



## Penile Size in Term Infants

### Term Yenidoğanların Penis Ölçüleri

Penile Length of Turkish Newborns

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#### Öz

Amaç: Bu çalışmanın amacı sağlam yenidoğanların penis uzunluk ve çaplarını saptamak ve bu değerlerin neonatal antropometrik değerler ile ilişkisini belirlemektir. Gereç ve Yöntem: Çalışmaya hastanemizde Kasım 2013 Mayıs 2014 tarihleri arasında canlı doğan matür erkek çocuklar dahil edildi. Çocukların doğum haftası, vücut ağırlıkları, boy uzunlukları ve kafa çapları kaydedildi. Ayrıca penis boyu, gerdirilmeden ramus pubise yerleştirilen dijital kumpas ile penil radiksten glans ucuna kadar ölçülerek değerler kaydedildi. Penis çapı, penil şaftın en geniş olduğu yerden yine dijital kumpas ile ölçüldü. Bulgular: Çalışmaya 150 yenidoğan çocuk dahil edilmiştir. Ortalama vücut ağırlığı  $3455 \pm 354.2$  gr, ortalama oğum haftası ise  $39.5 \pm 1.18$  hafta olmuştur. Olguların penis boyları  $3.19 \pm 0.37$  cm, penis çapı ise  $1.95 \pm 0.44$  cm olarak bulunmuştur. Çalışmada penis uzunluğu ile gestasyonel hafta arasında pozitif korelasyon bulunmuştur ( $r = 0.19$ ,  $p = 0.042$ ). Fakat penis uzunluğu ile vücut ağırlığı arasında korelasyon saptanmamıştır ( $r = 0.10$ ,  $p = 0.179$ ). Tartışma: Bu çalışmada penil antropometri ve neonatal antropometrik değerler arasında korelasyon olduğu saptandı. Bu verilerin pediatriklerin, pediatrik cerrahlar ve endokrinologlara faydalı olacağı kanısındayız.

#### Anahtar Kelimeler

Yenidoğan; Penis Uzunluğu; Penis Çapı

#### Abstract

Aim: The objective of the study was to determine normal penile length and diameter in newborn infants and determine the relationship between penile anthropometry and neonatal anthropometric values. Material and Method: This cross-sectional study was conducted on male newborn infants delivered from November 2013 to May 2014. Birth weeks, body weights, height lengths, and head diameters of the children were recorded. Penile length was measured from the penile radix to the tip of the penile glans, without stretching the penis, with the use of digital calipers placed on the ramus pubis. Maximal penile diameter was also measured with digital calipers. Results: A total of 150 newborn boys were included in this study. The mean birth weight of infants was  $3455 \pm 354.2$  g and the mean gestational age at birth was  $39.5 \pm 1.18$  weeks. In infants, the mean penile length was  $3.19 \pm 0.37$  cm (range 2–4 cm) and the mean penile diameter was  $1.95 \pm 0.44$  cm. There was a significant positive correlation between gestational age at birth and penile length in infants ( $r = 0.19$ ,  $p = 0.042$ ), whereas no significant correlation existed between penile length and birth weight ( $r = 0.10$ ,  $p = 0.179$ ). Discussion: There is a correlation between neonatal anthropometric measurements and penile anthropometry. The results of this study provide a useful guide for pediatricians, pediatric surgeons, and endocrinologists.

