Journal of Vessels and Circulation
Qom University of Medical Sciences
Winter 2023. Volume 4. Number 1

Research Paper

Determining the Association Between Congenital Heart Diseases in Fetuses With Plexus Choroid Cyst

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Please cite this article as Arjmandnia MH, Yousefi M, Rahimi Sh, Vahedian M, Sharifi M, Rezvan S, et al. Determining the Association Between Congenital Heart Diseases in Fetuses With Plexus Choroid Cyst. J Vessel Circ. 2023; 4(1):1-6. http://dx.doi.org/10.32598/JVC.4.1.31.24

doi: http://dx.doi.org/10.32598/JVC.4.1.31.24

Article info:
Received: 22 Jul 2022
Accepted: 11 Sep 2022
Publish: 01 Jan 2023

Keywords:
Congenital heart diseases, Plexus choroid cyst, Fetal anomalies

ABSTRACT

Background and Aim: This cross-sectional study investigates the association between congenital heart diseases (CHD) in fetuses with choroid plexus cysts (CPCs) detected through fetal anomaly sonography. The study was conducted at Masoumeh Children Hospital in 2019.

Materials and Methods: A total of 250 participants were enrolled using the available sampling method. The data included maternal age, gestational age, fetal sex, CPC presence, and CHD diagnosis. Fetal echocardiography was performed, and the participants were categorized into groups with and without CHD. The statistical analyses were carried out using the SPSS software, version 22. Descriptive statistics, the chi-square tests, and the independent t-tests were employed for data description and comparison.

Results: The mean age of mothers with CPCs was 32.1±10.92 years, while in the healthy mothers' group, it was 32.78±10.73. CPCs were observed in 57.8% of female neonates and 62.6% of male neonates, with no significant statistical relationship to fetal sex. Although the group with CPCs exhibited more abnormal fetal echocardiographic findings, no significant association was observed between these findings and CPC presence. Additionally, no significant relationship was identified between pregnancy term and CPC presence.

Conclusion: Infants with CPC had a higher incidence of congenital heart defects, as seen on the echocardiogram; however, there was no significant correlation between the presence of these cysts and heart defects. Thus, parents need not to worry.

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Introduction

Choroid plexus cysts (CPCs) are small fluid-filled structures that develop from the lateral ventricles of the fetal brain. These cysts form when cerebrospinal fluid accumulates in the villi and may disappear as the pregnancy progresses [1-3]. CPCs are usually found by chance during ultrasounds conducted in the second trimester and are present in approximately 1% to 3.6% of all fetuses [4]. Arjamandania's study revealed that diabetic babies have a high incidence of congenital heart abnormalities [5]. Cysts can occur as a single or multiple and on one or both sides, with no difference in occurrence between males and females [2]. During second-trimester screening sonography, fluid-filled structures called CPCs are observed in the fetal brain's lateral ventricles [4, 6]. These cysts may be single/multiple or unilateral/bilateral [2, 7]. They are diagnosed in 1% to 3.6% of all fetuses, while 90% resolve until 26-28 weeks of gestation [3, 8]. Although many CPCs are typically considered harmless because they can result from cerebrospinal fluid blockage in developing ventricles, they can also indicate a chromosomal irregularity, particularly trisomy 18 [7, 9]. The clinical significance of CPCs that remain present during the second trimester is uncertain when diagnosed through ultrasound. However, there is a known association with other growth abnormalities, such as trisomy 18, trisomy 21, and the Klein-Felter syndrome. This connection has been well documented [10, 11]. In 1984, the correlation between Trisomy 18 and CPC was initially established, with CPC present in 30% to 50% of trisomy cases [12]. Limited research has been conducted on the correlation between congenital heart disease in infants and CPCs. However, a study conducted in 2011 suggested a potential link between CPCs, hydronephrosis, and congenital heart disease (CHD) [1, 13]. To date, there has been no report on the prevalence of CPCs associated with CHD. The objective of this study is to ascertain the prevalence of CHD in fetuses with CPC identified during fetal anomaly sonography in mothers referred to Hazrat Masoumeh Hospital in 2019.

Material and Methods

This study was performed cross-sectionally. The sample size, according to the formula and considering the probability of Type 1 error, was equal to 5%, power of 0.8, and the rate of CPC in the group with CHD and without CHD was equal to 26% and 12%, respectively. Based on the results of similar studies [13], the minimum number of required samples was calculated at 119 people in each group, which will be added 5% to the sample volume due to possible losses, and 125 individuals in each group and a total of 250 people were studied. The sampling was done by the available method. The data collection tool in this study was a researcher-made checklist that included variables such as gender, CHD, gestational age, CPC, maternal age, and gestational turn. After approving the plan and obtaining the Code of Ethics from Qom University of Medical Sciences, the researcher began to conduct the study. In this study, brain sonography was performed in fetuses with CPCs, and their mothers were referred to Hazrat Masoumeh Hospital for echocardiography. Then, in the next step, based on the echocardiographic results and clinical examinations, we divided all these fetuses into two groups with CHD and without CHD. In addition, variables such as maternal age, gestational age, and sex were entered into checklists. Finally, the prevalence of the CPC was compared between the two groups. We used descriptive statistics, such as Mean±SD, and frequency tables, for data description. For comparison, we used the chi-square test for qualitative data and the independent t-test for quantitative data. The results were analyzed using the SPSS software, version 22. The significance level was considered 0.05.

