

Assessment of Gestational Age in Healthy Neonates by Auxiliary Health Personnel Using a Simple Scoring System

YARDIMCI SAĞLIK PERSONELİ TARAFINDAN BASİT BİR SKORLAMA YÖNTEMİ \ KULLANILARAK SAĞLIKLI YENİDOĞANLARIN GEBELİK YAŞININ TAYİNİ

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Summary

Purpose: This study was carried out to investigate dependability of Eregie's scoring method in assessing the gestational age of healthy neonates and its applicability by auxiliary health personnel.

Setting: The study was performed in the Neonatal Unit and Obstetric Department of Karadeniz Technical University.

Materials and Methods: Gestational age of 387 neonates were evaluated with Eregie and Tuncer methods by doctors and nurses in the 0th-12th hours (first evaluation =FE) and in the 24th-72nd hours (second evaluation =SE) of life as a prospective and double-blinded study. The results obtained by doctors and by nurses using Eregie and Tuncer methods were compared.

Results: There were no significant differences between the FE and SE scores obtained by doctors and nurses using Eregie method, and between the scores obtained in the FE and SE by doctors using Tuncer method, and there were positive correlations among all of score pairs. However, there were significant differences between the scores assessed in the FE and SE by nurses using Tuncer method, and between the scores assessed by doctors and nurses using the same method, but there was no correlation between any score pairs. In comparison of both methods, there was no significant difference between the FE and SE by doctors, but a significant positive correlation was found. Although meaningful differences were determined between the FE and SE scores assessed by nurses with both methods, there was no correlation between any score pairs obtained in FE and SE by nurses with both methods.

Conclusion: We think that Eregie's simple method is a reliable scoring system in assessing the gestational age of healthy neonates and auxiliary health personnel can also use it easily.

Key Words: Scoring system, Gestational age, Auxiliary health personnel

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Özet

Amaç: Bu çalışma, sağlıklı yenidoğanların gebelik yaşı tayininde, Eregie'nin skorlama yönteminin güvenilirliği ve yardımcı sağlık personeli tarafından uygulanabilirliğinin değerlendirilmesi amacı ile gerçekleştirildi.

Yapıldığı Yer: Çalışma Karadeniz Teknik Üniversitesi Yenidoğan Ünitesi ve Doğum Kliniğinde gerçekleştirildi.

Gereç ve Yöntem: Çalışmada, 387 sağlıklı yenidoğan bebeğin gebelik yaşları servis doktor ve hemşireleri tarafından 0-12 (birinci değerlendirme =BD) ve 24-72. saatler (ikinci değerlendirme=İD) arasında çift kör olarak, Eregie ve Tuncer yöntemleri kullanılarak belirlendi. Hem Tuncer hem de Eregie yöntemleri ile doktor ve hemşireler tarafından elde edilen sonuçlar daha sonra karşılaştırıldı

Bulgular: Eregie metodu ile doktor ve hemşireler tarafından BD ve İD ile elde edilen ortalama skorlar arasındaki fark önemsiz ve korelasyonlar pozitif idi. Tuncer metodu ile doktorlar tarafından BD ve İD ile elde edilen ortalama skorlar farklı olup, pozitif korelasyon belirlendi. Buna karşılık Tuncer metodu ile hemşirelerin BD ve İD skorları ile doktor ve hemşirelerin her iki değerlendirme skorları arasındaki fark anlamlı idi ve korelasyon yoktu. Eregie ve Tuncer metotları ile elde edilen skorların karşılaştırılmasında; doktorların BD ve İD skorları arasında anlamlı fark olmayıp, pozitif korelasyon mevcuttu. Hemşirelerin her iki skorlama sistemi ile elde ettikleri BD ve İD skorları arasında anlamlı fark vardı ve bu skorlar arasında anlamlı korelasyon belirlenemedi.

Sonuç: Sağlıklı yenidoğan bebeklerin gebelik yaşının tayininde Eregie metodunun, basit ve güvenle kullanılabilen bir yöntem olduğu ve yardımcı sağlık personeli tarafından da doğru bir şekilde uygulanabileceği düşünülmektedir.

Anahtar Kelimeler: Skorlama sistemi, Gebelik yaşı, Yardımcı sağlık personeli

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Prematurity is one of the most important causes of neonatal mortality (1,2). Because of this reason, assessment of gestational age is the basic factor to evaluate whether the neonate is under any risk (1-3). Most of the present methods that have

been used for assessment of gestational age are based on the physical or neurologic examination, or combined physical and neurologic examination findings of baby. These methods require experience and also the results might not be trustworthy (4-11). Whereas, most of births in our country are occurred in the peripheric health subunits that have no educated or experienced person for using these scoring systems. This situation constitutes difficulties and false results in using these scoring systems. Moreover, these scoring systems may cause false scoring in the first hours after birth, by educated but inexperienced persons (1,2). Recently, a simple method was defined by Eregie (12) which is based on head and mid-arm circumference. We think that, a basic and trustworthy scoring method that can be used by inexperienced persons, also in the first hours after birth, will be gain important time to the risky babies.

