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Review

Apparently Isolated Ventricular Septal Defect, Prenatal Diagnosis, Association with Chromosomal Aberrations, Spontaneous Closure Rate in Utero and during the First Year of Life: A Systematic Review

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Abstract

Aim: To evaluate the incidence of chromosomal aberrations in apparently isolated ventricular septal defects (VSD), quantify the timing of diagnosis of prenatally diagnosed VSDs, and define the spontaneous closure rate prenatally both in utero and during the first year of life.

Materials and methods: Medline, PubMed, and the Cochrane Database Library were searched to identify studies published between January 2013 and January 2023 using keywords and word variant combinations for isolated ventricular septal defect, fetal echocardiography, karyotype, genetics, array CGH, spontaneous closure, and outcome. Inclusion criteria: studies reporting apparently isolated ventricular septal defect. Primary outcomes: to find the incidence of chromosomal aberrations in apparently isolated ventricular septal defects, and quantify the timing of diagnosis. Secondary outcome: to define the spontaneous closure rate in utero and in the first year of life. Statistical analysis was performed using Jamovi Meta-Analysis major package 2.3.21 Solid. To combine data, we used proportions and maximum likelihood ratios.

Results: Overall, the maximum likelihood ratio of chromosomal aberrations in antenatally diagnosed apparently isolated VSD was 2.7%. The different types of defects showed substantially different rates of chromosomal aberrations. Muscular VSDs had a chromosomal aberrations rate of 0.4% vs. 4.8% for perimembranous VSDs. Mean gestational age of diagnosis was 25^{+4} days. Spontaneous closure rate maximum likelihood ratio in utero was 28.6%. Higher closure rate in utero was observed for the perimembranous type while muscular VSDs showed higher closure rates after birth. Closure in utero was observed in 28.9% of the perimembranous VSDs and in 14.5% of the muscular VSDs. Closure after 12 months was found in 22% for the perimembranous defects and in 53.8% for the muscular defects. The presented results could be of use in informed prenatal counseling and of great help in parental decision making.

Conclusions: This systematic study included 740 isolated ventricular septal defects, of which 422 were muscular and 165 were perimembranous. Other types were not specified. One hundred fifty-nine perimembranous and 384 muscular VSDs were available for a follow-up after 12 months of life. Chromosomal aberrations were detected in 4.8% of the perimembranous VSDs and in 0.4% of the muscular VSDs.

Keywords

fetal echocardiography, isolated ventricular septal defect, karyotype, spontaneous closure, outcome

INTRODUCTION

Ventricular septal defects (VSDs) are the most common congenital heart anomalies (CHD) in newborns, affecting 25%-30% of neonates with cardiac defects.[1] The exact incidence and natural history of the condition remain controversial.[2] A meta-analysis of 53 studies published in 2002 reported a mean VSD incidence of 3.45/1000, but these studies, the majority of which were conducted in the 1980s, were found to be unrepresentative because small VSDs were excluded from them.[3] The recent increase in neonatal prevalence of VSDs is due to changes in the diagnostic methods and screening modalities, such as the widespread use of fetal echocardiography.[4] Demonstration of any VSD during fetal life is feasible by ultrasonography as early as the late first trimester.[5] Improvement in imaging techniques has led to higher detection rates of VSD in prenatal setting.[6] Prenatal sonographic diagnosis can be difficult. The best visualization of the ventricular septum is achieved by using subcostal approach to the four-chamber view. The presence of intact ventricular septum should be visualized by long-axis view of left and right ventricles together with an apex to base sweep along the short axis.[7] The diagnosis of this common defect in utero has been linked to an increased risk of chromosomal aberrations.[8] An estimated 30% of all VSDs are attributed to chromosomal aberrations or monogenic disorders, but the etiology of the remaining 70% has not been established yet.[9] However, the exact incidence of abnormal karyotype varies from <1%[1,10] to 20%-30%[11,12] and up to 90%, compromising the quality of the genetic counseling and informed decision of the parents[13]. Another challenge in determining the frequency of chromosomal aberrations is the existence of different definitions for an isolated ventricular septal defect. Even in cases of an isolated VSD with no detectable genetic defect, there is an increased recurrence rate for CHD of about 3% among first degree relatives, highlighting the genetic component of this malformation.[9] Recent large-scale cohort studies have shown that 1.8% of isolated VSDs have genetic abnormalities.[8] The severity of VSD ranges from small, isolated muscular VSDs that close spontaneously to large VSDs requiring surgery shortly after birth.[14] The spontaneous closure rate varies between 11% and 71%.[12,15,16] The defects which remain patent after the first year had different reported rates. For VSDs with the size of the defect less than 3 mm, the rate was 15.8%, while it was 71.4% for those greater than 3 mm in size.[12] Closure rates differs according to the place of the defect in the septum: mid-ventricular muscular trabecular VSD – 89%, apical muscular trabecular – 84%, anterior muscular trabecular – 83%.[17] The closure rate depends on the type of defect: it was 74.0% for muscular VSDs and 22.2% for membranous VSDs.[18] The spontaneous closure rate reported in utero was 5%, and that within 1 year of life – 76%.[1]

AIM

This systematic review of studies published in the last decade aimed to find the incidence of chromosomal aberrations in apparently isolated ventricular septal defects and quantify the timing of diagnosis as a primary outcome. The secondary outcome is to define the spontaneous closure rate in utero and during the first year of life.

