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CONTEMPORARY STUDY

Single Umbilical Artery and Pregnancy Outcome: Cause for Concern

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ABSTRACT

Objective: To study the pregnancy outcome of antenatal women diagnosed with single umbilical artery (SUA) in singleton pregnancy in tertiary medical center and its association with intrauterine growth restriction (IUGR), renal and cardiac anomalies.

Materials and methods: We performed a prospective study of 6,711 singleton pregnancies at Sri Ramachandra Medical College, Chennai, between July 2009 and June 2011 and the pregnancies diagnosed with SUA were followed. The primary outcomes were renal anomalies, cardiac anomalies and IUGR.

Results: Of the 6,711 pregnancies there were 59 (0.88%) cases of SUA diagnosed at anatomic survey. Thirty seven pregnancies had isolated SUA (62.7%) and 22 singleton pregnancies had associated malformations (37.2%).

Conclusion: Our data suggests that the prevalence of SUA and associated anomalies seems to be similar to that reported in other countries. Evaluating cord vessels is important and fetuses with isolated SUA need more detailed assessment and monitoring[1] including Doppler study in the presence of IUGR. SUA with multiple anomalies need further evalution with fetal echocardiogram and invasive tests like amniocentesis for karyotyping.

Keywords: Single umbilical artery, Ultrasound, Fetal anomalies, Intrauterine growth restriction.

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INTRODUCTION

The umbilical cord contains two arteries and one vein, occasionally one artery is absent, left more common that right.[2] Single umbilical artery is the most common abnormality of the umbilical cord. Single umbilical artery can be diagnosed prenatally by ultrasound as early as 12 weeks of gestation. USG finding of two vessels on cross section of free loop of cord[3] and in the fetal pelvis as arteries course around the bladder is useful. A number of studies have reported that presence of single umbilical artery (SUA) is associated with variety of congenital anomalies,[4] chromosomal defects, aneuploidy and low birth weight. The incidence estimates of SUA from different countries range from 0.2 to 0.87%.[5] Some studies show an increased incidence of prematurity, intrauterine growth restriction (IUGR) and also cardiac and renal anomalies. When SUA is associated with structural abnormalities there are increased chances of chromosomal abnormalities like trisomy 21, 18, Turner's syndrome.[6]

The aim of our study was to estimate the incidence of singleton pregnancies with SUA in a major tertiary medical center, its clinical significance, its possible association with occurrence of other anomalies, further evaluation and outcome.

MATERIALS AND METHODS

In this prospective study, we studied a total of 6,711 consecutive singleton pregnancies at Sri Ramachandra Medical Centre between July 2009 to June 2011. All studies were performed by the same team of sonologists. SUA was evaluated as part of every routine anatomic survey. All cases diagnosed as SUA had detailed anomaly scan and fetal echocardiography. We studied the incidence of SUA in our study population. We evaluated the fetuses regarding associated anomalies, fetal growth, neonatal outcome and postnatal follow-up. All women with multiple anomalies with SUA were counseled for amniocentesis and karyotyping. Only three women were willing and underwent the procedure.

RESULTS

The incidence of SUA in our study is 0.87%. Out of the 59 cases of SUA diagnosed at anatomic survey, 37 (62.7%) singleton pregnancies had isolated SUA and 22 (37.2%) were nonisolated (SUA with multiple anomalies). Single umbilical artery was associated with cardiac defects in 10 cases (16.94%) (Table 1). Of these there were four neonatal deaths, five pregnancies were terminated in view of mulitiple anomalies and one case lost in follow-up. Six (10.16%) pregnancies with single umbilical artery had urogenital anomalies (Table 2). There was one case of bilateral renal agenesis, three cases of absent right kidney and two cases of hypospadias. Of these three were alive and healthy, one neonatal death (Vater complex), one had intrauterine death (prune belly syndrome), one case had multiple anomalies and renal agenesis so medical termination done.

There were multiple anomalies in 11 (18.64%) fetuses with single umbilical artery (Table 3). Of these two had neonatal deaths and nine pregnancies were terminated by medical means after diagnosis. In our study, one fetus was diagnosed as Vater complex (ventricular septal defect with aortic stenosis) died in neonatal period. There was one case of Patau's syndrome, i.e. trisomy 13 and one case of body stalk anomaly (abdominal wall defect with spinal abnormality), both terminated medically. There were eight singleton pregnancies (13.55%) with SUA with IUGR (birth weight of <10th centile). Of these (Table 4), six cases had isolated SUA, one case had tetrology of fallot and one case had hypospadias.

