

Anterior Fontanelle Size in Healthy Iranian Neonates on the First Day of Life

Hamideh Shajari¹, Neda Rashidiranjbar¹, and Mahmoodreza Ashrafi²

¹ Department of Neonatology, Shariati Hospital, School of Medicine, Tehran University of Medical Science, Tehran, Iran

² Department of Neurology, Children's Medical Center, School of Medicine, Tehran University of Medical Science, Tehran, Iran

Received: 23 Aug. 2010; Received in revised form: 29 Oct. 2010; Accepted: 7 Nov. 2010

Abstract- There is limited data in the literature on the normal size of the anterior fontanelle. This cross-sectional study was to determine normal values of anterior fontanelle size on the first day of life, using standard methods. Anterior fontanelle size was measured in 400 term and healthy neonates delivered at the Shariati Hospital, Tehran, Iran. Examination included assessment of head circumference, anterior fontanelle size, weight, length. Type of delivery was also recorded. The mean size of anterior fontanelle was 25.34 ± 13.27 mm, and it was established in both genders, 26.70 ± 13.19 mm in boys, and 23.67 ± 13.20 mm in girls. A significant difference between the mean anterior fontanelle size in boys and girls was found ($P=0.023$). There was no significant difference in anterior fontanelle size between the infants born with a normal vaginal delivery and those with cesarean-section ($P=0.08$). There was found a significant negative correlation between the mean size of anterior fontanelle size with both weight and height ($P<0.05$). No significant correlation was found between mean size of anterior fontanelle and head circumference or with gestational age of infant ($P\geq 0.05$). Our results proved possible to define a references range and centile chart. The method used is simple and accurate and easy used in the routine neonatal examination.

© 2011 Tehran University of Medical Sciences. All rights reserved.

Acta Medica Iranica, 2011; 49(8): 543-546.

Keyword: Anterior fontanelle; Neonate; Routine neonatal examination; Normal size

Introduction

Assessment of the size of the anterior fontanel can be considered an index of cranial growth since the prenatal period and especially after birth (1,2).

Despite the clinical value of anterior fontanel (AF) examination, its measurement has not been routinely performed as part of the newborn examination, which traditionally includes head circumference measurements (3-6). It appears to be a racial difference in AF sizes, therefore appropriate local references should be used in different societies (7-12). Since there is no published report of AF size in Iranian newborn (13) this study was carried out to measure the AF size in healthy Iranian neonates on the first day of life.

Materials and Methods

A total of 400 full term (38-41 weeks) newborns, including 220 (55%) boys and 180 (45%) girls, born between June 2008 and May 2009 in one of the University Hospitals (Shariati Hospital) were enrolled in this cross-sectional study. Gestational age was assessed

by the last menstrual period and Scroll Ballard Score with the accuracy of ± 2 weeks.

All infants were clinically examined by a physician to measure weight, height, head circumference, and anterior fontanelle size within 24 hours of birth.

Anterior fontanelle size was appointed by the method of Popich and Smith (11). The corner of the anterior fontanelle was determined by inserting the index finger of the examiner to each corner, and was marked with a washable ink. Then with a calibrated paper tape, the distance between the anterior and posterior points and between the transversal points were measured and recorded with an accuracy of ± 1 mm (Figure 1). The average of anterior-posterior diameter (length) and transverse diameter (width) was considered as the anterior fontanelle size (Figure 2).

Head circumference was measured with a narrow calibrated non-elastic plastic tape around the infant's head, through the prominence of the occiput to supraorbital ridges, with an accuracy of ± 1 mm. A balance beam type infant scale was used for measuring the weight, with the accuracy of ± 100 g. The weight was measured twice, and the mean value was recorded.

Corresponding Author: Hamideh Shajari

Department of Neonatology, Shariati Hospital, School of Medicine, Tehran University of Medical Science, Tehran, Iran
Tel: +98 21 84902417, Fax: +98 21 88220033, E-mail: shajarih@tums.ac.ir

Anterior fontanelle size in neonates on the first day of life

Height was assessed by a supine measuring table calibrated in millimeter, when the infant was laid supine with extremely extended knees, contacted the soles of the feet to the sliding footboard, and the crown of the head was held against the headboard. Type of delivery [normal vaginal delivery (NVD) or Cesarean-section (C-section)], was obtained from the recorded files in the neonatology ward.

Statistic analysis was performed by two-tailed t-test, and Pearson correlation test for determination of correlation coefficient between the parameters. *P*-value less than 0.05 was considered to be statistically significant. This study was approved by the Ethic Committee of the Tehran University of Medicine.