MATERIALS AND METHODS

Literature search review

The research was conducted following the PRISMA guidelines.[19] We searched PubMed, Medline, and the Cochrane Library Databases using key words and word variant combinations for isolated ventricular septal defect, fetal echocardiography, karyotype, genetics, array CGH, spontaneous closure, and outcome. The search was conducted electronically in September 2022 and updated in January 2023. The search and selection criteria were restricted to the English language. Reference lists of relevant articles and reviews were searched manually.

Inclusion criteria, primary and secondary outcomes

The inclusion criteria were studies reporting isolated VSDs. The primary outcome was the timing of the prenatal diagnosis and the incidence of chromosomal aberrations. The secondary outcome was the spontaneous closure rate in utero and in the first year of life.

Study selection and data collation

Only studies reporting and combining the incidence of chromosomal aberrations, prenatal diagnosis, and spontaneous closure rates were selected for inclusion. Studies associated with other structural anomalies on ultrasound were excluded from the study. We excluded studies published before December 2012.

Quality assessment

Quality assessment of the included studies was performed using the Newcastle-Ottawa scale (NOS) for case control and cohort studies. According to this scale, each study was judged on three broad perspectives: selection of the study groups, comparability of the groups, and outcome of interest **(Table 1)**.

Statistical analysis

Statistical analysis was performed using the Jamovi Meta Analysis major package 2.3.21 Solid. To combine data,

we used proportions and maximum likelihood ratios. Between-study heterogeneity was explored using the I^2 statistic which represents the percentage of between-study variation that is due to heterogeneity rather than chance. A value of 0% indicates that no heterogeneity is observed while values over 50% are associated with substantial heterogeneity.

Table 1. Quality assessment of the included studies according to Newcastle-Ottawa scale for cohort studies

Study	Selection	Comparability	Outcome
Cheng et al.[20]	•••	••	•••
Erol et al.[22]	••	••	••
Kopylov et al.[21]	•	•	•
Svirsky et al.[9]	•••	•	••
Gomez et al.[1]	•••	•••	•••
Vedel et al.[14]	•	••	•

RESULTS

General study characteristics: A total number of 521 articles were identified, 53 were assessed with respect to their eligibility for inclusion. Six studies were included in the systematic review **(Table 2, Fig. 1)**. These 6 studies included 740 isolated VSDs. No randomized control trials were available for inclusion, data was derived from cohort studies.[1,9,14,20-22]

Chromosomal aberrations rate with maximum likelihood ratio in the isolated VSDs was 2.7% (CL 95%, I^2 0%) with ranges of chromosomal aberrations reported between 0.0% and 6.6%. The mean genetic abnormality rate for the included studies was 2.2%. The highest rate was reported by Svirsky et al.[9] where two genetic abnormalities were reported. Kopylov et al.[21] reported the lowest rate and Erol et al.[22] identified no isolated VSDs with genetic abnormalities **(Fig. 2)**.

The maximum likelihood ratio for mean gestational age at detecting the apparent isolated ventricular septal defects in the included studies was 24^{+4} days (Cl 95%, I^2 0%) ranging from 23^{+1} to 30^{+4} days. Most of the authors detected VSDs in the second trimester. Vedel et al.[14] did not report the mean gestational age at VSD diagnosis in their study. All authors used both greyscale and color Doppler ultrasound to diagnose VSD **(Fig. 3)**.

The reported maximum likelihood ratio of closure in utero was 28.6% (Cl 95%, I^2 69.1%), with a wide range of reported mean ratios ranging from 5.3% to 46.4% in the different studies. Vedel et al.[14] reported the highest rate of closure in utero but no mean gestational age at diagnosis, whereas Gomez et al.[1] reported a mean maximum likelihood ratio of 5.3% and a mean gestational age at diagnosis of 30^{+4} days. Greyscale and color Doppler ultrasound were used by all authors to diagnose VSD **(Fig. 4)**.

Isolated VSD closure in the first year of life was reported with a maximum likelihood ratio of 46.81% (Cl 95%, I^2 88.49%), ranging from 20.0% to 76.3% **(Fig. 5)**.

