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RESEARCH ARTICLE

Clinical analysis of 52 cases of neuromuscular examination for early screening of cerebral palsy in high risk premature infants

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Abstract: **Objective** To investigate the effect of 52 neurological tests on early screening of cerebral palsy in high-risk premature infants. **Methods** 52 Neurological examination were conducted in 363 cases with high-risk preterm aged 28 to 32 weeks at 1 month, 3 months, 6 months respectively after they were birthed from 2009 to 2012. If the children were checked with abnormal items (2 results of checked items were abnormal), they will be closely observed and urge their parents to recheck 1 month later. If the check results were still abnormal, the children would start to be early intervention treated immediately in our department; if the children were checked to have more than 3 items abnormal, they will start to be early intervention treated immediately. Meanwhile, 302 cases of heath premature children without early screening were set up as control group. All children were followed up for 36 months. With the Gesell scale to evaluate the child's intelligence and sports development. **Results** 81 Cases of suspected cerebral palsy were found by this method, including 52 cases of early intervention group and 10 cases of untreated group. Another 10 cases were developed for a transient exercise. The positive rate of screening was 92.85%, and the incidence of cerebral palsy was 3.0%. After early intervention, early intervention in the preterm children group were diagnosed cerebral palsy in 5 cases 36 months later, 17 cases of non-intervention group. **Conclusion** 52 Neurobehavioral examinations are a effective method for early detection of cerebral palsy in premature children, and it is helpful for early detection of cerebral palsy in premature children, early intervention, as well as to significantly reduce the incidence of cerebral palsy in premature children.

Keywords: 52 neurological examination; premature children; cerebral palsy; screening; high risk

Cerebral palsy is primarily a disorder of movement and posture. It is defined as an "umbrella term covering a group of non-progressive, but often changing, motor impairment syndromes secondary to lesions or anomalies of the brain arising in the early stages of its development".[1] With the progress of pediatric intensive care, the success rate of premature delivery of children was greatly improved in recent years. Preterm birth is an independent risk factor for cerebral palsy in children. Timely detection of prenatal morbidity and early intervention, is the key to the morbidity of cerebral palsy to reduce premature children. 52 Items of nerve motion examination was used to early screen cerebral palsy from preterm children aged 28 to 32 weeks from 2009 to 2012, and achieved the anticipated target. The results and follow-up report are as follows.

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1 Materials and methods

1.1 Research object

363 Cases of premature children aged 28 to 32 weeks who were treated in our department from November in 2009 to October in 2012 were as screening group, and those with birth weight of 1.0 to 2.1 kg, suffering from genetic metabolic diseases, epilepsy and chromosomal diseases such as premature children were not included in this study. 302 Cases of health premature children with a routine physical examination in our hospital children's physical examination center were as the control group. There was no significant difference between the two groups of children in gender, gestational age, birth weight and so on ($P < 0.05$). See Table 1.

1.2 Methods

2 Groups of preterm children in the corrected age of 3 months, 6 months were tested with 52 neurological examinations. If the children were checked with abnormal items (2 results of checked items were abnormal), they will be closely observed and urge their parents to recheck 1 month later. If the check results were still ab-

Table 1. Comparison of the basic situation of the two groups of children

Groups	n	Gender		Average gestational age (weeks)	Body weight (kg)	NBNA scale (28 d)
		male	female			
Screening group	363	192	171	31.84±2.04	1.71±1.04	29.71±5.28
Control group	302	164	138	31.71±3.12	1.65±1.23	28.67±4.16
Statistic		x^2=0.2314		u=0.2985	u=0.0147	u=0.4752
P value		>0.05		>0.05	>0.05	>0.05

normal, the children would start to be early intervention treated immediately in our department; if the children were checked to have more than 3 items abnormal , he will start to be early intervention treated immediately. The control group was given routine parenting guidance, and the patients were followed up at 12, 18, 24, 30, and 36 months. Using the Gesell scale the child's intelligence and movement.

