

Isolated Single Umbilical Artery In Singleton Pregnancies: Maternal and Neonatal Outcomes**Tekil Gebelerde İzole Tek Umbilikal Arter: Maternal ve Yenidoğan Sonuçları**

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ÖZ

Giriş: Tek umbilikal arter (TUA) en yaygın umbilikal kord anomalisidir. Çalışmanın amacı tek umbilikal kordu olan gebeliklerde maternal ve perinatal sonuçların incelenmesidir.

Gereç ve Yöntemler: Çalışmamız hastanemizde yürütülen retrospektif bir çalışmadır. Bu retrospektif kohort çalışmada tek umbilikal arter tanısı almış ve kanıtlanmış ek bir anomalisi olmayan hastaların maternal ve neonatal sonuçları incelenmiştir. Maternal yaş, doğum haftası, doğum kilosu, doğum şekli, fetal cinsiyet ve diğer komplikasyonlar kaydedilmiştir.

Bulgular: Antenatal olarak tespit edilmiş 42 TUA vakası saptanmıştır. Gestasyonel yaşın 258-289 gün arasında dağıldığı saptanmıştır. Median maternal yaş 28 olarak saptanmıştır (19-36). Gravida 2 olarak saptanmıştır (1-4). 5 gebelik invitro fertilizasyon sonrası oluşmuş olup, 2 gebelikte prematür membran rüptürü gözlenmiştir. Tek umbilikal arterli 2 bebekte kriptorşitizm ve 1 bebekte hipotiroidi saptanmıştır. Erkek cinsiyet %50 oranında saptanmıştır.

Sonuç: Tek umbilikal arter izole bir ultrasonografi bulgusu olduğunda da kriptorşitizm gibi minör defektler gözlenebilmektedir.

Anahtar Kelimeler: Fetal sonuçlar, tek umbilikal arter, umbilikal kord.

ABSTRACT

Aim: Single umbilical artery (SUA) is the most common umbilical cord abnormality. The aim of the study was to evaluate maternal and neonatal outcomes in pregnancies with single umbilical artery.

Material and Methods : This was a retrospective study from a tertiary referral center. In this retrospective cohort study, maternal and neonatal outcomes of patients who had a diagnosis of single umbilical artery without an established anomaly were reviewed. Maternal age, gestational age at delivery, birth weight, mode of delivery, fetal gender and any complications were recorded.

Results : There were 42 cases of SUA without an antenatally diagnosed anomaly. Gestational age ranged between 258-289 days. Median maternal age was 28 (19-36) years. Gravida was 2 (1-4). There were five in vitro fertilization pregnancies, and two pregnancies with premature rupture of membranes. Two of the neonates with single umbilical artery had cryptorchidism and one had hypothyroidism. Male gender was 50%.

Conclusion : When the single umbilical artery is an isolated ultrasonography finding, neonates will still have a possibility of having minor problems such as cryptorchidism.

Keywords: Neonatal outcome, single umbilical artery, umbilical cord.

INTRODUCTION

A normally formed umbilical cord contains two umbilical arteries and one umbilical vein. A single umbilical artery (SUA) is the most common anatomical abnormality of the umbilical cord. It is found in 0.08% to 1.9% of all pregnancies (1). In previous studies; many risk factors have been suggested in previous studies, including maternal smoking status, multiple gestations, ethnicity, maternal age, and multiparity (2). It has also been indicated in some studies that the risks of some adverse pregnancy outcomes; such as hypertensive disorders, intrauterine growth restriction, preterm delivery, and low birth weight in pregnancy; could be augmented in cases with a single umbilical artery (3,4). SUAs have been associated with fetal aneuploidy, premature delivery, stillbirths, low birth-weight, and multiple congenital anomalies

(including cardiac, renal, and musculoskeletal (5-7) structures). The introduction of prenatal ultrasound has made the assessment of the umbilical cord and prenatal diagnosis of SUA possible. The oxygenated blood from the placenta is carried by the umbilical vein to the fetus. A portion of the yolk sac, namely the allantois, is the origin of the umbilical arteries. The deoxygenated blood from the fetus is transported by these umbilical arteries to the placenta. The arterial system forms during the fourth and fifth week of embryonic development. The paired umbilical arteries, transporting deoxygenated blood, pass through the connecting stalk which will later become the umbilical cord, and drain into the chorionic vessels of the placenta. The proximal parts of the umbilical arteries become the internal iliac arteries and the superior vesical arteries. The distal parts obliterate after birth and become the medial umbilical ligament (8). There are three theories concerning the pathogenesis of

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an absent umbilical artery: (1) primary agenesis; (2) secondary atrophy or atresia of the previously normally developed vessel and; (3) persistence of the original allantoic artery of the body stalk.

