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ORIGINAL ARTICLE

Prenatal Diagnosis of Single Umbilical Artery: Incidence, Counselling and Management in Indian Scenario

Nupur Shah[1]

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About the Author

Dr Nupur Shah After pursuing postgraduation in OBGY, she completed her fellowship in Fetal Medicine at Apollo Centre of Fetal Medicine, New Delhi, followed by her training under Prof Kypros Nicolaides at King's College Hospital, UK. She has worked as a senior fellow in Apollo Hospitals, New Delhi. She is now working as a Consultant Fetal Medicine at Paras Bliss Fetal Medicine Centre, near Chandigarh.

Abstract

Purpose The objective of this study is to report the incidence of single umbilical artery (SUA) on prenatal diagnosis and formulate protocol for counselling and its management in Indian scenario.

Method A total of 1024 cases were screened for Single umbilical artery (SUA) between 12 and 20 weeks gestation during the 1 year period from May 2016 to April 2017. Targeted anomaly scan was performed for all cases at 18–20 weeks. Those with additional structural anomalies were subjected to invasive genetic testing. Serial growth monitoring starting from 28 weeks was done.

Results Out of ten cases diagnosed with SUA, five had isolated SUA. Two out of five cases of isolated SUA developed FGR in third trimester. Out of the remaining, three cases with additional structural anomalies had normal foetal karyotype, whereas other two cases showed chromosomal abnormalities (12pder and trisomy 18).

Conclusion Targeted anomaly scan is must in all cases of SUA. Invasive genetic testing must be offered in case of associated anomalies. Serial growth monitoring in third trimester is an important part of protocol.

Keywords Prenatal · Single umbilical artery · Counselling · Management · India

She is working as a Consultant Fetal Medicine at Paras Bliss Fetal Medicine Centre, Paras Bliss hospital, Panchkula (near Chandigarh).

✉ Nupur Shah
nupurmshah@gmail.com

[1] Paras Bliss Fetal Medicine Centre, Paras Bliss Hospital, Panchkula, Chandigarh, India

Introduction

A single umbilical artery is found in 1 of 200 deliveries [1]. When diagnosed on prenatal ultrasound in first or second trimester ultrasounds, it poses a dilemma in context to counselling the couple and offering invasive tests for foetal karyotype, amongst the obstetricians. In this study, we intend to analyse the incidence of single umbilical artery on prenatal ultrasounds in North Indian population, its association with structural and chromosomal abnormalities. We also report outcome in terms of foetal growth restriction (FGR) and gestational age at delivery and attempt to simplify counselling and protocol for management of such pregnancies.

Methodology

A total of 1024 cases were screened for single umbilical artery (SUA) between 12 and 20 weeks of gestation during the 1-year period from May 2016 to April 2017. Ten cases of SUA were detected. A targeted anomaly scan was performed in all the cases where SUA was found to exclude other structural anomalies. All those with additional anomalies were offered invasive diagnostic procedure with amniocentesis for foetal karyotype. All the cases were followed up every 4 weeks, 28th week onwards for growth monitoring. Foetal growth was also plotted on the graphs to analyse its appropriateness to the gestation (astraia software gmbh, Munich). Outcomes in terms of gestational age at delivery, foetal growth restriction (FGR defined as estimated foetal weight less than 5th centile for gestation) and additional anomalies at physical examination at birth were noted.

In cases of isolated SUA on targeted anomaly scan, biochemical screening (dual or quadruple test) was reviewed and all were reported as low risk of aneuploidies. No invasive testing was offered in these pregnancies based on the published statistics [1, 2]. These pregnancies were followed up every 4 weeks, 28th week onwards for serial foetal growth monitoring.

Results

The incidence of single umbilical artery in this study is 1%. Five (50%) cases had isolated SUA on targeted anomaly scan. On follow-up two out of five cases (40%) developed FGR in third trimester. The physical examination at birth showed no additional anomalies. The median gestational age at delivery was 37 weeks.

Three cases out of ten which had additional anomalies (choroid plexus cysts, echogenic focus in heart, aberrant right subclavian artery and suspected closed spina bifida) had normal karyotype on invasive testing. All of them showed FGR in third trimester follow-up scans.

Remaining two cases with additional anomalies (polyhydramnios, dysmorphic ears, flat facial profile, clenched hands and rocker bottom feet) reported chromosomal abnormalities on invasive testing (12pder and trisomy 18). These were offered termination of pregnancy.