Results

The mean size of anterior fontanelle was 25.34 ± 13.27 mm, and it was established in both genders: 26.70 ± 13.19 mm in boys, and 23.67 ± 13.20 mm in girls (Figure 3). A significant difference between the mean anterior fontanelle size in boys and girls was found ($P=0.023$). Comparison of AF size in the NVD cases ($n=95$) with confection ($n=305$) showed that AF size in the C-section group was higher than NVD, but the difference was not significant 25.99 ± 13.09 versus 23.25 ± 13.68 , respectively; $P=0.08$)

The mean value of other parameter's (gestational age, weight, height and head circumference), the relationship between these parameters and the mean size of anterior fontanelle is presented in Table 1.

We found a significant negative correlation between the mean size of anterior fontanelle with both weight and height ($P \leq 0.05$). No significant correlation was found between mean size of anterior fontanelle and head circumference or with gestational age of infant ($P > 0.05$).

Table 1. The mean value of weight, height, and head circumference and their correlation with anterior fontanelle size in Iranian newborns

| | Weight | Height | Head circumference |
|----------------|-----------|----------|--------------------|
| N | 400 | 400 | 400 |
| Mean value | 3098.66 g | 50.04 cm | 34.26 cm |
| Pearson P | 0.04* | 0.002* | 0.46 |
| Relation r | -0.10 | -0.15 | 0.03 |
| R ² | 0.00 | 0.02 | 0.00 |

* $P < 0.05$

N: 400 in all Parameter

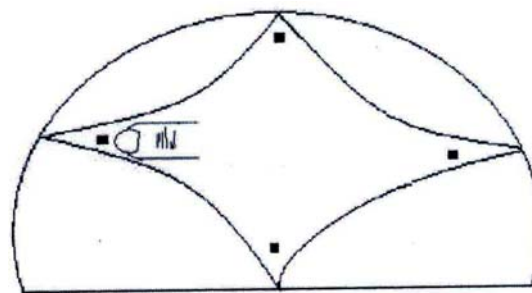


Figure 1. Measurement of anterior fontanelle size in the neonate

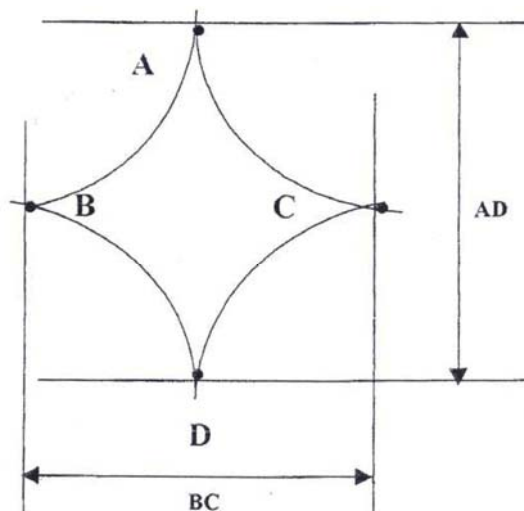
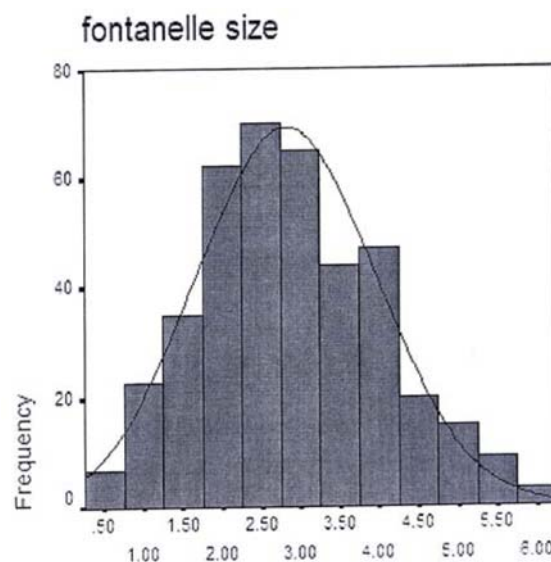


Figure 2. The method use for calculation of the area of the anterior fontanelle.

$$\text{Area of ABCD} = \frac{AD + BC}{2} \text{ (method of Popich and Smith)}$$



Mean: 25.34 Std. Dev: 13.27 N: 400

Figure 3. Distribution of AF size in healthy, term Iranian newborn in Shariati Hospital

Discussion

Anatomically, there are at least six fontanelles in the newborn skull: anterior, posterior, two mastoid and two sphenoid fontanelles (14,15).

The anterior fontanelle is the largest and most important for clinical evaluation. Since the bones of the cranium develop in membrane, the fontanelles (which are essentially expansions of the suture lines where these bones meet) are considered good indicators of the process of membranous ossification. Thus, fontanelle sizes are a clue to a number of disorders in which the skeletal morphogenesis is abnormal (11).

