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ULTRASOUND

Parental decision-making differences between patients in two healthcare systems for choroid plexus cysts

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SUMMARY

We evaluated the medical-sociological implications of parental perception of risk and decision-making choices for prenatally ascertained choroid plexus cysts (CPC) between two obstetric populations.

The Wayne State University (WSU) Reproductive Genetics database and the Madigan Army Medical Center (MAMC) experience were reviewed to compare the rates of aneuploidy and invasive testing for cases with CPC. Aneuploidy rates were compared between those with isolated CPC, CPC with advanced maternal age (AMA), and CPC associated with multiple anomalies.

In the WSU cohort 186 cases were identified, of whom 27 (15%) declined invasive fetal testing. In the remaining 159 cases, aneuploidy was present in 2/132 (1.5%) isolated CPC, 3/11 (27%) CPC with AMA, and 15/16 (93%) CPC with multiple anomalies.

In the MAMC cohort 107 cases were identified, of whom 99 (92%) declined invasive fetal testing. No aneuploidy cases were found in the 3/12 AMA cases or 5/95 non-AMA cases that underwent amniocentesis.

The two cases of aneuploidy with isolated CPC cannot be ignored, and provide an estimated attributable risk of at least 0.8%, a higher risk than 38 years of age. However, the parental sociologic context may be as important for decision-making as the genetic-prognostic risk.

INTRODUCTION

The choroid plexus is the primary source of cerebrospinal fluid for the brain and spinal cord. It is present in the third and fourth ventricles and is visualised in the lateral ventricles as a large hyperechogenic structure.[i,ii] Fetal choroid plexus cysts (CPC) were first recognised on obstetric ultrasound in 1984.[iii] The incidence of choroid plexus cysts in routine antenatal ultrasound screening is reported to be between 0.18% to 2.5%, with the majority spontaneously resolving by 26–28 weeks gestation.[4,5,6] Choroid plexus cysts, initially considered to be benign and transient, were subsequently demonstrated to be associated with fetal aneuploidy.[7]

Nicolaides first postulated an association between choroid plexus cysts and Trisomy 18 in 1986, and in 1987 Ricketts described an association of choroid plexus cysts with Trisomy 21.[8,9]

The risk of aneuploidy in the presence of isolated choroid plexus cysts is reported to be 1.22–2.6%.[10,11,12,13,14,15] As a consequence, invasive prenatal diagnostic testing has been recommended for cases in which choroid plexus cysts have been identified.[16,17,18,19,20,21,22] However, debate remains regarding the true association between this minor ultrasonographic dysmorphism and aneuploidy.[4,18] The purpose of this study was, therefore, to evaluate the impact of choroid plexus cysts in two diverse patient groups in an attempt to explain the disparate recommendations in the literature.

It has long been appreciated that from the perspective of the genetic counsellor or obstetrician, the easiest situations are those in which there is certainty about the actual risks. Poor prognoses may be unpleasant to convey but are straightforward in comparison

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to situations in which there is considerable uncertainty as to expected outcomes. How patients could perceive such uncertain data is, likewise, variable, thus, we sought to study how two disparate patient population groups would deal with similar but ambiguous genetic risk factors.[23,24]

MATERIALS AND METHODS

The genetics abnormal case databases from WSU and MAMC were reviewed to compare the rates of aneuploidy for cases with fetal choroid plexus cysts. Aneuploidy rates were compared among those fetuses with isolated choroid plexus cysts, choroid plexus cysts with other anomalies demonstrated on ultrasound, and choroid plexus cysts in patients with AMA. Patients undergoing obstetric ultrasound in the WSU cohort were generally referred from other institutions (the referral base includes both indigent and private referral patients). Patients in the MAMC cohort were offered routine sonographic anatomic screening between 16 and 20 weeks. All patients underwent a thorough fetal anatomic survey. Upon demonstration of a choroid plexus cyst or other anomaly, genetic counselling was offered and was performed by either a genetic counsellor, or Fellow in maternal fetal medicine or genetics, under the supervision of a board certified clinical geneticist. Amniocentesis was routinely offered at both centres to patients with choroid plexus cysts. Parental decision-making regarding invasive prenatal diagnostic testing serves as the surrogate for recognised risk.

RESULTS

In the two study groups 293 cases of CPC were identified. The WSU cohort had 186 cases; 27 patients (15%) declined invasive fetal testing. In the remaining 159 cases, aneuploidy was detected in 2/132 (1.5%) patients with isolated CPC, 3/11 (27%) CPC associated with AMA, and 15/16 (93%) CPC associated with multiple anomalies (Table 1).