Discussion

The umbilical cord forms between 13 and 38 days post-conception. It usually comprises of two arteries and one vein [3]. The theories that might explain the pathogenesis are: 1. primary agenesis of one umbilical artery, 2. secondary atrophy of one umbilical artery, 3. persistence of original allantoic artery of body stalk [3, 4]. On prenatal ultrasound in first and second trimester, at the level of foetal bladder in axial view on colour Doppler there is umbilical artery running on only one side of bladder (Fig. 1). In third trimester, a normal cord shows Mickey Mouse sign, which is missing in SUA as shown in Fig. 2. The incidence of SUA is 0.25% to 1% of all singleton pregnancies and up to 4.6% of twin gestations [5]. In our study, the incidence is 1% for singleton pregnancies. The rate of associated structural anomalies varies from 13 to 50%, and most commonly include renal, cardiovascular, gastrointestinal and central nervous systems [6]. Genetic syndromes that may feature an SUA include VATER complex (a group of congenital anomalies consisting of vertebral defects, imperforate anus, tracheoesophageal fistula, and radial and renal dysplasia), Meckel–Gruber and Zellweger [1, 6]. The incidence of associated structural anomalies in our study is 50%, and that of chromosomal abnormalities is 20%. All the cases of chromosomal abnormalities featured SUA with other structural anomalies. FGR was reported in 40% cases with isolated SUA in our study, but the incidence increased with associated anomalies.

Counselling and Management of Pregnancies with SUA Diagnosed in First or Second Trimester

All the pregnancies diagnosed with SUA should be thoroughly evaluated for the presence of additional structural anomalies, preferably by a foetal medicine expert. All cases wherein no other anomalies are detected can be reported as isolated SUA. Foetal echocardiography is of little significant if four-chamber, three-vessel and outflow tracts are already evaluated at anomaly scan by an expert

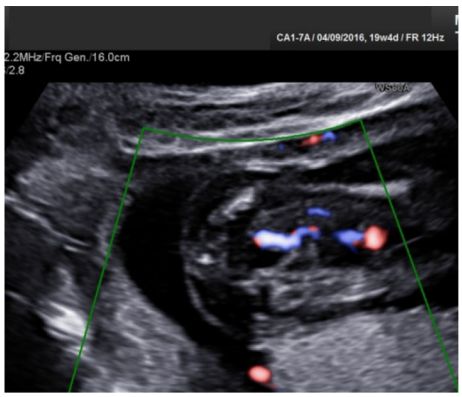

Fig. 1 SUA at 19 weeks at the level of foetal bladder on colour Doppler

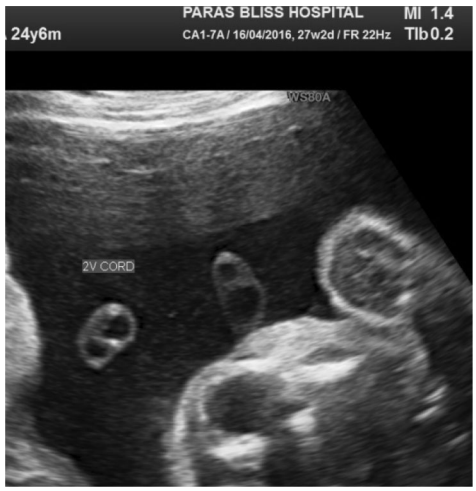

Fig. 2 SUA in third trimester, one ear of Mickey Mouse is missing

[6]. Because the incidence of chromosomal abnormalities is not increased in foetuses with an isolated SUA (< 1%), invasive genetic testing is not routinely indicated [1, 6].

In all the cases with additional structural anomalies, prenatal diagnostic procedures for foetal karyotype should be carried out [1]. The couple should be counselled accordingly, and in case if chromosomal abnormalities reported, termination of pregnancy can be offered before the legal limit of 20 weeks in our country [7].

In view of association of FGR in up to 30% of cases with isolated FGR [2, 8], the pregnancy should be evaluated for additional risk factors for FGR like low PAPP-A, pre-eclampsia, previous history of FGR, and the couple should be counselled regarding the same. Importance of serial growth monitoring 28th week onwards should be explained.

A thorough physical examination at birth by a neonatologist is advisable in view of prenatally unrecognizable abnormalities [2].

Conclusion

Isolated SUA on targeted anomaly scan with low-risk biochemical screening needs no diagnostic intervention but serial growth monitoring. The couple should be counselled about the good perinatal outcome and importance of serial growth monitoring in isolated cases.

In the presence of additional abnormalities, prenatal diagnostic tests for foetal karyotype/microarray should be offered.

An obstetrician who is the first contact point with the pregnant mothers can do the counselling or refer it to a foetal medicine expert.

Compliance with Ethical Standards

Conflict of interest There are no conflicts of interests to be disclosed.

Informed Consent The study was approved by the Ethics Committee, Paras Hospitals, and written informed consents were taken from the patients included.

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