Table 1: Outcome of fetuses with SUA and cardiac anomalies

Obstetric score	*GA in weeks*	*CVS anomaly*	*Outcome*
G3P1D1A1	Term	Rt heart syndrome	SVD and Apgar 8/10 neonatal death
G2P1L1	Term	TOF/ IUGR	LSCS and Apgar 7/10 neonatal death
Primi	Term	VSD/TOF	Lost follow-up
G4A3	Term	VSD/aortic stenosis (Vater complex)	LSCS and Apgar 7/10 neonatal death
G3P1D1A1	Term	AV Septal defect/single ventricle	SVD and Apgar 7/10 neonatal death
G2P1L1	23	VSD + TOF (Taussig syndrome)	MTP/expelled
Primi	22	RT ventricle hypoplasia and tricuspid atresia	MTP/expelled
Primi	22	VSD + AV malformation	MTP/expelled
G4P1L1A2	28 + 6	Large VSD + Truncus arteriosus (Patau's syndrome)	MTP/expelled
G2P1L1	26	ASD + VSD + multiple anomalies	MTP/expelled

SUA: Single umbilical artery; VSD: Ventricular septal defect; ASD: Atrial septal defect; TOF: Tetrology of fallot; MTP: Medical termination of pregnancy; SVD: Spontaneous vaginal delivery

Table 2: Outcome of fetuses with SUA and urogenital anomalies

Obstetric score	*GA in weeks*	*Defect/syndrome*	*Outcome*
Primi	Term	Rt kidney absent	SVD and alive/healthy
Primi	Term	Rt kidney absent	SVD and alive/healthy
G4A3	Term	Rt kidney absent + imperforate anus + hypospadias	LSCS and neonatal death
Primi	Term	Hypospadias + IUGR	SVD and alive/healthy
Primi	26	Unilateral renal agenesis (Prune Belly syndrome)	MTP/expelled
G2P1L1	26	Renal agenesis + multiple anomalies	MTP/expelled

SVD: Spontaneous vaginal delivery, MTP: Medical termination of pregnancy

Table 3: Outcome of fetuses with multiple anomalies

Obstetric score	*GA in weeks*	*Defect/syndrome*	*Outcome*
G4A3	38	Vater complex	Neonatal death
Primi	32	Multiple anomalies	Neonatal death
Primi	23	Multiple anomalies	MTP/expelled
G3p2l1	22	Body stalk syndrome	MTP/expelled
Primi	20	Omphalocele + multiple anomalies	MTP/expelled
G2p1L1	28	Patau's syndrome (trisomy 13)	MTP/expelled
G2P1L1	23	Taussig syndrome + multiple anomalies	MTP/expelled
Primi	27	Occipital encephalocele + microcephaly	MTP/expelled
Primi	26	Prune Belly syndrome	MTP/expelled
Primi	25	Multiple anomalies	MTP/expelled
G2P1L1	26	Multiple anomalies	MTP /expelled

MTP: Medical termination of pregnancy

DISCUSSION

SUA can occur as isolated feature or associated with complex malformations, anueploidy and genetic syndromes. USG diagnosis is best done with color Doppler imaging. The exact cause of SUA is not known but primary agenesis, secondary atrophy[7] and persistence of the only existing artery are the most suggested mechanisms. Absence of left artery is more common. The incidence in most studies is 0.2 to 1.6% (euploid) to 9 to 10% (anueploid pregnancies).[8]

In our study the incidence was 0.88 per 100 pregnancies. SUA is associated with congenital anomalies. There is no specific pattern in the occurrence of malformations. There is a predominance of cardiac and urogenital anomalies.[2-4] If SUA is associated with multiple anomalies then the prognosis is reserved. All authors agree that if SUA is found, a detailed USG must be carried out to detect associated anomalies. A retrospective study performed in pregnancies with SUA (127/26883) by Vinlas, in Chicago USA 2008 found that 44/127 had major anomalies and 25/44 had cardiac anomalies. In our study, we found that 22/59 had anomalies and 10/22 showed cardiac anomalies. In a study by AS Gornall, JS Kronje, Prenatal Diag.[1] 2003 there were 20/107 anomalies. Of these 10/20 were renal anomalies. In our study there were 6/22 urogenital anomalies.

In cases of nonisolated SUA (SUA with complex malformations) further prenatal tests should be considered.[11] Fetal karyotyping should be offered to all nonisolated cases.[9] In our series we had 22 nonisolated SUA and offered karyotyping but only three patients were willing and underwent the same. Out of the three, trisomy 13 was detected in one case and the other two were normal.

In pregnancies with isolated SUA (no associated malformations, anomalies) the incidence of fetal growth

Table 4: Outcome of fetuses with IUGR

	IUGR	*Neonatal death*
Isolated	6	0
Nonisolated	2	1

IUGR: Intrauterine growth restriction; one fetus had tetralogy of fallot and another had hypospadias

Table 5: SUA and pregnancy outcome

SUA	*Alive/ healthy*	*MTP*	*Lost follow-up*	*Neonatal death*
Isolated (37)	34	0	3	0
Nonisolated (22)	3	11	2	6
Total (59)	37	11	5	6

restriction and small placental size is increased.[10] In our study, the pregnancy outcome (Table 5) was six neonatal deaths, 11 medical abortions, eight cases of IUGR and 22 pregnancies had complex congenital malformations.

CONCLUSION

Prenatal diagnosis of single umbilical artery should prompt detailed fetal anatomic survey especially four chamber view and outflow tract of the heart and genitourinary system.[11] Fetal echocardiogram may be useful. In cases of multiple anomalies[12] invasive testing like amniocentesis for karyotyping should be considered. In view of association with IUGR it seems reasonable to follow-up pregnancies with serial ultrasound assessment, (American College of Obstetricians and Gynecologists, ACOG).[13] These findings should be used to counsel women whose pregnancies are diagnosed with SUA and guide antenatal surveillance.

The neonate with single umbilical artery should be evaluated for anomalies.[14]

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