In the MAMC cohort 107 cases were identified; 96 (90%) declined invasive fetal testing. No cases of aneuploidy were demonstrated in the 3/12 patients with advanced maternal age, nor in the 5/95 patients not of advanced maternal age who had amniocentesis (Table 1). No cases of aneuploidy were reported in liveborns in the MAMC cohort.

Perceived risk warranting invasive prenatal diagnostic testing by parents varied between cohorts; 85% (WSU) chose to undergo testing versus 10% (MAMC) (Table 1).

Table 1 Aneuploidy in fetuses with CPC

Total cases	Wayne State University n (%)	Madigan Army Medical Centre n (%)
CPCs	186	107
No testing	27 (15)	96 (90)
Amniocentesis	159 (85)	11 (10)
Aneuploidy with isolated CPC	2 (1.5)	0 (0)
Aneuploidy with AMA	3 (27)	0 (0)
Aneuploidy with CPC and multiple anomalies	15 (93)	0 (0)
Aneuploidy in untested fetuses		0 (0)

DISCUSSION

The attributable risk for aneuploidy when CPC is found poses a counselling conundrum that is apparent in our data. Earlier reports, summarised in Table 2, suggested that amniocentesis should be offered when a choroid plexus cyst was identified.[4,10,11,14,16,17,18,19,20,21] However, in a recent study Reinsch suggested that an isolated choroid plexus cyst may not be associated with an increased risk of Trisomy 18 or Trisomy 21.[4] The two cases of aneuploidy with isolated CPC cannot be ignored, and provide an estimated attributable risk of at least 0.8%, a higher risk for aneuploidy than 38 years of maternal age. However, the differing rates of invasive prenatal testing suggest that the parental sociologic context may be as important as the genetic-prognostic risk for decision-making.

Table 2 Studies reviewing incidence of aneuploidy with isolated CPC or CPC with other anomalies

Study	Total number of patients evaluated	Total number of cases with CPC	Number of cases with aneuploidy other and isolated CPC	Number of fetuses with aneuploidy with CPC and anomalies detected on ultrasound
	n	n (%)	n (%)	n (%)
Gabrielli et al[11]	NI	82	0 (0)	4 (4.9)
Platt et al[16]	7350	71 (0.96)	0 (0)	4 (5.6)
Sohn et al[18]	4326	41 (0.94)	0 (0)	1 (2.4)
Ostlere et al[21]	11700	100 (0.85)	0 (0)	3 (3)
Walkinshaw et al[10]	15565	152 (0.98)	2 (1.3)	0 (0)
Achiron et al[20]	5400	30 (0.56)	1 (3.3)	1 (3.3)
Porto et al[14]	3247	63 (1.9)	2 (3.2)	4 (6.3)
Reinsch[4]	16059	301 (1.9)	0 (0)	3 (1)
Kupferminc et al[19]	9100	102 (1.1)	4 (3.9)	3 (2.9)
Thorpe-Beeston et al[17]	NI	83	0 (0)	4 (4.9)

NI = not indicated

Potential reasons for interpretive differences of the reports to date include i) the low incidence of Trisomy 18 given the small size of the cohort study groups, ii) the varying nature of the populations studied, iii) different study population sizes, and iv) the remarkable improvements in ultrasonographic resolution and skill in the ascertainment of additional anomalies possible.

The two study populations in this study vary in age and risk distributions, most likely representing the referral nature of the WSU cohort (older and more multiple anomalies) compared to the MAMC cohort who received routine sonographic fetal anatomic screening, and maternal serum analyte screening with fetal echocardiography performed as indicated.

It is not possible to determine from these data the aetiology of the drastically different parental decisions about seemingly similar risk situations. Several years ago we showed that a patient's state, but not trust-anxiety levels, were altered by abnormal biochemical screening results and that such patients were more anxious than those referred to genetic testing because of AMA. Our data are also consistent with the phenomena seen with laboratory screening tests.

While the sensitivity and specificity do not vary with population prevalence, positive and negative predictive values do. Such recognition may now finally explain variance between centes, and suggests that the significance attached to the detection of CPC needs to be adjusted to the demographics of the particular population. At the very least, identification of fetal CPC is an indication for a more diligent search for other risk factors such as pedigree analysis, comprehensive fetal anatomic survey, and fetal echocardiography to provide adequately informed genetic counselling.[25] The polarisation of actions is far too disparate to be merely by chance. The differing rates of invasive fetal testing between centres offers a textbook example of the pluralistic variations of decision-making in our society.

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