1.3 Quantification

"52 Neurological examination method" items was divided into five dimensions:(1) Head growth: head circumference as the main judgment indicators; (2) Social interaction: including the object of the awakening of the state, feeding, crying, ear and eye tracking test; (3) Passive muscle tension examination: including adductor muscle angle, nest angle, Bragard's test , opisthotonus; (4) Sports activities: whether there is hemifacial spasm, limb function or continued hand fist; (5) Reflection: knee reflection, Babinsky sign, sucking action, embracing reflection, grasping reflection, automatic step reaction, asymmetric tension of the neck reflex. Each item's scoring method is: 0 Point means typical results in the normal range. Recorded as 0 points of the item, indicating the central nervous system of the subject with normal performance; 1 Point means moderate abnormality: item marked as 1 point, indicating that the subjects' central nervous system with moderate abnormalities in this aspect of the performance of light, such as adduction muscle angle $\leq 30^{\circ}$; 2 Points means severe anomalies: 2 points for the item, indicate that the central nervous system in this area is characterized by severe abnormalities such as gaze and tracking reaction. If each dimension of the item is only scored 1 point, then the dimension is rated as 1 point; as long as any dimension is recorded 2 points, this dimension is rated as 2 points.

The final assessment of this study is the extent of the central nervous system development abnormal and the barrier. The criteria of severe defect for central nervous system development is that at least 4 dimensions scored 2 points in 5 groups, and the moderate defects is that the 5 dimensions mostly scored 1 points or only few scored 2 points (no more than 2 items).

The staff to evaluate is a long-term medical practitioner with experience of child care, and all of them must be gave professionally training before assessment. Special staff was responsible for the work to follow-up . The professional medical staff who have obtained intelligence assessment is responsible for the Gesell scale assessment.

1.4 Statistical analysis

All data was proceeded by SPSS 13.0 statistical software.Measurement data was showed with the mean $\pm$ standard deviation, and enumeration data were compared between groups using x^2 test. P $<$0.05 for the difference indicate statistical significance.

2 Results

2.1 Test results

84 Cases of children were tested being abnormal from 2 groups of children with 52 neurological examination including 48 cases from screening group, 35 cases with moderate abnormalities and 13 cases with severe abnormalities. 30 Cases from the control group include 19 cases with moderate abnormalities and 11 cases with severe abnormalities. Another 6 cases were transient developmental retardation of motion. The positive rate of screening was 92.85%. The Mental Development Index (MDI) and Exercise Development Index were significantly higher than the control group through early intervention therapy screening. 3 Cases were diagnosed cerebral palsy in screening group 36 months later, the incidence of cerebral palsy was 8.2‰; 17 cases diagnosed cerebral palsy in the control group , the incidence of cerebral palsy was 5.6%. The criterion of diagnosis of cerebral palsy was from the National Cerebral Palsy Conference in 2010.

Table 2. Comparison of MDI of the two groups of children ($\bar{x}\pm$s, score)

Groups	n	12 months	18 months	24 months	30 months	36 months
Screening group	363	92.71±8.36	94.84±7.62	95.93±9.48	96.92±7.13	97.18±9.25
Control group	302	73.39±14.54	74.15±15.82	75.24±16.97	76.71±13.45	77.36±14.67
t value		5.2364	5.8369	6.8693	8.6141	9.0443
P value		＜0.05	＜0.05	＜0.05	＜0.05	＜0.05

Table 3. Comparison of PDI of the two groups of children ($\bar{x}\pm$s, score)

Groups	n	12 months	18 months	24 months	30 months	36 months
Screening group	363	70.68±13.58	79.22±13.32	84.61±14.26	88.24±9.33	90.57±9.81
Control group	302	66.24±10.36	66.71±11.58	67.86±11.67	68.43±11.56	69.26±12.82
t value		1.6374	4.6496	6.3797	7.3968	7.4239
P value		>0.05	＜0.05	＜0.05	＜0.05	＜0.05

Table 4. Compare the prognosis between the two group after 36 months)

Groups	n	Cerebral palsy	Hearing impairment	Language barriers	Cognitive disorders
Screening group	363	3	5	8	4
Control group	302	17	22	34	28
x^2 value		6.9541	5.3687	4.9633	20.3561
P value		<0.05	＜0.05	＜0.05	＜0.05

2.2 Comparison of Gesell scale

See Table 2,3.