The aim of the study was to evaluate maternal and neonatal outcomes in pregnancies with single umbilical artery.

MATERIAL AND METHODS

This was a retrospective study from a tertiary referral center. The study was approved by the Education, Planning and Coordination Council of the Zekai Tahir Burak Women Health Training and Research Hospital (approval date: 17.01.2013, No: 14). All cases underwent a detailed fetal anomaly scan in our unit. Detailed obstetric ultrasound examinations were performed between the 18th and 22nd gestational weeks. The standard protocol for fetal anomaly scanning in our unit included identification of the umbilical arteries by color-flow Doppler ultrasonography on the sides of the fetal bladder. In this retrospective cohort study, maternal and neonatal outcomes of patients who had a diagnosis of single umbilical artery without an established anomaly were reviewed. Only singleton pregnancies were evaluated. Maternal age, gestational age at delivery, birth weight, mode of delivery, fetal gender and any complications were recorded.

RESULTS

There were 42 cases of SUA without an established anomaly diagnosed antenatally. Gestational age ranged between 258-289 days. Median maternal age was 28 (19-36) years. Gravida was 2 (1-4) (Table 1). There were five in vitro fertilization pregnancies, two pregnancies with premature rupture of membranes. Two neonates with single umbilical artery had cryptorchidism and one had hypothyroidism. Intrauterine cardiac anomaly in 2 fetuses, trisomy 13 in one case, and trisomy 18 in another were detected. Descending aorta hypoplasia was reported in one patient. 14 cases were delivered by normal vaginal delivery, 12 cases by caesarean section, and 4 cases were diagnosed with oligohydramnios, 2 cases with polyhydramnios. Male gender was 50%.

Table 1: Demographic characteristics

Demographic characteristics	n (min-max)
Maternal age (years)	28 (19-36)
Gestational age (days)	28 (19-36)
Gravida	2 (1-4)
In fertilization pregnancies	5/42
Male gender (%)	50

DISCUSSION

Normally, there are two arteries and one vein in the umbilical cord. When one of the umbilical arteries is missing, this a condition referred to as "single umbilical artery" (SUA). Primary agenesis of one umbilical artery, persistence of the original single allantoic artery of the body stalk, or later thrombotic atrophy of one umbilical artery are the most widely accepted underlying explanations that would result in SUA. Development of a single umbilical artery is associated with primary agenesis of umbilical arteries, or atrophy or atresia of an existing artery.

Ultrasonography is important in diagnosis. In normal circumstances, a finding resembling a "Mickey Mouse" image is displayed. We do not see this image in SUA. Usually, a horizontal section view of the umbilical cord obtained 3cm distant from the location where the cord leaves the placenta, should display the 3vessels. Normally the arterial diameters are equal and are less than the half of the vein diameter. In these cases; the artery diameter is wider than the vein radius. Persutte et al. (9) have indicated that a transverse umbilical arterial diameter of >4 mm in the 20th - 36th pregnancy weeks is an important indicator of SUA. Another method is; while an investigation by color Doppler scanning of the fetal pelvis provides an image of two separate arteries navigating from both sides of the bladder, in case of SUA there is only one artery developing on one side of the bladder. The cases we have included in our study were cases detected through detailed ultrasonography.

Until recently the absence of umbilical artery was diagnosed by examining the cord after the delivery. Thanks to developments in ultrasonography devices, the diagnosis can now be made even in the first trimester. Detection of SUA by ultrasonography is affected by many factors; i.e., length of the cord, a gyros shape, the experience of the doctor, thickness of the skin, the position of the baby, and quality of the device. In our study; 32 cases detected by detailed ultrasonography were included in the study. We believe that the reason for detecting a low number of cases is related to the fact that the detailed ultrasonography is performed during the second trimester perinatal examinations, whereas they could be detected even in the first trimester. Fetal echo, which requires high level specialization in our clinic, has not been performed in all cases. Of the cases which underwent the echo procedure; intrauterine fetal anomaly was detected in two (6.25%). It has been reported that 15-20% of SUA cases are associated with cardiovascular anomalies. Prefumo et al. (10) have displayed that; between selected and unselected groups of fetuses with an SUA, and consistent with the presence or absence of extra cardiac abnormalities; the prevalence of congenital heart disease (CHD) shows a substantial difference.