#### Keywords

Newborn; Penile Length; Penile Diameter

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## Introduction

Pediatricians, pediatric endocrinologists, endocrinologists, urologists, and pediatric surgeons may frequently be consulted for the evaluation of micropenis, macropenis, and concealed penis, as well as sexual concerns, in children [1]. An abnormal condition of the external genital organs may be the first and only symptom of underlying endocrine or genetic diseases in newborns [2]. To identify any abnormality, the normal variations for each measurement in a newborn must be known. Micropenis is defined as a penile length of less than  $-2.5$  standard deviation (SD) in the absence of hypospadias while macropenis is defined as a penile length of more than  $\pm 2.5$  standard deviation (SD) [3]. A knowledge of normal values is necessary in order to make an early diagnosis and to initiate early treatment of penile size abnormalities. The measurement method with digital calipers was previously described by Kutlu et al. [4] for the measurement of clitoris in newborn girls. Owing to a greater sensitivity of digital calipers (0.01 cm), their use was also planned in this study. The correlation of penile length (PL) and penile diameter (PD) with anthropometric measurements, such as height and weight at birth, has been reported. To our knowledge, this is the first study to use digital calipers for penile measurements.

## Material and Method

This cross-sectional study was conducted on male newborn infants delivered at Etlik Zubeyde Hanim Gynecology Training and Research Hospital, Ankara, Turkey, over a 7-month period from November 2013 to May 2014. The study was approved by the Ethics Committee of the Etlik Zubeyde Hanim Gynecology Training and Research Hospital (10.10.2013/169). The subjects were healthy male newborns born at gestational weeks 37 to 41 who stayed with their mothers in the hospital. The gestational week was calculated on the basis of the date of the last menstrual period and the Dubowitz scoring system [5].

The exclusion criteria for infants were as follows: ambiguous genitalia, hypospadias, epispadias, scrotal hyperpigmentation, undescended testis, hydrocele, dysmorphism, and multiple congenital abnormalities. The antenatal history and the condition of each infant were carefully evaluated. Having a family history of urogenital disorders, still births, deaths immediately after birth, or a maternal history of gestational androgenic treatment was also considered an exclusion criterion. The subjects were examined according to a prespecified protocol. The height and weight of every infant was measured first. The infants were weighed by two experienced nurses and their heights were also measured twice by a nurse. The penile lengths of the uncircumcised infants were measured at the supine position between 0 to 2 days of age, by extending the penis on a wooden tongue depressor but without stretching it. The distance between the penile radix and the penile glans was measured with digital calipers (Figure 1). While pressing down the pubis bone, one leg of the calipers was placed on the penile radix and the other was placed on the tip of the glans. The measurements were then recorded. The maximal penile diameter was also measured with digital calipers. All measurements were performed twice by the same physician having the assistance of nurses, and the mean values were recorded.



Figure 1. Calipers used for measurement of penile size in the newborn

## Statistical analysis

Anthropometric values were analyzed with SPSS (Statistical Package for Social Sciences) for Windows 10.0 software. Descriptive statistics included mean and standard deviation (SD). Qualitative data were compared by the Chi-square test. The results were presented within a 95% confidence interval, and a p value of less than 0.05 was considered statistically significant.

## Results

A total of 150 newborn boys were included in this study. The mean birth weight of the infants was  $3455 \pm 354.2$  g (range 2750 to 4300 g) and the mean gestational age at birth was  $39.5 \pm 1.18$  weeks (range 37 to 41 weeks). The mean penile length was  $3.19 \pm 0.37$  cm (range 2–4 cm) and the mean penile diameter was  $1.95 \pm 0.44$  cm. Anthropometric measurements at birth are shown in Table 1. Figure 2 shows the penile length

Table 1. Anthropometric measurements of the body and penis and gestational age at birth in newborns.

Measurement	Min.	Max.	Mean	SD
Birth length (cm)	49	54	51.5	1.34
Birth weight (g)	2750	4300	3455	354.2
Gestational age (wk)	37	41	39.5	0.87
Penile length (cm)	2	4	3.19	0.37
Penile diameter (cm)	0.92	1.6	1.95	0.44

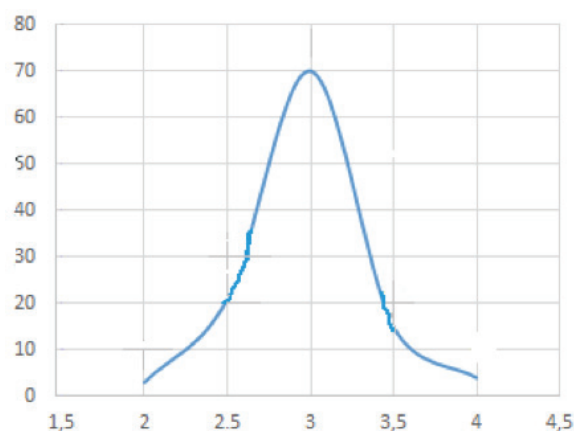


Figure 2. Histogram showing the distribution of penile length.

distribution among the study population.

