European Review for Medical and Pharmacological Sciences 2016; 20: 3447-3451

AIMS baby movement scale application in high-risk infants early intervention analysis

Y. WANG[1], J.-P. SHI[2], Y.-H. LI[1], W.-H. YANG[3], Y.-J. TIAN[4], J. GAO[2], S.-J. LI[5]

[1]Department of Pediatric Rehabilitation, The First Affiliated Hospital of Xinxiang Medical University, Weihui, China
[2]Department of Neonatology, The First Affiliated Hospital of Xinxiang Medical University, Weihui, China
[3]Department of Nursing, The First Affiliated Hospital of Xinxiang Medical University, Weihui, China
[4]Department of Pediatric I, The First Affiliated Hospital of Xinxiang Medical University, Weihui, China
[5]Department of Pediatric Intensive Care Unit, The First Affiliated Hospital of Xinxiang Medical University, Weihui, China

Abstract. – OBJECTIVE: We investigated the application of Alberta Infant Motor Scale (AIMS) in screening motor development delay in the follow-up of high-risk infants who were discharged from NICU, to explain the state of infants' motor development and propose early individualized intervention.

PATIENTS AND METHODS: The study design was a randomized, single-blind trial by selecting patients between April 2015 and November 2015 in our hospital, children nerve recovery branch clinics and 77 cases of high-risk infants. We randomly divided the patients into observation group (39 cases) and control group (38 cases). To evaluate the application with AIMS, observation group was based on evaluation results for the first time to give rehabilitation training plan making, early intervention, control group according to the growth and development milestone in order to guide parents to take family training interval of 3 months.

RESULTS: While comparing the two groups of high-risk infants before the intervention, the months of age, gender, risk factors, it was found that the AIMS scores, each position AIMS scores did not show a significant difference in percentile ($p > 0.05$). There was also no significant difference between two groups in the seat and stand AIMS scores before and after intervention ($p > 0.05$). However, the comparison of two groups of high-risk infants after intervention in comparison showed that the observation group supine AIMS scores and AIMS scores were significantly higher than the control group ($p < 0.05$). Prone position AIMS scores observation group was also significantly higher than that of the control group ($p < 0.01$). The corresponding percentile for two groups after the intervention of AIMS scores was less than 10% of cases, which was significantly lower in the observation group ($p < 0.01$).

CONCLUSIONS: AIMS can predict the development delay in high-risk infants, for improving the early hypernymic diagnosis and intervention.

Key Words:
High-risk infants, Alberta, Early intervention, Movement scale.

Introduction

With the continuous progress and development of perinatology, neonate custody medicine and salvage technique, there is a significant decrease in the mortality of infants with low birth weight. Moreover, there is a continuous increase of survival rate of high-risk infants with premature birth, low birth weight, infection, pathological icterus and perinatal period anoxia and ischemia, and a significant increase of mutilation rate and developmental abnormality rate of infants[1-3]. First year after birth is a critical stage of integration and function development of central nerve system, when brain has high plasticity, and many researchers indicate that brain has plasticity in early development especially in infant stage[4], in which period the improvement of movement skill and intelligence of high-risk infants by early intervention treatment is possible[5,6]. Therefore, it appears especially important to supervise movement development of high-risk infants and find a developmental abnormality in time and enact related rehabilitation training plan according to abnormal conditions. Alberta infant motor scale (AIMS) is the scale to assess movement development level of high-risk infants, which has high reliability and validity[7]. So far, the application of AIMS is already well known in western countries, while

Corresponding Author: Yun Wang, MD; e-mail: yqtqdygoqrrw2@163.com

still at starting period in China[7]. This work uses AIMS to assess the movement of each posture of high-risk infants, and enact rehabilitation training plan according to the assessed results, with an aim to investigate application value of AIMS to supervise the movement development and guide the training of high-risk infants.

Patients and Methods

Patients

From the period of April 2015 to November 2015, we selected 77 cases high-risk infants of 3-11 months. The incorporating standard was children having risk factors like premature birth, low birth weight, infection of newborn, pathological icterus or perinatal period anoxia and ischemia, and have lower movement development level by neurology examination and clinical observation compared to normal excluding standard. It has been already clearly diagnosed as heritage metabolism disease, and has an abnormal movement combined with severe inherent heart disease, epilepsy, bronchopulmonary dysplasia, etc. In these patients, the youngest was 3.3 months and the oldest was 10.7 months, with 51 males and 26 females. As for high-risk factors, there were 6 cases of perinatal period anoxia and ischemia, 7 cases of perinatal period infection, 20 cases of premature birth and low birth weight, 4 cases of pathological icterus, and 20 cases having multiple high-risk factors. We randomly divided them into observation group (39 cases) and control group (38 cases). SPSS software (SPSS Inc., Chicago, IL, USA) was used for corresponding analysis, which showed that the differences of common data between the two groups of high-risk infants was not statistically significant, e.g. age, gender proportion and high-risk factors ($t > 005$, $p > 0.05$) as shown in Table I.

