

Original Article

Histomorphological Study of Umbilical Cord on 50 Bangladeshi

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Abstract

Microscopic study was done on 50 human umbilical cords in the Department of Anatomy, during January to December 1998 at Bangabandhu Sheikh Mujib Medical University, Dhaka. The basic structure of the umbilical cord was observed. The covering of umbilical cord varied on two sides. The side overlying the umbilical vein was covered by simple epithelium and that overlying the umbilical arteries was covered by multilayer epithelium. Presence of internal elastic lamina of umbilical arteries was found in 18% and in the veins was in 70% cases. Remnant of allantois was found in 28% cases.

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Introduction

The umbilical cord connects the placenta with the umbilicus of fetus during the period of gestation through which blood flows to and from the fetus to provide nutrition for fetal development and growth. It is believed that epithelium helps in secretion of fluid and exchange of fluid between vessel's blood and amnion¹. Some author described that the covering of umbilical cord composed of simple epithelium while other found it to be covered by stratified epithelium¹⁻⁵.

Presence of internal elastic lamina (IEL) is more conspicuous in the umbilical veins than that in arteries. This serves to distinguish the

veins from the accompanying arteries. Contradictory reports have been published about the presence or absence of the internal elastic lamina⁴⁻⁷. Even the existence of the any elastic tissue in the umbilical vessels has been denied by some authors⁸. The functional implication of its presence is also not well explained.

The endodermal allantoic duct usually disappears by intra-uterine life. At birth persistence of the allantois give rise to urechal cyst. It is unrecognized at birth but when it is concomitant congenital pyelonephritis, persistence of urachus lead to pre umbilical linkage of urine⁸.

There is hardly any study on anatomy of umbilical cord in Bangladesh. The present study was done to expand the body of knowledge of histology of the umbilical cord

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of Bangladeshi people with a view to established a normal standard on which further research can be done for understanding the clinical variation and to address the disputed aspect in this regards.

Material Methods

The present observational study was conducted at the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University, Dhaka during January to December 1998. A total 50 umbilical cords (25 females and 25 males) were studied. The specimens were collected from department of obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical University, Dhaka; Lutfu Nursing Home and Family Health Care, Dhaka and Department of obstetrics and Gynecology, Dhaka Medical College Hospital, Dhaka. Specimens were collected during March to August in 1998. Umbilical cords of the babies whose mother were suffering from hypertension and diabetes were excluded from the study. Umbilical cord of twins was also excluded.

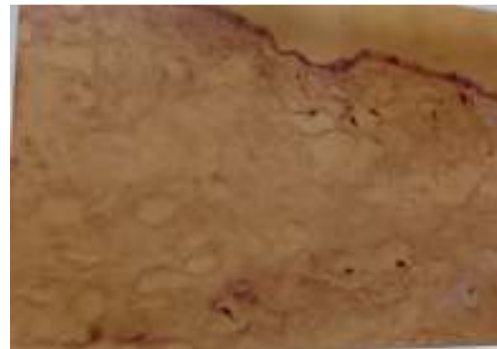
Processing for histological examination was started on the same days of collection of sample. Umbilical cord was slice transversely using a razor blade 5 cm away from umbilicus. The cord was preserved in the formalin for further studies. Fixation was done by keeping the specimen in Carnoy's fluid overnight. Cut tissue was made at 2 mm thickness. Then fixed tissue were blotted and processed following standard historical

procedure⁹. Block was section at 7mm thickness and stained with hematoxylin and eosin for routine examination and resorcin fucsin for elastic tissue stain.

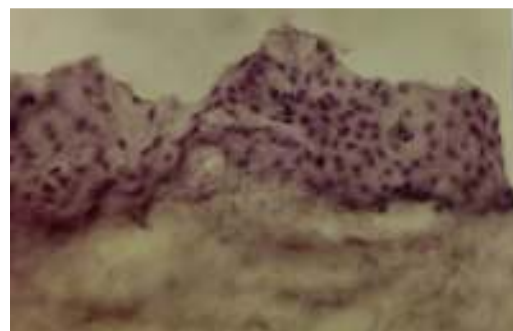
In those cord where allantois was detected by microscopic examination, they were further sectioned at 2 mm intervals until the remnant was no longer visible.

