

The normal position of the umbilicus in the newborn: An aid to improving the cosmetic result in exomphalos major

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ABSTRACT

Exomphalos major is an inherited disorder characterized by defects in the central portion of abdomen. Because of major improvements in the survival of these patients in recent years, primary repair of abdominal wall and reconstruction are considered. Therefore, umbilicus position will be an important landmark for abdominoplasty. The aim of this study was to determine normal position of umbilicus in healthy Iranian neonates to improve cosmetic outcome of exomphalos major repair. In a cross-sectional study comprising 200 healthy Iranian neonates (107 boys and 93 girls), who were born in Esfahan, the position of the umbilicus was determined in all of them by measuring the distance of xiphisternum to pubis in midline and determining umbilical position in this line. Our findings showed that umbilical position was 59.28 ± 5.2 percent off the way from the inferior border of xiphisternum to the superior border of the pubis in the midline, and it was independent of sex and neonatal growth indices.

KEY WORDS: Abdominoplasty, cosmetic, exomphalos major, umbilicus

The umbilicus is a round dermal projection on the center of anterior abdominal wall. Position of the umbilicus is a significant factor in making the abdomen aesthetically pleasing.^[1] The umbilicus lies over the umbilical ring, which is the last part of abdomen closed in fetus or after birth.

In some conditions such as omphalocele, gastroschisis, bladder or cloacae extrophy, prune-belly syndrome and umbilical hernia,^[2,3] this defect is not closed and may be too large and may change the appearance and the position of umbilicus. The defect in babies with an exomphalos may extend from a few centimeters below the xiphisternum to a few centimeters above the pubis. Therefore, it may be difficult to select the most appropriate segment of abdomen skin from the margin of defect to create an umbilicus in a normal position at surgery. This may be particularly difficult if a staged silo reduction or mesh closure techniques were used.^[4] Until recently, there has been no study providing good evidence to suggest umbilicus position on the abdominal wall.^[1, 2] We could find just one similar study done before to help in this regard.^[5] As there are anatomic differences among different nations and races, this study was done for the first time in Iran. We tried to find the best position of the umbilicus with respect to the xiphisternum and pubis in normal newborns.

MATERIALS AND METHODS

In a cross-sectional study, 200 healthy Iranian newborn babies up to 15 days of age (107 boys and 93 girls), who were born in Esfahan (central part of Iran), were selected. Our inclusion criteria were as follows:

Healthy and normal neonates, 1-15 days of age, gestational age of 37-42 weeks, birth weight of 2.5-4 kg, height of 45-55 cm and head circumference of 32-36 cm.^[6] The babies who were not in the normal range or had any specific abdominal wall abnormalities were excluded. Distances between the lower border xiphisternum and center of umbilicus Xiphi-Umbilicus (XU) and also from the lower border of xiphisternum to the upper border of pubis Xiphi-Pubis (XP) were measured while the babies lay in a supine position [Figure 1]. Two pediatric surgeons did all the measurements with standard tools for all newborns, and each measurement was double-checked every time. Data were presented as mean \pm SD. Quantitative data were compared between boys and girls using t-test analysis. Pearson correlation was used to test the relationship between XU / XP percentage ratio with gestational age and different anthropometric data. Data were analyzed with SPSS-11 software. Differences were considered statistically significant if *P* was less than 0.05.

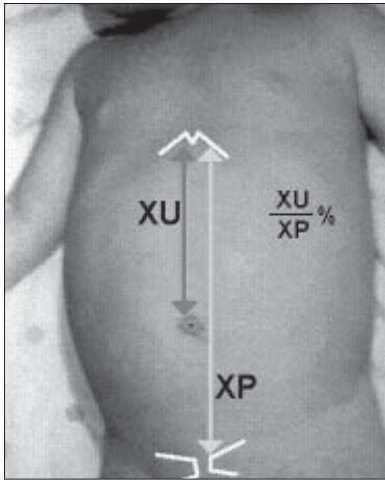


Figure 1: Normal position of the umbilicus. XU = Xiphi-Umbilicus distance, XP = Xiphi-Pubis distance

RESULTS

In this study, 200 neonates were evaluated (107 boys and 93 girls). Distance of xiphisternum to the upper border of the pubis was 10.7 ± 1.23 cm in boys and 10.9 ± 1.35 cm in girls ($P = \text{NS}$). XU / XP percentage ratio was 59.28 ± 5.2 [Figure 2]. No significant differences were noted between girls and boys. Distance between the xiphisternum and the umbilicus center was 6.39 ± 1 cm in boys and 6.49 ± 1.1 cm in girls ($P < 0.01$). XU / XP percentage ratio was 59.28 ± 5.2 [Figure 2]. The ratio of the XU to XP was not significantly different between boys and girls ($59.22 \pm 5.34\%$ in boys vs. $59.34 \pm 5.1\%$ in girls) [Table 1].

