

in circumstances likely to produce bacteremia. Antithrombotic and antiplatelet therapy such as aspirin and dipyridamole should be considered in patients with cerebral embolic events. How long anticoagulants should be continued is unknown(5).

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Neurological Assessment at Three Months as a Predictor for Developmental Outcome in High Risk Infants

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With modern methods of neonatal care, babies have begun to survive after insults, which were previously thought to be fatal. As a result of this, there is an increase in the number of survivors and also in the type of brain lesions from which they suffer(1). Hence, it is becoming increasingly important to keep a close watch on the neurodevelopment of these graduates of the neonatal intensive care unit (NICU).

Ideally, all high risk babies need close surveillance throughout infancy. However, in developing country like ours, with limited resources, a poor transport system and rising cost of fuel, this is not possible. It is essential to identify a group of babies, early on in infancy, who do not need close surveillance as far as neurodevelopment is concerned. A study was undertaken to determine if a 3 month neurological assessment could be used to predict the neurodevelopmental outcome at one year. This

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study is a retrospective analysis of prospectively collected data.

Material and Methods

Babies discharged from the NICU of KEM Hospital, Pune, were identified for follow-up, using the usual high risk criteria. Those with congenital anomalies were excluded. High risk babies were given a special high risk card and asked to come to the High Risk Clinic for regular follow-up. At each visit, routine anthropometric measurements were done, advice regarding diet and immunization was given and intercurrent illnesses were treated. Neurological assessment was done at 3, 6, 9, 12 months ± 4 days by the neonatologist, using the method described by Amiel-Tison(2). In addition, a history of acquisition of motor milestones was asked and confirmed during examination. The occupational therapist acted as a second observer. Babies who were acutely ill, were not assessed.

The babies were classified as having developmental delay if: (i) there was not even partial head support at 3 months, (ii) there was no momentary sitting when pulled to sit at 6 months, (iii) no creeping at 9 months, and (iv) no cruising at 12 months. A baby was classified as abnormal when there was developmental delay with or without tone abnormalities. Minor tone abnormalities like slight increase or decrease of tone in one limb, slight asymmetry in angles was considered normal unless it was associated with developmental delay. Corrected age was used for assessing preterms.

The data was fed to a computer and analysis was done using packages like d Base III plus and SPSS.

Results

One hundred and eleven babies had a

neurological assessment at 3, 6, 9 and 12 months. Seventy three babies were male (66%) and 38 babies (34%) were female. The birth weight ranged between 1100 g to 3460 g with a mean of 1962 ± 572 . The gestation ranged between 30-40 weeks with a mean of 36.3 ± 2.8 . Seventy one babies had a birth weight less than 2 kg, while 68 (61%) babies had a gestation less than 37 weeks. Out of the 71 low birth weight babies, 61% were small for gestational age (SGA). Out of the 68 preterm babies, 33 (49%) were SGA. Out of the 43 full term babies 44% were SGA. All the risk factors at birth are shown in *Table I*.

TABLE I—Frequency Distribution of 111 Babies According to Risk Factors at Birth

Risk factor	n	(%)
Preterm	68	(61)
AGA	35	(51)
SGA	33	(49)
Low birth weight (<2 kg)	71	(64)
AGA	28	(39)
SGA	43	(61)
Birth asphyxia	19	(17)
Hyperbilirubinemia	25	(23)
Sepsis/meningitis	32	(28)

Of the 111 babies who were assessed at 3 months, 66 babies were normal (*Table II*). All except 2 babies from this group remained absolutely normal at 12 months. These two babies were called abnormal because they had delayed development with minor tone abnormalities. In contrast, out of the 45 babies who were abnormal at 3 months, 12 (37.5%) remained abnormal at 12 months. The difference in these two

TABLE II—*Neurological Assessment at 3 months and Outcome at 12 Months (n = 111)*

3 month examination	12 month	Outcome
	Major neuromotor abnormality	Normal
Abnormal (n = 45)	12	33
Normal (n = 66)	2	64

$$\chi^2 = 11.50; p = 0.0006.$$

groups was highly significant, using χ^2 test ($p = 0.0006$).

Out of the 12 babies who were abnormal at one year, 3 had spastic quadriplegia, 3 others had gross mental retardation (MDI < 70 on Bayley scales), while the remaining six babies had mild mental retardation (MDI 70-85) with delay in milestones and minor tone abnormalities.

The sensitivity of this method of assessment for predicting outcome was 85.7%, with specificity of 65.9%. The predictive value for a positive test (abnormal) was 26.6% whereas the predictive value for a negative test (normal) was excellent, 96.9%.

Discussion

We have used the Amiel-Tison method of neurological assessment because in our experience(3) it is a good screening test for detecting abnormality in early infancy. Several authors, have used certain neonatal signs(4,5) as predictors of cerebral palsy. Allen(6) has used a neuromotor examination done at the time of discharge from NICU, as a predictor for cerebral palsy at 12 months. All babies who have had a stormy neonatal course, need a period of

convalescence, as stated by Amiel-Tison(7). According to Grenier(8), this period of convalescence does not have definite limits and neurological evaluation must be done only after complete stabilization has occurred. Hence, we chose 3 months as a good time to do the first complete neurological evaluation.

One year is the minimum time required to make a definite diagnosis of cerebral palsy(6), because most of the major gross motor milestones are acquired by this time and most of the transient tone abnormalities have disappeared. A list of gross motor milestones was added to the neuromotor examination described by Amiel-Tison (which is mainly based on tone) to make it more comprehensive.

There appeared to be a strong association between the 3 month assessment and outcome at one year ($p = 0.0006$). The sensitivity (85.7%) and specificity (65.9%) of this test was good. Since the incidence of cerebral palsy is low, a large sample is required to make a valid prediction(9), and many babies who appear abnormal at 3 months, may have transient tone abnormalities(10). Hence, no attempt has been made to make a prediction of cerebral palsy based on the 3 month assessment.

The main aim of this study was to identify a group of babies, as early in infancy as possible, who are going to be normal in all probability and do not need close supervision and early intervention. The prediction for normal development using the 3 months assessment was excellent (predictive value for negative test 96.9%). Hence, close surveillance in these babies can be relaxed with confidence, saving our limited resources.

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Embolic Stroke in Myocarditis

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Almost all embolic strokes that occur in pediatric population beyond the perinatal period are the result of either congenital or acquired heart disease. Among acquired heart diseases, rheumatic heart disease is known to cause embolization to the central nervous system. However, acute myocarditis of non-rheumatic etiology with embolic stroke is a previously unrecognized association. Hence, we report a case of acute myocarditis of non-rheumatic etiology with embolization to the central nervous system.

Case Report

A 5-year-old boy presented with complaints of right sided weakness of thirty six hours and inability to speak for twenty four hours duration. The past history was non-contributory except for a mild febrile illness seven days earlier. The child was appropriately immunized for age. The developmental history was normal.

On examination, the child was afebrile

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