Prenatal ultrasound diagnosis of single umbilical artery (SUA) and pregnancy outcomes

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SUMMARY

The presence of a single umbilical artery (SUA) identified during routine morphological assessment in the second trimester is not rare. This retrospective descriptive study examines five cases where the prenatal ultrasound diagnosis of single umbilical artery (SUA) was made between seventeen and twenty-one weeks and reports on the outcomes of pregnancy.

In three of five cases there were associated abnormalities including one case of Dandy Walker variant confirmed after birth, a complex structural cardiac anomaly and one case of polyhydramnios. Fetal karyotype was assessed as normal in two cases.

Clinical growth restriction was suspected in one case but not confirmed. Doppler studies were undertaken in three cases and was abnormal in one case, complicated by polyhydramnios.

SUA is associated with structural and chromosomal abnormalities in around one third of cases. Common structural abnormalities in decreasing order of incidence are cardiac, gastrointestinal, central nervous system, genitourinary, respiratory and musculoskeletal. Chromosomal abnormalities include trisomy 13 and 18. A short review of the literature and management guidelines are presented.

INTRODUCTION

The normal umbilical cord consists of two umbilical arteries and one umbilical vein surrounded by Wharton's jelly. A single umbilical artery (SUA) has an incidence of 0.5%[1] with a higher prevalence in twin pregnancies[2]. The aetiology remains unknown but the most likely mechanism is atrophy of the second umbilical artery during development.[3,4]

The clinical implications of SUA include an increased incidence of congenital and karyotype abnormalities, intrauterine growth restriction, premature birth and fetal death. Interpretation of Doppler velocimetry is problematic as estimates of normal values are based on the presence of two umbilical arteries. Patient counselling in the setting of SUA is required, especially with respect to fetal karyotyping.

The reported sensitivity and positive predictive value of sonographically detected SUA is 65%[5]. It is noted that two and three vessels can co-exist in different segments of the same umbilical cord[6].

This paper reports the findings in five patients seen at a regional Queensland Base Hospital over twelve months with a prenatal ultrasound diagnosis of single umbilical artery.

MATERIAL AND METHODS

The perinatal database was searched to find patients who had delivered at Bundaberg Base Hospital with a two-vessel umbilical cord during the study period.

Relevant data wereextracted from patient records, including age, parity, clinical evidence of intrauterine growth restriction and any tertiary referral for fetal karyotyping, pregnancy outcomes including birth weight, naked eye placental examination, post delivery and paediatric follow-up.

Data extracted from sonographic records included the gestational age at the time of identification, the presence of coexisting abnormalities, evidence of growth restriction and Doppler readings.

RESULTS

Five cases of SUA were identified. The mean age was twenty-eight years. Four of five were multips. Clinical growth restriction was detected in one case and this was confirmed on ultrasound criteria. Tertiary referral to a fetal unit was undertaken in two cases, with a normal karyotypes established in both.

The sonographic diagnosis was made in all cases between seventeen and twenty-one weeks. In three of five cases there were other abnormalities. In one case there was an amniotic band and a dilated fourth ventricle suggesting a Dandy Walker variant. In one case structural cardiac anomalies consisting of a small left ventricle; dominant right ventricle; a large right outflow tract and a large VSD were detected. The third case had idiopathic polyhydramnios.

Doppler velocimetry was obtained in three cases in the third trimester and the mean Doppler reading was 3.36. In one case a value in excess of 4.0 was obtained, but this pregnancy was complicated by hydramnios.

In three cases delivery was *per vaginum*, in one elective Caesarean section was performed for obstetric reasons and in one case there was elective termination of the pregnancy.

There were no cases of low birth weight (less than 2500g) in the term deliveries and one infant had a Dandy Walker variant confirmed after delivery.

All placentas showed a two-vessel cord, examined at the point of transection.

DISCUSSION

SUA have been associated with structural and chromosomal abnormalities. Common structural abnormalities in decreasing order of incidence are cardiac, gastrointestinal, central nervous system, genitourinary, respiratory and musculoskeletal systems.

The incidence of structural abnormalities has been reported in one study as 31% (in keeping with the two in five in this review). Where SUA was the only sonographic abnormally, 7% of neonates had some structural abnormality when examined post delivery[7].

No cases of chromosomal abnormalities were identified in this study, in keeping with other studies where abnormal chromosomes are reported in 11.3% of fetuses with SUA, most commonly trisomy 13 and 18[8].

Although growth restriction was clinically and sonographically suspected in one case, the birth weight was in excess of 2500g. Growth restriction is reported to occur in association with SUA and was detected in 10.2% in one study[9].

One patient demonstrated elevated cord Doppler values but this pregnancy was complicated by hydramnios. Doppler readings in pregnancies with SUA are generally towards the lower end of the normal range, attributed to the larger arterial diameter which may be associated with decreased flow resistance[10]. Doppler abnormalities have been reported to occur in 30% of fetuses with SUA. Abnormal Doppler readings in SUA are highly associated with growth restriction, complex structural malformations or an abnormal karyotype[11].

A suggested protocol for the management of prenatally diagnosed SUA on ultrasound includes a detailed sonographic evaluation with fetal echocardiography possibly at a tertiary fetal ultrasound or cardiac unit. The finding of a second pertinent sonographic abnormality is an indication for karyotype determination. Clinical growth monitoring for the remainder of the pregnancy appears indicated, augmented by Doppler velocimetry where there is clinical concern. Counselling of the parents should include a description of the recognized associations and impact on fetal/perinatal mortality.

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