Methods

Assessment Methods

AIMS movement development assessment was done by receiving training on AIMS development assessment and reading of relevant material[7,8]. The assessment environment was warm, independent, good in lighting, quiet. The assessment was avoided when infants were hungry, crying, sleepy or another unstable state, during which the parents were allowed to interact with the infant by its side and encourage it to bring out the best level. The whole assessment process was of 15-30 minutes. The assessment process was carried out under supine, prone, sit and stand postures respectively, getting scores under each posture and calculate full AIMS score. The corresponding percentiles were checked out according to full AIMS score and month age. By searching papers, 10% was used as the percentile corresponding with AIMS score for judging standard of movement development abnormality has good assessment effect[9]. After 3 months, the AIMS assessment was followed up again to the high-risk infants in the control group and observational group, in blind fashion i.e. without disclosing earlier assessment details. There was no loss of follow-up cases during the whole process.

Intervention Methods

In the control group, the parents were guided to carry out family training according to the order of development limestone. In observation group, enact rehabilitation training plan was performed according to the first assessment results, in which the infants received 1-2 times of in-family training for around 30-40 min per time with therapist guidance and training for around 40 min.

Statistical Analysis

SPSS 19.0 statistical software (SPSS Inc., Chicago, IL, USA) was used to analyze the data. The *t*-test for two independent samples was used

Table I. Common data of high-risk infants in control group and observational group.

Group	Cases	Gender (cases)		Grouping month age ($\bar{x} \pm s$ months)	High-risk factor (cases)				
		Male	Female		Asphyxia	Premature birth	Infection	Icterus	Multiple factors
Control	38	25	13	5.69 ± 1.62	5	13	4	3	13
Observation	39	26	13	5.7 ± 1.71	4	13	6	4	12

Comparison between groups: *$p < 0.05$.

Table II. Comparison of AIMS percentiles level of control group and observation group before and after intervention [N(%)].

AIMS	Percentile 10% level	Percentile > 10% level
Before intervention		
Control	25 (66.87%)	13 (33.13%)
Observation	34 (87.12%)[1]	5 (12.88%)[1]
After intervention		
Control	34 (89.31%)	4 (10.69%)
Observation	15 (38.14%)[2]	24 (61.86%)[2]

Comparison between groups: [1]$p > 0.05$, Z = -1.617, $p = 0.103$ [2]$p < 0.01$, Z = -3.974, $p = 0.000$.

to analyze the AIMS full score of the two groups after intervention. Further, the *t*-test was used to analyze the prone, AIMS core of the two groups after intervention. Kruskal-Wallis H-test was used to analyze AIMS score of each posture or full AIMS score before intervention and AIMS score of supine, prone, sit and stand posture after intervention. $p < 0.05$ was considered statistically significant.

Results

The difference of AIMS percentiles level between the two groups before intervention does not have statistical significance ($p > 0.05$). The comparison of AIMS percentiles level of the two groups after intervention showed statistically significant values ($p < 0.01$). This result showed that there was a significant reduction of occurrence of movement development abnormality of observation group after intervention (Table II).

We found that in comparison to prone, AIMS score of the two groups after intervention, the difference was statistically significant ($p < 0.01$). It suggested that use of AIMS assessment in accordance to the corresponding intervention before and after treatment, prone AIMS score of observation group has an improvement compared to the control group. Besides, comparison of supine AIMS score of the two groups after the intervention was not statistically significant ($p < 0.05$). There were no significant differences of sitting AIMS score and standing AIMS score between the two groups after the intervention ($p > 0.05$). Also the comparison of full AIMS score between the two groups after intervention was statistically different ($p < 0.05$) (Table III).