The aim of this study was to investigate the applicability of the simple method of Eregie in assessing the gestational age of healthy neonates by auxiliary health personnel.

Materials and Methods

This study was performed in healthy neonates who were born in our hospital in a period of eight months. The babies who have hydrocephalus, cephal hematoma, caput succedaneum, congenital and chromosomal anomalies and neurologic deficit were excluded from the study. Gestational ages of all babies who were admitted in the study were assessed by doctors and by educated but inexperienced

nurses of the Neonatal Unit, with both Eregie (12) and Tuncer (5) methods as double-blinded, in the 0-12th hours (first evaluation =FE) and in the 24-72nd hours (second evaluation =SE). For Eregie's method, head circumference and the left mid-arm circumference were measured with a tape measure. Mid-arm circumference was measured in the middle of distance between acromion and olecranon when the forearm was in extension and abduction. The gestational ages were assessed using Eregie's score-tables for head and arm circumferences (Table 1) (12).

The gestational ages that obtained using both methods were calculated as mean \pm standard deviation. The results were compared reciprocally as score pairs of FE and SE, score pairs of doctors and nurses evaluations, and score pairs obtained with Tuncer and Eregie methods using paired t test for dependent samples. The relation of the same score pairs were investigated using Spearman's correlation analysis.

Results

In this study, 387 (202 male, 185 female) neonates were evaluated. Their gestational ages according to the date of their mother's last menstrual period were 38.6 ± 3.2 (26-43) weeks and their mean body weights were 3250 ± 950 (810-4100) grams. All scores assessed by doctors and nurses using both methods were given in Table 2. The scores assessed by doctors using Tuncer method were 39.6 ± 2.9 weeks in the FE and 39.7 ± 3.0 weeks in the SE. The scores assessed by nurses

Table 1. Assessment of mid-arm and head circumferences with Eregie method (12).

A Mid-arm CIRC (cm)	Scores	B Head CIRC (cm)	Scores	Final Score (A+B)	Gestational Age (Weeks)
<6,9	0	<25,4	0	1	31
6,9-7,8	1	25,4-28,7	1	2	32.5
7,9-8,5	2	28,8-30,6	2	3	33.5
8,6-9,8	3	30,7-33,3	3	4	35
9,9-10,6	4	33,4-34,6	4		36
>10,7	5	>34,7	5	6	37
				7	39
				8	40
				9	41
				10	42

CIRC: circumference

Table 2. Assessed gestational ages by doctors and nurses using both methods (mean±SD)

Scoring system	Gestational age assessed by doctors (week)		Gestational age assessed by nurses (week)	
	FE	SE	FE	SE
Tuncer's (n=387)	39.6±2.9 ^a	39.7±3.0 ^b	37.4±3.3 ^c	38.1±2.5 ^d
Eregie's (n=387)	39.8±3.1	39.7±2.9	39.7±3.2 ^e	39.6±3.4 ^f

Significantly different score pairs: $p < 0.05$: b-d; $p < 0.01$: d-f; $p < 0.001$: a-c, c-d, c-e; FE: first evaluation, SE: second evaluation

with the same method were 37.4±3.3 weeks in the FE and 38.1±2.5 weeks in the SE. The scores assessed by doctors using Eregie's method were 39.8±3.1 weeks in the FE and 39.7±2.9 weeks in the SE, and those assessed by nurses with the same method, were 39.7±3.2 weeks in the FE and 39.6±3.4 weeks in the SE. The results of statistical analysis for both methods were given in Table 2 and 3.

There were no significant differences between the FE and SE scores assessed by doctors and nurses using Eregie method ($p > 0.05$), and between the FE and SE scores assessed by doctors using Tuncer method ($p > 0.05$), and positive correlations were determined between these pairs of scores ($r > 0.5$, $p < 0.05$). There were significant differences between the scores obtained in the FE and SE by nurses using Tuncer method ($p < 0.001$), and between the scores assessed in the FE ($p < 0.001$) and SE ($p < 0.05$) by doctors and nurses using Tuncer method, but there was no correlation between any pairs of scores ($r < 0.5$, $p > 0.05$). In comparison of the scores assessed with Tuncer and Eregie methods; any significant difference among all scores assessed in the FE and SE by doctors using both methods was not determined ($p > 0.05$), but significant positive correlations were found ($r > 0.5$, $p < 0.05$). Although meaningful differences were present between the scores determined in the FE ($p < 0.001$) and SE ($p < 0.01$) by nurses using both methods, there was no significant correlation between any score pairs ($r < 0.5$, $p > 0.05$).