They suggest that, if an extended basic cardiac scan, including four-chamber and outflow tract views have been performed, referral for specialist fetal echocardiography is not necessary unless a cardiac abnormality is suspected.

It has been determined that the SUA is more frequent in assisted reproductive technique pregnancies than normal developing pregnancies. There may be an association between the use of progesterone and SUA development, due to atrophic and apoptotic influences of progesterone, but there is a need for further investigation of this area. In our study, 5 cases were determined as IVF pregnancies.

In cases that are diagnosed with SUA in the prenatal phase, the existence of additional congenital malformations is checked through detailed ultrasonography. If they exist; it has been reported that invasive interventions for chromosomal analysis are required. In isolated cases with no additional structural anomalies; chromosomal anomalies are not expected. Thus karyotype identification is not recommended in isolated cases. Chromosomal anomalies; particularly trisomy 13 and trisomy 18, can be seen in approximately in 50% of cases with additional anomalies. Dogklis et al. (11) detected 643 isolated cases (424/ 65.9%), and 219 cases (34%) with additional structural anomalies. We, in our study, determined trisomy 13 in one case, and trisomy 18 in another one. Familial predisposition does not exist in single umbilical artery cases. Musculoskeletal system anomalies, urogenital, cardiovascular, gastrointestinal system, vertebral, crania-neural system, ophthalmic anomalies, diaphragmatic hernia, hydrops fetalis are among the other anomalies associated

with SUA. Anomalies related to SUA may concern every system in the body. In our study; we have detected a descending aorta hypoplasia in one patient, thyroid hypoplasia in another and; undescended testicles in two cases. Chang et al (12) suggested that fetuses with a prenatal diagnosis of SUA and other developmental abnormalities need to undergo prenatal chromosomal examination. For fetuses with uncomplicated SUA, careful ultrasound examination is necessary to avoid missed diagnosis of potential congenital abnormalities. In accordance with Chang et al, we suggest that when the single umbilical artery is an isolated ultrasonography finding, neonates will still have a possibility of having minor problems such as cryptorchidism.

In the presence of SUA; a normal fetus receives less oxygen. Predanic M et al (13) have not discovered a significant correlation between the single umbilical artery cases and birth weight. The birth weights in our study also were determined as normal, with a median of 3270 grams (2240 – 4150 grams). Only in two cases, due to prematurity, the birth weight has been low.

The result of a meta-analysis conducted by Voskamp et al. (14) displayed that larger studies on single umbilical arteries exhibited a weaker association between birth weight and single umbilical artery. Therefore, it was indicated by the authors that an evident relationship, in smaller sample-sized studies, between single umbilical artery birth weight could be the results of publication biases. Moreover Horton AL et al. (15) have not been able to find a significant relation between SUA and small for gestational age fetuses (SGA). No correlation has been determined between SGA fetuses and SUA in our cases. Small for gestational age (SGA), which is defined as an infant that does not display any abnormal parameters on Doppler studies and has a weight below the 10th percentile because of local curves (16). The incidence of small for gestational age (SGA) fetuses and hypertensive disorders in pregnancy was found to be significantly higher in cases with an isolated SUA (17). Burnshetin et al. (18) have shown that growth retardation, polyhydramnios, oligohydramnios and caesarean rates increase in fetuses with SUA. In our cases; 14 patients had normal vaginal deliveries, 12 patients were applied cesarean section; a further 4 cases were diagnosed with oligohydramnios, 2 with polyhydramnios.

Although a majority of previous studies have indicated that in cases with an isolated single umbilical artery, cesarean rates are higher due to non-reassuring fetal heart trace (4, 19), while other studies have failed to display any difference (15). In our study; 14 cases were delivered by normal vaginal delivery, and 12 cases by caesarean section.

As a conclusion; in order to diagnose SUA in the early stages, all pregnant women should undergo a detailed 2nd trimester ultrasonography screening. The radiologist and obstetrics & gynecology specialists who perform this procedure, should take note that the umbilical cord should at least be examined for quantitative anomalies. Counseling of the parents should be done properly. In pregnancies which have an isolated single umbilical artery complication, a strict monitoring for preterm birth seems to be unfeasible. However, in order to better clarify these aspects, larger sample sized prospective studies would be beneficial.

CONFLICT of INTERETS

The authors declare that there is no conflict of interests regarding the publication of this paper. The authors alone are responsible for the content and writing of the paper.

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