Discussion

AIMS is a tool to quantitatively assess bulky movement of infants according to the observation of assessment people, avoiding assessment error from the operation of assessment people. This scale can be applied to infants for the period between birth and learning to independently walk, which is 0-18 months[10]. By supervising the gradually enlarged high-risk infants group, this scale can benefit to the early discovery of bulky movement abnormality, and satisfy the given requirement of intervention as early as possible[11]. The detailed clinical meaning of AIMS application:

Table III. Comparison of AIMS score of control group and observation group before and after intervention ($\bar{x} \pm s$).

	Cases	Prone	Supine	Sit	Stand	Full score
Before intervention						
Control	38	6.05 ± 2.62	5.69 ± 1.62	4.67 ± 2.32	2.49 ± 0.62	19.03 ± 6.26
Observation	39	6.23 ± 2.72	5.04 ± 1.92	4.09 ± 2.57	2.12 ± 0.73	17.87 ± 6.98
After intervention						
Control	38	9.69 ± 3.62	7.61 ± 1.42	7.31 ± 2.46	3.51 ± 1.75	28.41 ± 8.71
Observation	39	12.29 ± 4.62[2]	8.39 ± 1.62[3]	8.79 ± 2.61[1]	4.31 ± 1.16[1]	33.47 ± 9.76[3]

Comparison between the two groups after intervention: [1]$p > 0.05$; [2]$p < 0.01$, [3]$p < 0.05$.

1. Screening – AIMS can identify infants with movement development abnormality or retardation, who need intervention treatment.
2. Assessment – The reliability and validity of AIMS' test showed that it can sensibly find the slight change of movement skill in 1 week, and it assess the change of movement skill brought by the development or the intervention treatment[12].
3. Treatment guidance – AIMS arranged each assessment items according to the order of acquirement of each movement skill, and it has a detailed description of the weight-bearing position, posture characteristic and antigravity movement. It has a guidance meaning to enact the treatment plan.

This study investigation out the advantage of the high reliability and validity of AIMS to assess the effect before and after the intervention by the standard measure of the infant's movement.

The probability of developing a developmental abnormality of intelligence and movement of high-risk infants was 8-10 times of that of normal infants, and they had 3‰ probability of developing cerebral palsy. One study has shown that more than 90% high-risk infants can completely recover by effective early intervention in time[13,14]. This study was based on AIMS, and it was found that after 3 months of early intervention training there was a significant reduction of incidence of movement abnormality for observation group in comparison to control group ($p < 0.05$). Early intervention can lower disability rate of high-risk infants, and enhance movement and intelligence development of high-risk infants[15]. AIMS was used to assess cerebral palsy children and design training plan according to assessment results can also improve the bulky movement function of them after the training. While concentrating on the speed of movement skill development, AIMS also paid more attention to observe the deficient or abnormal part of movement skill, which provided valuable information for the enacting of the intervention plan, especially the selection of main intervention points[16]. For therapists lacking experience, this feature is greatly instructive.

The items of each posture of AIMS were arranged in the order of limestone development of infant movement, but the development of each posture at different age was unbalanced. This study found that the prone AIMS score of high-risk infants was statistically significant from the two groups before and after intervention ($p < 0.01$). This may be related to the lack of chance to move under prone posture for high-risk infants, since parents usually are not customed to allow their infants be under this posture in daily rearing. While by guided training, the chance of movement under prone posture of high-risk infants significantly increases, and they learn corresponding skill under this posture. Therefore, they can obtain the most obvious effect among the four postures. Since high-risk infants are young and immature in standing movement development which only includes three items, the absence of statistically significant difference between control group and observation group before and after the intervention does not preclude the probability of later statistically significant difference with the prolong of the follow-up period. Research on this aspect is pending for further follow-up survey and assessment. This could also be verified from another aspect that it is possible to change the movement development level and movement pattern of infants by changing rearing methods according to the unbalance of movement development under each posture of high-risk infants. A study has found that[17] infants who often maintain prone posture when awake or asleep have more rapid movement development and get movement limestone earlier than the infants with supine posture. Prone posture belongs to active postures, which needs more active participation of infants, and often maintain prone posture is important to the development of antigravity expansion and the control of head of infants[18]. Therefore, different external environment like arrangement at different postures can be set to carry out interventional treatment for high-risk infants.