In the infants there was a significant positive correlation between penile length and gestational age at birth ( $r = 0.19, p = 0.042$ ), whereas no significant correlation existed between penile length and birth weight ( $r = 0.10, p = 0.179$ ) (Table 2). The penile lengths in centimeters of the newborns by gestational age at birth are presented in Table 3.

Table 2. Relationship of penile length with birth weight and gestational week at birth.

	Penile length	
	r	P
Birth weight	-0.10	0.179
Birth week	0.19	0.042

Table 3. Distribution of penile measurements according to gestational age at birth.

Birth week	Mean penile length (cm)	SD
37	2.88	0.37
38	2.86	0.23
39	3.00	0.46
40	3.02	0.33
41	3.04	0.45

### Discussion

It is important to define normal genital standards for different age ranges to identify clues to pathological conditions. To date, many studies have investigated the mean penile length. The first study examining the age-adjusted penile length was reported by Schongeld in 1942 [6]. It examined males between 2 months and adulthood and reported a mean penile length of  $3.7 \pm 1.3$  cm in 2-month-old infants.

In 1975, Feldman et al. [7] examined phallic growth in both sexes by measuring fetal phallic length by gestational week. Fetal measurements were done in 68 male and 33 female fetuses without prominent anomalies (spontaneous or induced abortions) fixated in formalin. Because fixation in formalin may lead to small but quantifiable changes in organ size, it is likely that the reported values do not represent standard values but fetal

penile and clitoral growth. This study showed that the major increase in penile size occurred between the 16th gestational week and birth. Subsequently, a large number of studies aimed to standardize penile length measurements in different ethnic groups [2, 8-13]. Similar studies have been conducted in Turkey as well, although they are limited in number [1,13-18]. Including the infants in our study, a total of 3294 newborn infants underwent penile length measurement in Turkey between 1999 and 2013. Semiz et al. [18] measured a mean penile length of  $2.81 \pm 0.32$  cm and a mean penile diameter of  $1.04 \pm 0.09$  cm within 48 hours of birth in 746 healthy male newborns. These results are considerably different from ours. The authors stated that their results resembled those from studies reported from Indonesia, Japan, and China. Similar to our findings, however, they identified a significant, albeit weak, correlation between penile length and newborn body length ( $r = 0.179, p = 0.001$ ). In 2015, Akarsu et al. [15] measured penile length of 1522 healthy males aged 0 to 18 years. Circumcised and uncircumcised infants aged 0 to 28 days constituted 8.6% ( $n = 130$ ) of the study group. In this study, penis size was determined in two different positions (normal and slightly stretched). The mean stretched penis size was  $3.5 \pm 0.7$  cm (range, 2.1–4.9 cm), the mean penile diameter was  $1.1 \pm 0.2$  cm, and the mean penile circumference was  $3.96 \pm 0.44$  cm in infants aged 0 to 28 days. In that study, the mean length of 3.2 cm for normal penis and 3.5 cm for stretched penis were in accordance with previously reported data in the literature. Penile size measurements were similar to those previously reported from Turkey and other countries [15]. The results of that study were also very similar to ours. Table 4 lists eight studies reporting penile length and diameter measurements in newborn Turkish children. Mean penile length varied from  $2.81 \pm 0.32$  cm to  $3.77 \pm 0.35$  cm. Those studies are



Figure 3. Scale of mean penile length in Turkish children. The black arrow represents the mean of all values (3.40 cm).

