW (52%) and 15% were macrosomic babies and rest 33% were in normal range (Table 4).

Table 4: Distribution of neonates according to birth weight.

Birth weight (kg)	%
1.5-2.49	52
2.5-4	33
>4	15

78% babies are term babies. 22% babies are post term babies (Table 5).

Table 5: Neonates distribution according to gestational age.

Gestational age	%
38-42	78
>42	22

Table 6: Distribution of neonates according to their sex.

Sex	%
Male	61
Female	39

Male to female ratio is 1.5:1 (Table 6).

84% are presented with vertex, 14% with breech and 2% with face (Table 7).

Table 7: Presentation of newborns.

Presentation	0/0
Vertex	84
Breech	14
Face	2

According to ACOG, HIE staging was done .38 neonates belong to HIE 1, 39 neonates belong to HIE 2 and 33 neonates belong to HIE 3 (Table 8).

Table 8: Sarnat stage of HIE distribution of neonates.

HIE status	%
HIE 1	38
HIE 2	39
HIE 3	33

76% neonates were AGA, 14% SGA and 10% belonged to LGA (Table 9).

Table 9: Distribution of neonates according to gestational age.

Fetal growth	%	
Appropriate for gestational age	76	
Small for gestational age	14	
Large for gestational age	10	

Table 10: Asphyxiated newborns on the basis of presence or absence of planter grasp.

	HIE-I (n=38)		HIE-II (n=	HIE-II (n=39)		HIE-III (n=33)	
Reflex	Elicited (%)	Not elicited	Elicited	Not elicited	Elicited	Not elicited	
	Effected (70)	(%)	(%)	(%)	(%)	(%)	
Planter grasp response	34 (89)	4 (11)	22 (56)	17 (44)	3 (9)	30 (91)	

Out of 38 neonates in HIE stage I, Babinski reflex was elicitable in 34 (89%) and in remaining 4 (11%) it could not be elicited. For uniformity we checked planter grasp over right foot but among non elicitable group we checked it on both side and in all cases it remained same i.e. non elicitable. Similarly it remain non elicitable in 44% and 91% in HIE stages II and III respectively. Absence of planter grasp can be correlated with the increase in severity of HIE (Table 10).

DISCUSSION

Improved antenatal care and institutional deliveries have resulted in decreased mortality and increased morbidity. Failure to initiate and sustain breathing immediately after delivery has been associated with hypoxic ischemic injury to the central nervous system and the clinical manifestations have been termed as HIE.

The incidence of HIE in developed countries is estimated to be 1.5 per 1,000 live births.⁹

Estimates in developing countries range from 2.3-26.5 per 1,000 live births. ^{10,11} The localization and extent of perinatal hypoxic-ischemic cerebral injury is determined principally by the maturity of the brain at the time of insult and the severity and duration of the insult. ¹² The status of neonatal reflexes is related to the neurological status of the newborns. Assessing primitive reflexes is easy to evaluate and feasible to perform in any circumstances without high technology equipment.

In the present study we tried to evaluate the status of Babinski reflex in different stages of HIE. In our study out of 38 neonates in HIE stage I, planter grasp was elicitable in 34 (89%) and in remaining 4 (11%) it could not be elicited. Similarly it remain non elicitable in 56% and 91%

in HIE stages II and III respectively. Many researchers have noticed that abnormality of plantar grasp reflex is of high clinical significance.^{13,14} Patients with abnormal planter grasp have significant association with many neurological conditions presenting later in life including cerebral palsy.¹⁵⁻¹⁸

Absence of Babinski reflex can be correlated with the increase in severity of HIE. Absence of planter grasp may be an indicator of spasticity and such high risk infant should be followed for early diagnosis and intervention. Detailed neurological examination including examination of primitive reflexes can add in the diagnosis, prognosis and early intervention of high risk newborn where electroencephalography (EEG) and other neuro imaging facilities are not readily available.

Limitations

The sample size was small and we have not recorded EEG.

CONCLUSION

Absence of Babinski reflex can be correlated with the increase in severity of HIE. It is important to include the assessment of Babinski reflex along with other primitive reflexes in the newborn generally and especially in HIE.

ACKNOWLEDGEMENTS

Authors would like to thank their nursing staff and Dr. Sarala Sabhapathy.

Funding: No funding sources Conflict of interest: None declared

Ethical approval: The study was approved by the

Institutional Ethics Committee

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Cite this article as: Chikkanna S, Nagaraj MV, Bhavana KR, Shwetha N. Evaluation of Babinski reflex in term neonates with hypoxic ischemic encephalopathy: a cross sectional observational study. Int J Contemp Pediatr 2020;7:2285-8.