

# Umbilical cord

The **umbilical cord** is a cord with a diameter of 1–2 cm and a length between 20 and 150 cm. Connects the fetus to the placenta . Inside, three umbilical vessels are stored in a jelly-like substance (Wharton's jelly): two *aa. umbilicales* and one *v. umbilicalis*.

## Anatomy of umbilical cord

The umbilical cord is pale in color, during maceration it turns into a reddish-brown color, thin and elongated. False knots are caused by the spiral course of the vessels or the accumulation of jelly-like tissue, called Wharton´s jelly .

### Insertion of the umbilical cord

- central
- paracentral in 90% of cases.

## Histology

Wharton's jelly arises from embryonic mesoderm . It consists of a gelatinous mass and stellate cells. At the placental end of the umbilical cord, remnants of the yolk sac can be found in the jelly, and at the fetal end of the umbilical cord, remains of the allantois.

## Umbilical vessels

The umbilical arteries carry deoxygenated blood from the fetus to the placenta , and the umbilical vein carries oxygenated blood from the placenta to the fetus. Arteries wrap around the vein (on average one turn per 5 cm of length). The spiraling of the arteries of the umbilical cord is predominantly to the left side. The number of vessels in the umbilical cord can already be determined by ultrasound in early pregnancy .

## Pathologies of the umbilical cord

### Length anomaly

The growth of the umbilical cord length-wise is made possible by mechanical forces that stretch the umbilical cord during fetal movements. The umbilical cord grows mainly in the I. and II. trimester and after the 28th week the umbilical cord no longer lengthens significantly.

### Short umbilical cord

This complication causes the umbilical cord to be shorter than 35 cm at the time of delivery. The cause are congenital neuromuscular disorders, congenital developmental defects of the skeleton, multiple malformations of the fetus and other conditions in which the mobility of the fetus in the womb is limited . Clinical sign of this defect are asphyxia of the fetus or pathological position of the fetus (transverse, oblique). An extremely short or even missing umbilical cord is part of a severe fetal malformation. An extensive defect of the abdominal wall, chest, limb deformities and severe scoliosis may be the main consequence of this, but it can also cause various congenital defects of internal organs. This malformation is not compatible with life.

### Long umbilical cords

Because of this complication the umbilical cord is longer than 70-80 cm at the time of delivery. This creates a risk of knotting, wrapping around the body of the fetus, torsion, insistance and prolapse during childbirth.

### Insertion anomaly

1. **Velamentous insertion** : the umbilical cord attaches to the amniotic membrane outside of the placenta. Therefore, umbilical vessels are not protected by jelly-like tissue, so they are easily injured. It is classified as **vasa previa** if the velamentous vessels pass through the internal opening of the uterus, which risks the disruption of the amniotic sac during childbirth and tearing these vessels. Bleeding from vasa previa has a very high mortality rate , the fetus bleeds out within a few minutes. Vasa previa can be detected before delivery using color Doppler ultrasound. The birth must then be carried out by planned caesarean section.
2. **Marginal insertion**: Insertion of the umbilical cord at the very edge of the placenta and its incidence rate is 5-7% of pregnancies.

### Coiling pathology



Umbilical cord

1. **Hypocoiled umbilical cord** (absence of spiralization) is associated with a poor prognosis (intrauterine fetal distress, fetal death).
2. **Hypercoiled umbilical cord** is a frequent cause of abortion in II. trimester. A typical symptom is an excessively long, strongly spiraled umbilical cord and the structure of the umbilical cord at the fetal end is changed (it suffers from narrowing of the lumen due to a deficiency of Wharton's jelly).

## Vascular anomalies

Aplasia of the umbilical artery is rare (less than 1% of pregnancies). More common are some congenital developmental defects (sirenomelia, trisomy 18. , 13. chromosome ). In healthy newborns, it is necessary to rule out hidden defects, especially of the kidneys. The effect on lower birth weight is not conclusive.

## Disorders of blood flow through the umbilical cord

- True knot
- wrapping the umbilical cord around the neck, limbs or body of the fetus
- strangulation of the umbilical cord by amniotic bands
- pressing and prolapse of the umbilical cord - the umbilical cord is compressed in the birth canal by the fetus

Restriction of blood flow from the placenta leads to fetal asphyxia . The consequence can be neurological damage or even death in utero or during childbirth.

## Inflammation of the umbilical cord

1. **Acute funisitis** is an expression of the fetal inflammatory response and it is accompanied by acute chorionamnionitis. The umbilical cord has a normal appearance , except when affected by *Candida sp.*, as white or yellowish spots are visible on the umbilical cord in those cases. Inflammatory cells penetrate through the vessels towards the amnion on the surface of the umbilical cord.
2. **Subacute necrotizing funisitis** is a subacute or chronic inflammation of the umbilical cord with high perinatal mortality. Etiological agents are Treponema pallidum, Herpes simplex virus and probably other infectious agents with low virulence, e.g. Mycoplasmas . On the cut through the umbilical cord, the vascular walls are thickened. Histologically, a necrotizing basophilic exudate (sometimes calcifying) liquid is present in concentric circles or crescents around the vessels.

## Links

### Related articles

- Placenta
- Fetal circulation
- Cordocentesis

### Sources

- ČECH, Evžen – MARŠÁL, Zdeněk, et al. *Porodnictví*. 1. edition. Praha : Grada, 1999. 432 pp. ISBN 80-7169-355-3.