Discussion

For standard reporting of reproductive health statistics and as a prerequisite to determining normality, all infants should be classified by gestational age and birth weight (3,4,6). Classifying infants

Table 3. Score pairs of gestational age with significantly positive correlations

Score Pairs of Gestational Age	r	P
Doctor.TU.FE-Doctor.TU.SE	0.620	0.021
Doctor.ER.FE-Doctor.ER.SE	0.730	0.045
Doctor.TU.FE-Doctor.ER.FE	0.540	0.049
Doctor.TU.SE-Doctor.ER.SE	0.571	0.037
Nurses.ER.FE-Nurses.ER.SE	0.632	0.001
Doctor.ER.FE-Nurses.ER.FE	0.710	0.043
Doctor.ER.SE-Nurses.ER.SE	0.612	0.020

FE: first evaluation, SE: second evaluation, TU: Tuncer's scoring system, ER: Eregie's scoring system

bom at term, preterm, or post-term helps to establish the level of risk for neonatal morbidity and long-term developmental problems (6). At the end of the initial examination in the delivery room, the gestational age of each infant should be estimated (1). In this purpose, various methods have been employed to assess gestational age. The most popular scoring systems for gestational age are based on physical criteria (11), neurologic examination (8), and combined physical and neurologic examination (10,13).

The assessment of gestational age using physical criteria was initially described by Fair et al. (11), and later elaborated by Finnstrom (14). These criteria are skin color, nipple formation, ear firmness and plantar creases. The physical criteria are less evident between 26 and 36 weeks (10), and the assessments based on only physical criteria underestimate gestational age particularly in SGA infants (4,15). The assessment of gestational age using neurologic criteria was originally defined by the French school and simplified by Amiel-Tison (8). The examination involves assessment of posture,

passive and active tone, reflexes, and righting reactions. Although the physical criteria can be used to establish gestational age immediately after delivery, the neurologic criteria used to determine gestational age require the infant to be in an alert and rested state. In some infants, this may not occur during the initial or subsequent examinations on the first day. Infants who are transiently depressed related to maternal medication characteristically underscore during neurologic examination (1).

Using a system that combines the physical and neurologic criteria of gestational age, Dubowitz (9) developed a combined scoring system. The disadvantage of the Dubowitz scoring system is that it involves the assessment of 11 physical and neurologic criteria. Although the physical criteria allow clear distinction of infants with varying gestational ages greater than 34 to 36 weeks, neurologic criteria are essential to differentiate infants between 26 and 36 weeks where the physical changes are less evident (1). Ballard and colleagues (13) modified the Dubowitz scoring system to include six neurologic and six physical criteria. But this earlier Ballard system tended to overestimate the age of premature infants and underestimate the age of post-term infants. Further modification of this system produced the New Ballard Score, and this includes the assessment for extremely premature infants (10). Tuncer method (5), which has been used in our clinic and some other clinics in our country, is a modified and simplified form of Ballard system based on 5 physical and 3 neurologic criteria.

For neurologic criteria of New Ballard or Tuncer methods; the square window may be falsely assessed in conditions of marked intrauterine compression, such as severe oligohydramnios, increase wrist flexion, the scarf sign is decreased range and a higher score if there is marked obesity, chest wall edema, a fractured clavicle, an abnormally shortened humerus, or shoulder girdle hyper-tonicity. A brachial plexus injury produces a spuriously low score because of abnormally low muscle tone. Any pathology affecting the motor strength of the arm will decrease arm-recoil score, as would a fetal position of fixed arm extension. In addition, if the infant was a frank breech with legs extended, the popliteal angle score will be greater than expected for age (7).

In this study, the scores of gestational ages assessed in the FE and SE by nurses using Tuncer method were different from those by doctors, and there was no correlation between FE and SE score pairs of nurses, and between those of nurses and doctors. These findings suggest that inexperienced persons may be assessed falsely the gestational age using these experience requiring systems.

Investigators have been studied to develop more basic and easily applicable methods. One of them is Eregie's scoring system (12) based on measuring of head and mid-arm circumferences. Recently, Yurdakok and Erdem (2) reported that the gestational ages assessed by doctors and nurses with Eregie and Ballard systems were correlated. The applicability of Eregie's method by inexperienced persons even in the first hours of life of healthy newborn babies has been investigated firstly in the present study.

In our study, the FE and SE scores of gestational age assessed by doctors and nurses using Eregie's method were not statistically different, and there were significant positive correlations among all of the score pairs. These findings suggest that inexperienced health personnel may use Eregie's method as truly even in the first hours of life.

Finally, we think that inexperienced persons may apply Eregie's scoring system confidently even in the first hours of life to healthy neonates without problems related to cranium and legs. However, it should be kept in mind that Eregie's method may lead to misleading scores of gestational ages in infants with edema of scalp and skin, cephal hematoma, micro or macrocephaly or congenital anomalies of cranium and leg.

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