Result

Histological examination of the covering of the umbilical cord reveals that the portions overlying the umbilical vein was covered by simple and that overlying the umbilical arteries was covered by multilayer epithelium (Figure 1).



A



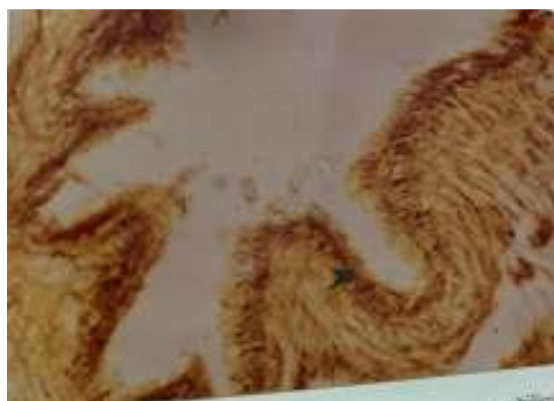
B

Fig 1 A. Covering of the umbilical cord overlying the vein is lined by simple squamous epithelium. 40X.

B. Covering lying overlying the artery is lined by stratified epithelium 40X (Stain with haematoxiline and eosin).



A



B

Fig 2. A Umbilical vein without internal elastic lamina 40 X.

B. Umbilical artery with internal elastic lamina (dark area – arrow) 40 X (Stained with resorcin fuchsin).

Table 1 shows that out of the 50 umbilical cord studied, only 9 (18%) had internal elastic lamina in umbilical arteries. Out of 9 having internal elastic lamina 7 (28%) belongs to the female and 2 (8%) belongs to male cords. On the contrary, umbilical veins contained internal elastic lamina in 37 (70%) cases (Fig 2). Internal elastic lamina was present in umbilical veins in 56% cases in female in contrast to 84% cases in male (Table 2). Out of the 50 cords studied, 14 (28%) cords showed the presence of remnant

Table 1 Internal elastic lamina of umbilical arteries in relation to sex. (n=50)

Sex	Internal Elastic Lamina		Total
	Present	Absent	
Male	2 (8%)	23 (92%)	25
Female	7 (28%)	18 (72%)	25
Total	9 (18%)	42 (82%)	50 (100%)

(Figure in the parenthesis shows the percentage)

Table 2 Internal elastic lamina of umbilical veins in relation to sex. (n=50)

Sex	Internal Elastic Lamina		Total
	Present	Absent	
Male	21 (84%)	4 (16%)	25
Female	14 (56%)	11(44%)	25
Total	37 (70%)	21 (30%)	50 (100%)

of allantois. In 8 (16%) cases the remnant was in the form of round mass approaching fibrosis. These cords were also sectioned at intervals to see how far the allantoic remnant extended. The extend was variable. In one case, it extended upto 12.5 cm from the umbilicus.

Discussion

Our study found that the epithelial covering of the cord varied on two sides. The side overlying the umbilical vein was covered by simple epithelium and that overlying the umbilical arteries was covered by multilayer epithelium. Most authors believed that the covering of the umbilical cord is lined by simple epithelium²⁻⁴. Bacsich reported that the cord is covered by simple epithelium at an early stage. Latter it become stratified. He suggested that from second trimester, the

simple epithelium shows some degree of differentiation and maturation. It was also proposed that it might be derived from amnion and also from fetal skin¹⁰. Hoeys examined the cord under electron microscope and found that the epithelium became bilaminar in the last part of third month. He also mentioned that during 6th or 7th month of intrauterine life the covering of cord acquired three or more layers. Though it was revealed that the covering epithelium was derived from fetal epidermis there was no evidence of definitive keratinization.