Anthropometric data are shown in Table 2. There was no correlation between the XU / XP percentage ratio and different anthropometric and demographic data, including birth weight, height, body mass index and gestational age in both sexes.

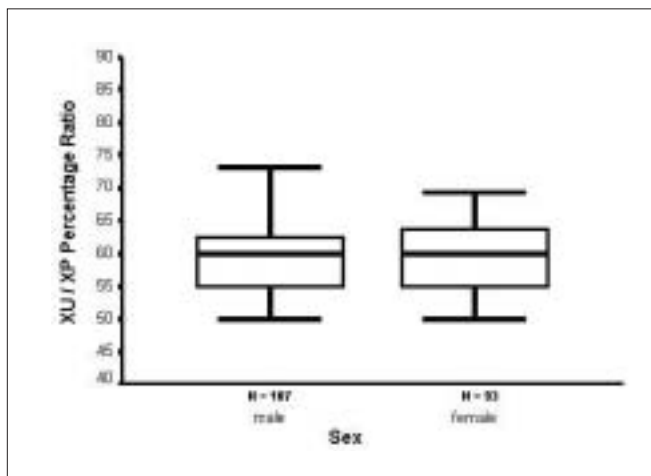


Figure 2: Distribution of the umbilicus in the both sexes

Table 1: Mean Xiphi-Pubic distance (XP), Xiphi-Umbilicus distance (XU) and the percentage ratio between them (XU / XP) in boys and girls

Sex		Mean \pm SD	Minimum	Maximum
Girl	XP (cm)	10.9 ± 1.35	8	14
	XU (cm)	6.49 ± 1.04	4.9	9
	XU / XP (%)	59.34 ± 5.1	50	69.23
Boy	XP (cm)	10.7 ± 1.23	8	14
	XU (cm)	6.39 ± 1.014	4.6	9.5
	XU / XP (%)	59.22 ± 5.34	50	80
Total	XP (cm)	10.85 ± 1.2	8	14
	XU (cm)	6.44 ± 1.03	4.5	9.5
	XU / XP (%)	59.28 ± 5.2	50	80

No significant differences between genders

Table 2: Comparison of different anthropometric data between boys and girls

	Boys	Girls
Height (cm)	48.6 ± 2.4	48.7 ± 2.5
Birth weight (kg)*	2.8 ± 0.4	3 ± 0.4
Head circumference (cm)	33.5 ± 1.8	34 ± 1.5
Body mass index*	12.2 ± 1.4	12.7 ± 1.33

* $P < 0.05$

DISCUSSION

Our study showed that the position of the umbilicus in newborns was 59.28 ± 5.2 (54.1-64.5) percent off the way from the lower border of the xiphisternum to the upper border of the pubis, and it was independent of the anthropometric data measured in this study.

During the past 25 years, the mortality rate of newborns with omphalocele and gastroschisis has significantly decreased, while survival and the outcome of treatment have remarkably improved due to development in neonatal care, surgical techniques and nursing.^[7] Absence of the umbilicus usually occurs after treatment of exomphalos after abdominoplasty and umbilical hernia repair,^[2,1] and the cosmetic results are often limited in patients with exomphalos major.^[1] There have been several reports on abdominoplasty and reconstruction of a normal-looking, well shaped and sufficiently deep umbilicus in neonates with exomphalos and prune-belly syndrome,^[8-10] but there are a few reports on the exact location of the neoumbilicus.^[2,1]

We found just one study in the literature about the normal position of the umbilicus. It was done on 50 neonates in England, and the normal position of the umbilicus was about 60% off the way from xiphisternum to the pubis and was independent of variables mentioned above in our study.^[5]

There were a few reports on the approximate position of normal umbilicus in plastic surgery references. In one of them, it is notified that the umbilicus is located below

the abdominal midpoint, between the xiphoid process and the symphysis pubis, situated over the disc between the third and fourth vertebrae; it is located approximately 2-4 cm above the line joining the crests of the iliac, and its position may vary considerably.^[2,3]

In conclusion, our study suggests that the best location of neoumbilicus can be achieved if it were reconstructed at 59.28 ± 5.2 (54.1-64.5) percent off the way from the lower border of the xiphisternum to the upper border of the pubis.

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