Substantial heterogeneity was shown within the spontaneous closure rate in the different groups both in utero and in the first year of life. Diagnostic criteria were similar in all studies as was the gestational age at diagnosis. The follow-up protocols differed slightly, which could be explained by the differences in the outcomes for closure rates.

Of interest for most of the studies was the determination of chromosomal aberration rate in relation to the VSD type: perimembranous versus muscular. Only two of the studies have included and divided the VSDs into perimembranous and muscular types. Erol et al.[22] and Svirsky et al.[9] included only muscular VSDs, while Kopylov et al.[21] included only the perimembranous type of VSD **(Table 3)**. Vedel et al.[14] did not specify the type of VSD they investigated. A total of 587 ventricular septal defects were found, with 165 being perimembranous and 422 being muscular. Chromosomal aberrations were found in 2 of 422 muscular ventricular septal defects (a rate of 0.4%) and in 8 of 165 perimembranous defects (a rate of 4.8%), which is a substantially high rate for this type of ventricular defect.

We can see from the results that the incidence of chromosomal aberrations in perimembranous VSDs is higher

Table 2. Studies included in the systematic review showing study period, type of study, mean gestational age (GA) at diagnosis, total number of VSDs, number of amniocentesis (AC), chromosomal aberration, and closure in utero and in the first year of life

Study	Study type/period	GA at diagnosis	VSD	Isolated VSDs	AC in VSD	Chromosomal aberrations	Closure	
		days	n	n	n	n/total number (%)	In utero	In the first year of life
							n (%)	n (%)
Cheng et al.[20]	Cohort (2016-2020)	25^{+1} (23^{+5}–27^{+5})	436	168	168	7/168 (4.2%)	48 (28.6%)	79 (47.0)
Erol et al.[22]	Cohort (2007-2012)	23^{+1} (19^{+0}–37^{+0})	264	76	18	0/76	3 (6.8%)	33 (75%)
Kopylov et al.[21]	Cohort (2015-2021)	25^{+1} (22^{+6}–29^{+3})	356	55	30	0/30	25 (45.4%)	17 (23.6%)
Svirsky et al.[9]	Cohort (2013-2017)	23^{+5} (15^{+0}–37^{+0})	N/A	40	30	2/30 (6.6%)	13 (32.5%)	8 (20%)
Gomez et al.[1]	Cohort (2005-2011)	30^{+4} (17^{+0}–41^{+0})	N/A	248	119	3/248 (1.2%)	13 (5.3%)	151 (76.3%)
Vedel et al.[14]	Cohort (2014-2018)	N/A	323	153	76	1/76 (1.3%)	71 (46.4%)	N/A

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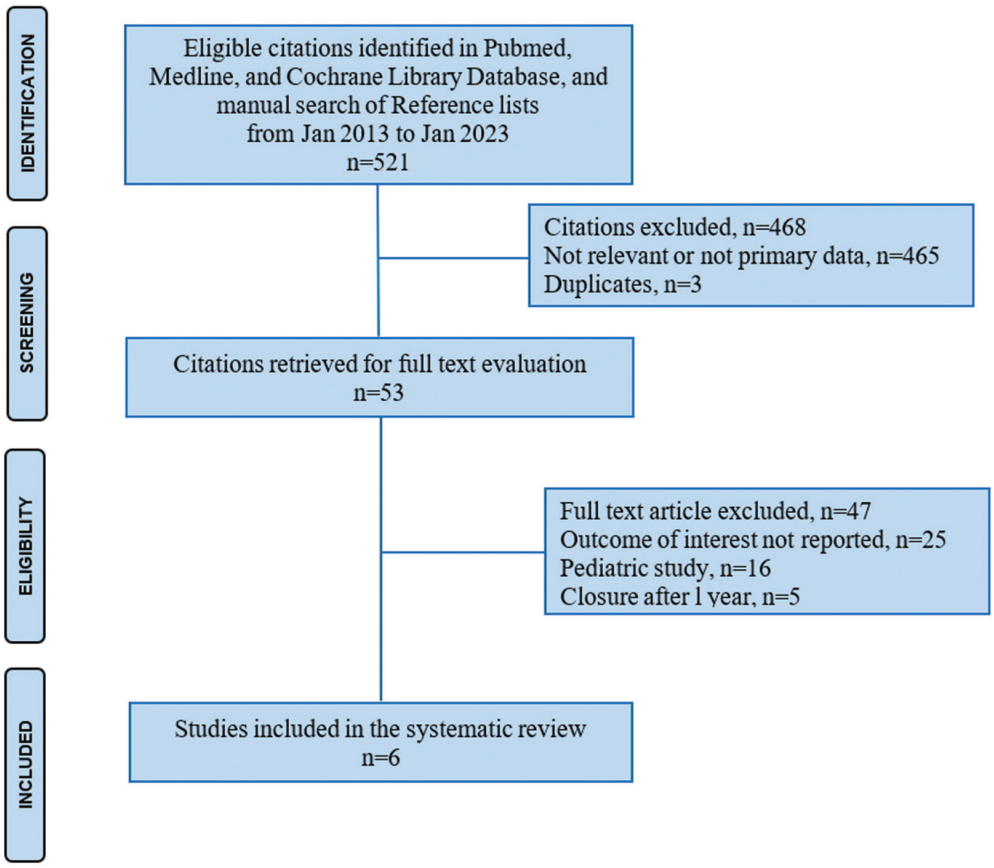

Figure 1. Flowchart summarizing the selection of studies for inclusion in the systematic review.