2.3 Comparison of the prognosis

Compare the prognosis between the two group after 36 months, the screening group are significant better than control group (P<0.005). See Table 4.

3 Discussion

3.1 The necessity for neurological examination

The incidence of premature children and very low weight birth weight infants was significantly high as the development of intensive care and the success rate of neonatal rescue in recent years. Premature children prone to brain damage. In the leading risk factors for cerebral palsy, premature birth is recognized as an independent risk,[2] and the smaller the gestational age, the greater the probability of occurrence. About 10% of these children develop to be cerebral palsy, 25% to 50% of the development of mild neurodevelopmental disorders.[3] If the abnormalities of nervous system was not early diagnosed, it will lead to cerebral palsy or irreversible consequence. Therefore, it is imperative for pediatric doctors to choose a kind of early neurological examination for cerebral palsy screening of preterm infants, and conduct early intervention to reduce disability.

Early diagnosis indicate to make a diagnosis within 6 months, and make a diagnosis within 3 months known as ultra-early diagnosis.[4] The development of early symptoms of infantile cerebral palsy is dynamic, and the clinical manifestations are complex but generally with sports development backward or active movement reduction, abnormal reflex, postural abnormalities or muscle tension abnormalities. So how to accurately detect these four aspects of the abnormalities is the key for early diagnosis of cerebral palsy. Screening should be detailed about the birth and gestational age, and track the development of movement and mental, especially to those younger gestational age and lighter weight of the children. To early effective intervene those dysplasia children uesing ”52 Neurological examination method” items, and then to avoid the occurrence of disability. In this study, 48 cases were found abnormalities in the screening group, moderate abnormalities in 35 cases, severe abnormalities in 13 cases; moderate abnormalities in 19 cases and severe abnormalities in 11 cases from control group. After rehabilitation, 3 cases were diagnosed being cerebral palsy and 17 cases were diagnosed being cerebral palsy in control group 36 months later, which were helpful for early detection and early intervention. After rehabilitation, the exercise development index and intelligence development index of screening group of abnormal children were significantly higher

than the control group, and the sequelae was significantly reduced.

3.2 The feasibility of the neuronography examinations

Majority of parents, and even the part medical workers are not yet aware of the importance of early screening, and for preterm infants, there is no consensus on the method of screening. This study shows that 52 cases of nerve transport dynamic examination can be used to early find out the development of preterm infants with cerebral palsy tendencies, especially birthed in 3 months, 6 months. This method is simple and easy to conduct. Through the system observation, neural development process of preterm children was clear, so as to make objective and accurate judgments, and can be used as early intervention for premature birth. The positive rate of screening was 92.85% in screening group, 3 cases of cerebral palsy were diagnosed, the incidence of cerebral palsy was 8.2‰; 17 cases with diagnosis of cerebral palsy in control group, the incidence of cerebral palsy was 5.6%. Screening physicians should be careful to know more about the baby's gestational age, receive an appropriate training to understand the characteristics of infant neurodevelopment well, have a high sense of responsibility for checking, and have an ability to communicate with the baby, so that children cooperate smoothly. The age of month for assessment refer to the corrected one. Screening room should be quiet to avoid noisy which may disrupt the baby's attention. Screening should be done within about 15min, some abnormal children usually need 2 screening physician to confirm the results. The parents should get a detailed instructions after the the inspection. With the consent of the parents, early intervention should be conducted. If the early screening network can be established, which will play a greater role. But the examination also has limitations, which is not a complete neurological assessment, neither including the assessment of the brain, muscle disease and other factors, nor including the spirit motion detection, and therefore limited to play a role in testing the abnormalities of behaviour, social or mental movements.

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