Results

The mean age of mothers in the CPC group was 32.1±10.92 years, and in the healthy mother's group was 32.78±10.73 years. The two groups had no significant statistical difference (P=0.631). A total of 78(57.8%) female neonates and 72(62.6%) male neonates had choroidal cysts, and no significant statistical relationship was found between neonatal sex and CPCs (P=0.517) (Table 1).

Based on the results of the Table 2, in the group with CPC, fetal echocardiographic findings showed that this group had more abnormal findings compared to a healthy fetal group; however, no significant relationship was found between echocardiographic findings and choroid cyst (P=0.402).

Also, based on the Table 3, no significant relationship was found between pregnancy turn and CPC (P=0.338).

Discussion

CPCs are harmless and temporary, and the only requirement for managing patients with these cysts is to conduct repeated sonography tests at 24 weeks of pregnancy to ensure that they have been eliminated. According to a

Table 1. Relationship between neonatal sex and choroid plexus cyst

Choroid Plexus Cyst Existence		No. (%)			P
		Sex		Total	
		Girl	Boy		
Choroid plexus cyst	Yes	78(57.8)	72(62.6)	150(60.0)	
	No	57(42.2)	43(37.4)	100(40.0)	0.517
Total		135(100)	115(100)	250(100)	

Table 2. Relationship between congenital heart disease and choroid plexus cyst

CHD Type		No. (%)								Total	P
		Congenital Heart Disease									
		Healthy	PDA	ASD	VSD	TGA	TA	COA	PTA		
Choroid plexus cyst	Yes	62(54.4)	25(69.4)	31(66.0)	17(68.0)	10(62.5)	2(28.6)	2(66.7)	1(50.0)	150	
	No	52(45.6)	11(30.6)	16(34.0)	8(32.0)	6(37.5)	5(71.4)	1(33.3)	1(50.0)	100	0.402
Total		114(100)	36(100)	47(100)	25(100)	16(100)	7(100)	3(100)	2(100)	250	

Abbreviations: PDA: Patent ductus arteriosus; ASD: Atrial septal defect; VSD: Ventricular septal defect; TGA: Transportation of the great arteries; TA: Tricuspid annular; COA: Coarctation of the aorta; PTA: Percutaneous transluminal.

study conducted by Enono Yhoshu, CPCs may involve one or both ventricles and disappear in approximately 95% of the cases, primarily within 2 months from the diagnosis [14]. According to Chitkara et al. 41 fetuses were found to have CPCs, which had reduced by 90% by 28 weeks of gestation. Once the cysts disappeared, they did not reappear, and a normal ultrasound in the second trimester predicted a normal scan in late pregnancy and infancy. Therefore, the researchers concluded that CPCs in fetuses are harmless and indicate normal intracranial anatomy [15]. Norton et al. conducted a study to investigate the frequency of CHD and its correlation with CPCs [13]. A study compared the presence of CPCs in neonates with and without CHD. The results showed a higher prevalence of these cysts in infants with heart disease; however, no significant difference between the two groups. The group with cysts had more abnormal fetal echocardiographic findings, but no significant relationship was found between these findings and the cysts. A study was carried out by Irani et al. to explore the clinical importance of choroid plexus cysts and their outcomes. They evaluated all prenatal ultrasounds and

Table 3. Relationship between pregnancy turn and choroid plexus cyst

Parity Pregnancy		No. (%)							P
		Para						Total	
		1	2	3	4	5	6		
Choroid plexus cyst	Yes	58(61.7)	52(63.4)	22(46.8)	9(69.2)	7(58.3)	2(100.0)	150(60.0)	
	No	36(38.3)	30(36.6)	25(53.2)	4(30.8)	5(41.7)	0(0.0)	100(40.0)	**0.338**
Total		94(100)	82(100)	47(100)	13(100)	12(100)	2(100)	250(100)	

found that fetuses with choroid plexus ultrasound did not display any abnormalities by 25 weeks of gestation, and all newborns were healthy after delivery. Nonetheless, our investigation produced dissimilar findings [16]. The data in this study indicated that the likelihood of these abnormalities is higher when CPCs are detected in brain ultrasounds of patients with CHD. As a result, it is advised that infants diagnosed with CPC undergo further evaluation for cardiac issues.

Conclusion

The study's findings indicate that infants with CPC had a higher incidence of CHD as seen on echocardiogram. There was no significant correlation between these cysts and heart defects. Accordingly, the parents can be assured that there is no cause for concern.

Ethical Considerations

Compliance with ethical guidelines

This article has been approved by the Ethics Committee of Qom University of Medical Sciences (Code: IR.MUQ.REC.1399.099).

Funding

This research did not receive any grant from fund-ing agencies in the public, commercial, or non-profit sectors.

Authors' contributions

All authors participated equally in the design, execution, and writing of all parts of this research.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors are grateful to the Research and Technology Vice-Chancellor of Qom University of Medical Sciences.

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