This work showed that early diagnoses was early appearing symptoms of high-risk infants in observation group according to AIMS results of the first assessment, and enact training goals and treatment plan in time. On the one hand, therapists train the infants according to this plan. On the other hand, therapists guide the parents to participate in the implementation to increase training time. After 3 months of intervention, high-risk infants are assessed by AIMS again, and the results show that full AIMS score and AIMS score of control group under supine and prone postures were all significantly lower than that of observation group ($p < 0.05$). Occurrence of movement development abnormality of obser-

vation group was significantly lower than that of control group, indicating fine effect, showing the value of AIMS in assessment-training guidance-reassessment of high-risk infants. Besides, by AIMS the observation scale, parents participate in the whole assessment process and personally feel the improvement of infant ability, which enhances their confidence of rehabilitation treatment and farthest decreases the occurrence of cerebral palsy and other grave disabilities. This helps the infants to normally develop and better adapt to the society.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

References

1) Lin W, Du W, Feng T. Application of AIMS in child health care. China Journal of Rehabilitation Medicine 2011; 10: 966-968.
2) O'Shea TM, Allred EN, Kuban KC, Hirtz D, Specter B, Durfee S, Paneth N, Leviton A; ELGAN Study Investigators. Intraventricular hemorrhage and developmental outcomes at 24 months of age in extremely preterm infants. J Child Neurol 2012; 27: 22-29.
3) Pitcher JB, Schneider LA, Drysdale JL, Ridding MC, Owens JA. Motor system development of the preterm and low birthweight infant. Clin Perinatol 2011; 38: 605-625.
4) Jian Z, Zhang G, Zeng Y. Correlaation research between AIMS and nerve psychology development checking scale of 0-6-year-old children. Chinese Journal of Child Health Care 2013; 12: 1327-1329.
5) Wang W, Wang C, Xi Y. Reliability research of AIMS among high-risk infants. China Journal of Rehabilitation Medicine 2012; 10: 913-916.
6) de Albuquerque PL, Lemos A, Guerra MQ, Eickmann SH. Accuracy of the Alberta Infant Motor Scale (AIMS) to detect developmental delay of gross motor skills in preterm infants: a systematic review. Dev Neurorehabil 2015; 18: 15-21.
7) Nuysink J, van Haastert IC, Eijsermans MJ, Koopman-Esseboom C, Helders PJ, de Vries LS, van der Net J. Prediction of gross motor development and independent walking in infants born very preterm using the Test of Infant Motor Performance and the Alberta Infant Motor Scale. Early Hum Dev 2013; 89: 693-697.
8) Syrengelas D, Kalampoki V, Kleisiouni P, Konstantinou D, Siahanidou T. Gross motor development in full-term Greek infants assessed by the Alberta Infant Motor Scale: Reference values and socioeconomic impact. Early Human Development 2014; 34: 907-909.
9) Gu Q. Application understand of AIMS to movement development of 0~18 months pre mature or high-risk infant. China Practical Medical 2015; 15: 274-275.
10) Zhang X, Yang L. Comparative study on early motor development of late preterm and term infants. Chinese Journal of Child Health Care 2015; 8: 865-866.
11) Serrano Gómez ME, Camargo Lemos DM. Reproducibilidad de la Escala Motriz del Infante de Alberta (Alberta Infant Motor Scale) aplicada por fisioterapeutas en formación. Fisioterapia 2013; 12: 353-355.
12) Liang L, Liang A, Yan S. Research of community screening method of infant motor developmental delay. Chinese Journal of Child Health Care 2015; 7: 753-755.
13) Luo F, Chen A, Ma X. Prognosis assessment of early movement development of premature infants from severe case supervision room. Chinese Journal of Contemporary Pediatrics 2013; 1: 5-8.
14) He L, Shao D, Du H. Role of Test of Infant Motor Performance in premature evaluation in corrected gestational aged 8-9 and 12-13 weeks. Chinese Journal of Child Health Care 2014; 3: 252-254.
15) Hu S, Huang R, Peng G. Application analysis of AIMS to early intervention of high-risk infants. China Journal of Rehabilitation Medicine 2015; 2: 157-170.
16) Jian Z, Zhang G, Zeng Y. Correlation research between AIMS and nerve psychology development checking scale of 0-6-year-old children. Chinese Journal of Child Health Care 2013; 12: 1327-1329.
17) Lin Y, Chen Y, Reyimula Y. Clinical effect research of early intervention of high-risk infants. Chinese Journal of Child Health Care 2013; 2: 179-181.
18) Ni Y, Chen J, Ding X. Statistical and screening methods analysis of high-risk factors of 403 cases of high-risk infants transfer treatment from base course in Nantong. Maternal and Child Health Care of China 2012; 34: 5501-5503.