The mean size of anterior fontanelle of appropriately grown, full term Iranian neonates was 25.34 ± 13.27 mm which was approximate to a previous, non-published study in Iranian infants, Caucasian American infants and Arab children (7,9,13). However, it was found to be smaller than those reported for African American infants and Nigerian infants (7, 10), and larger than Scottish and Israeli infants (8, 12).

A significant difference of AF size was established between genders, 26.70 ± 13.29 mm in boys and 23.67 ± 13.20 mm in girls; which is in agreement with the one in Arab children, who found a significant larger anterior fontanelle in boys in comparison with girls (9).

However other studies reported no significant difference in the AF size between genders (7,8,13).

No difference was found in the AF between two types of delivery, which is in accordance with some previous studies (13,16). To the best of our knowledge, no other study assessed the relationship between anterior fontanelle size and delivery type. A significant negative correlation was found between AF size and infant's weight ($r=-0.10$, $P=0.04$). This result was not in agreement with a study done in Brazil, as they reported a positive correlation between these parameters (16). No significant correlation was reported between AF size and infant's weight by similar studies in Nigeria and Turkey (2,10). Also a significant negative correlation with infant's height was found ($r=0.15$, $P=0.002$). This finding was not in agreement with the Brazilian study and the study of Scottish infants, as they reported a positive correlation between these parameters (8, 16). No study has reported any correlation between the AF size and infant's height.

No correlation was found between the AF size and infant's head circumference, which is in accordance with some previous studies (2,12). Although some other studies have reported a positive correlation between these parameters (10,16).

There has been a limitation in this study that should be considered. The overlapped sutures and cranial moulding are resolved after 72 hours of birth. However in present study infants were usually discharged from hospital after 24 to 48 hours of birth. Therefore infants were examined within 24 hours of birth, which may influence our results.

This study (a) describes a simple clinical method of measuring the size of the anterior fontanelle in the newborn, and (b) provides the normal range of mean size anterior fontanelle in term Iranian infants, and (c) establishes the significant difference of mean anterior fontanelle size in both genders. Our limitation, along with the literature review carried out for this study; indicate the need to further studies to establish patterns of normality for AF size and particularly for using appropriate local references when attempting to classify a given AF size normal or abnormal

References

1. Chang BF, Hung KL. Measurements of anterior fontanelles in Chinese. *Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi* 1990;31(5):307-12.
2. Malas MA, Sulak O. Measurements of anterior fontanelle during the fetal period. *J Obstet Gynaecol* 2000;20(6):601-5.
3. Paine RS. Neurological examination of infants and children. *Pediatr Clin North Am* 1960;17:471-510.
4. Prechtl HFR. The Neurological Examination of the Full-Term Newborn Infant: A Manual for Clinical Use from the Department of Developmental Neurology. 2nd ed. London: William Heinemann Ltd.; 1977. p. 1-6, 8.
5. Swaiman KF. Neurologic examination of the term and preterm infant. In: Swaiman KF, Ashwal S, editors. *Pediatric Neurology: Principles and Practice*. 3rd ed. St Louis (MO): Mosby; 1999. p. 39-53.
6. Volpe JJ. The neurological examination: normal and abnormal features. In: Volpe JJ, editors. *Neurology of the Newborn*. 4th ed. Philadelphia, PA: WB Saunders; 2001. p. 103-33.
7. Faix RG. Fontanelle size in black and white term newborn infants. *J Pediatr* 1982;100(2):304-6.
8. Lyall H, Ogston SA, Paterson CR. Anterior fontanelle size in Scottish infants. *Scott Med J* 1991;36(1):20-2.
9. Mir NA, Weislaw R. Anterior fontanelle size in Arab children: standards for appropriately grown full term neonates. *Ann Trop Paediatr* 1988;8(3):184-6.
10. Adeyemo AA, Olowu JA, Omotade OO. Fontanelle sizes in term neonates in Ibadan, Nigeria. *West Afr J Med* 1999;18(1):55-9.

Anterior fontanelle size in neonates on the first day of life

11. Popich GA, Smith DW. Fontanels: range of normal size. *J Pediatr* 1972;80(5):749-52.
12. Srugo I, Berger A. Anterior fontanelle size in healthy Israeli newborn infants. *Isr J Med Sci* 1987;23(11):1137-9.
13. Esmaeili M. Fontanel size from birth to 24 months of age in Iranian children. 2006.
14. Crelin ES. *Functional Anatomy of the Newborn*. New Haven, CT: Yale University Press; 1973. p. 14.
15. Williams PL, Warwick R, editors. *Gray's Anatomy*. 36th ed. Edinburgh: Churchill Livingstone; 1980. p. 345.
16. Pedroso FS, Rotta N, Quintal A, Giordani G. Evolution of anterior fontanel size in normal infants in the first year of life. *J Child Neurol* 2008;23(12):1419-23.