Out of the 50 umbilical cords studied 9 (18%) had internal elastic lamina in the umbilical arteries. Opinions differ regarding the presence of the IEL in the umbilical arteries. Some describe the IEL to be either inconspicuous or lacking^{2,4,7,11}. On the other hand, some workers asserted the presence of the IEL^{5,6}. But Phillippe and Sauvage denied any existence of elastic tissue in any of umbilical vessels⁸. Some found that the lamina was often split while others found the IEL as dense layer^{5,6}. Chacho & Reynolds examined IEL under electron microscope and reported that the elastic tissue was clearly seen just beneath the endothelium of the umbilical arteries⁵. Precisely it lies in the proximal media as a loose reticulum. In the constricted state, the elastic tissues do not show any strict lamination. However, in the distended state elastic fibers of the IEL arranged in longitudinally form several discrete layers. In the present study, no longitudinal section was taken. In transverse section, some arteries contained the IEL adjacent to the epithelium. In few cases this lamina was found somewhat deeper separating inner longitudinal and outer circular muscle layers. We found IEL in 70 % of umbilical veins. Various author differs

in opinion regarding the presence of internal elastic lamina in umbilical veins^{3,5,7,11}. However, the presence of the IEL in the umbilical veins seems to be less disputed than that of arteries. Our study shows that internal elastic lamina was present in the umbilical vein more frequently in female than in male. No available study indicated such sex discrimination.

We could not study whole umbilical cord. We have to give up 5 cm for the baby. We tried to find out the remnant of allantois., yolk sac stalk, right umbilical vein and the omphalomesenteric duct. We found the remnant of allantois only in 28% cases. In one case, allantois extended upto 12.5 cm from the umbilicus. Many authors stated that the remnant of allantois might be present at birth at the fetal end of the cord and it was considered almost regular feature^{4,6,8}. Jauniaux et al studied 1000 umbilical cord and found embryonic remnant of 23.1% cases of which allantois was 63%, embryonic vessels 30.4% and omphalomesenteric duct was 6.6% respectively¹². He also mentioned that in 70.9% cases the embryonic remnant was found at fetal end of the umbilical cord. But we did not find such embryonic vessels or omphalomesenteric ducts in this study.

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References

1. Hoey's AD. Ultrastructure of epithelium of the human umbilical cord. *J Ana* 1969;105 (1):149-62.
2. Greenhill JP. *Obstetrics*. 12 ed Philadelphia: WB Saunders Company, 1960.
3. Greep RO. *Histology*. 2nd ed. New York: McGraw-Hill book Company, 1966.
4. Spicvack M. Anatomical peculiarities of human umbilical cord and their clinical significance. *AM J Obst Gynae* 1946; 52:387-401.
5. Chacko AW, Reynolda SRM. Architecture of the distended and non-distended umbilical tissue with special reference of artery and vein. *Cortn Embryology* 1954; 237:137-50.
6. Monie IW. Some observations on the subendothelial cushion of umbilical arteries. *J Ana* 1945;79 (4):137-45.
7. Bunce DI. Morphology of human umbilical vessels. *J AOA* 1970; 69:1018-9.
8. Philippe E, Sauvage JP. The placenta and its membranes. In Iffg L Kamineszkly HA, Editors. *Principal and practice of obstetrics and perinatology*. New York: A Willey Medical Publication, 1981:181-240.
9. Humason GL. *Animal tissue techniques*. 2nd ed San Francisco: WH freeman company 1967.
10. Bacsich P. Some observations on epithelial covering of the human umbilical cord. *J Ana* 1957;91:611
11. Reith EJ, Ross MH. *Atlas of descriptive histology*. 2nd ed. Hagerstown: Harpers and Row Publishers, 1965.
12. Jauniak E, De Munter C, Canesse M, Wilkin P, Hustin J. Embryonic remnant of the umbilical cord: morphological and clinical aspect. *Hum Pathol* 1989; 20 (5); 458-62.