Table 4. Results of the present study and comparison with other studies.

Study	No. of infants	Province/region	Age	Penile length (cm) (±SD)	Range (cm)	Penile circumference (cm) (±SD)	Technique
Özbey et al. (14)	30	Istanbul/Marmara	Newborns and infants	$3.53 \pm 0.53$ $3.32 \pm 0.47$	ND	ND	CPLM Syringe
Akarsu et al. (15)	130	Diyarbakır/Southeastern Anatolia	Newborns and infants	$3.5 \pm 0.7$	ND	$1.1 \pm 0.2$	Spatula
Akin et al. (16)	1217	Istanbul/Marmara	Newborns	$3.16 \pm 0.39$	2.19–4.6	$1.21 \pm 0.11$	Straight edge ruler
Çamurdan et al. (17)	165	Ankara/Central Anatolia	Newborns	$3.65 \pm 0.27$	3.1–4.3	ND	Spatula
Semiz et al. (18)	746	Denizli/Aegean	Newborns and infants	$2.81 \pm 0.32$	2.0–3.8	$1.04 \pm 0.09$	Straight edge ruler
Çinaz et al. (1)	142	Ankara/Central Anatolia	Newborns	$3.64 \pm 0.36$	2.7–4.5	ND	Spatula
Kutlu (13)	514	Ankara/Central Anatolia	Newborns	$3.77 \pm 0.35$	ND	ND	Spatula
Erturk (current study)	120	Ankara/Central Anatolia	Newborns	$3.19 \pm 0.37$	2–4	$1.95 \pm 0.44$	Digital calipers

shown on a single scale in Figure 3. The mean penile length of newborn was 3.40 cm in those studies. The mean penile length found in our study is the second nearest value to the general average. Those studies used generally accepted methods for measuring penile length in newborns. Seven of nine studies used the conventional stretched penile length measurement method described by Schonfeld [6], which is based on the principle that stretched penile length and erect penile length are closely correlated to each other (erect penile length = 0.985, stretched length of  $-0.0095$ ;  $r = 0.983$ ) [3]. Two of those nine studies used different measurement techniques. Ozbey et al. used a modified 10-cc syringe technique for the first time in the published literature [14]. In this technique, the plunger of a deneedled syringe is put inside the barrel in reverse position. The straight edge of the syringe is then firmly placed on the penis stem and the plunger is gently drawn backwards, applying a negative pressure and thus partly stretching the penis. The stretched penile length is then measured on a previously marked scale on the syringe. In that study, the penile lengths of 30 uncircumcised newborn children were measured. Although this is not a commonly employed technique, it may be the most suitable and rapid technique to rule out normal variants such as concealed penis (a condition in which a normal penis is hidden below the surrounding subcutaneous tissue) and webbed scrotum (a condition in which scrotal skin extends onto the ventral penile shaft), which may be confused with micropenis or microphallus or both. The other different technique is the digital caliper technique we used in the present study. As this technique allows more precise measurements, our study is the first in the literature to report more precise results. The primary mistake made in penile length measurements is the failure to take into account the suprapubic fatty tissue [16]. A firm pressure onto the penis stem would completely reveal a concealed penis within the fatty tissue. Pressing one leg of the caliper against the penis stem during measurements with a digital caliper reduces measurement errors considerably. Nevertheless, using ultrasonography to determine penile (corporeal) length would produce more reliable results in equivocal cases, obese children, and those with embedded or webbed scrotum [19].

The correlation between penile length and birth weight and gestational age was determined with the use of the data obtained from term infants in this study. There was a significant positive relationship between gestational age at birth and penile length. Nine studies including the present one reported a mean penile length of 3.40 cm for newly born Turkish infants. Measurements with digital calipers will produce more precise data. These data may be a useful guide for pediatricians, pediatric surgeons, and endocrinologists. Further studies with larger sample size are needed in this field.

### Competing interests

The authors declare that they have no competing interests.

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