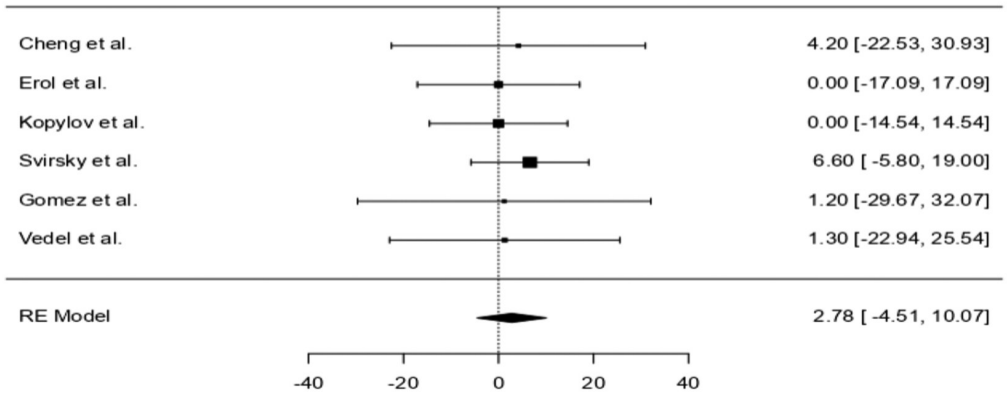

Figure 2. Forest plot showing the maximum likelihood ratio of chromosomal aberration rate in the included studies (CL 95%, I^2 0%).

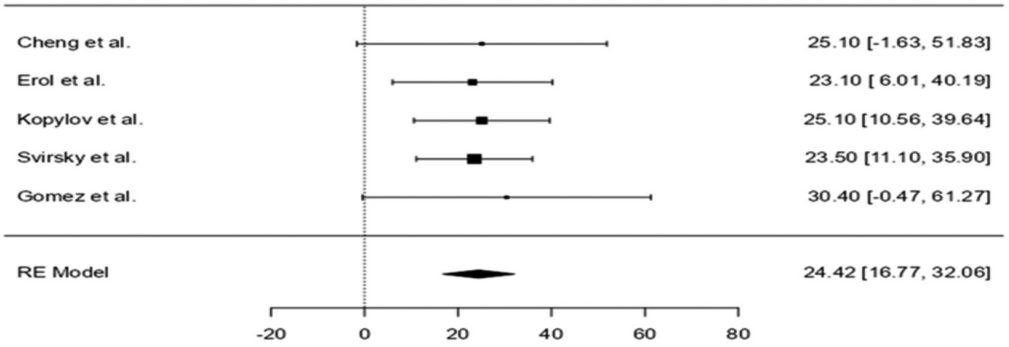

Figure 3. Forest plot showing the maximum-likelihood ratio in GA of diagnosis (Cl 95%, I^2 0%).

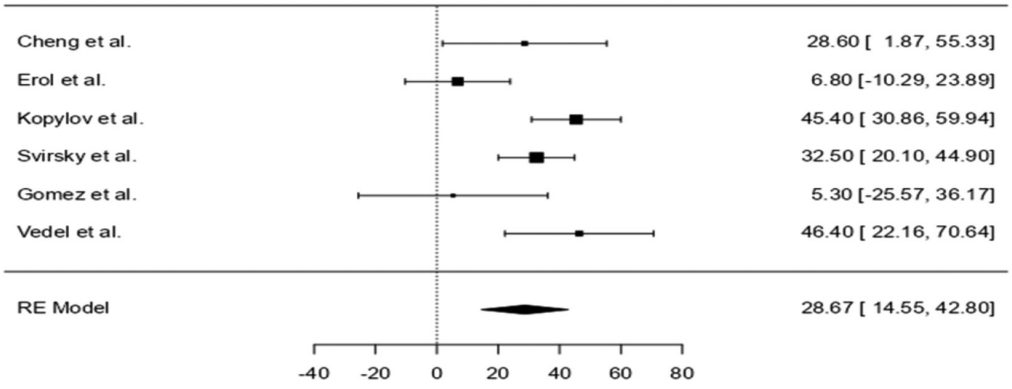

Figure 4. Forest plot showing maximum-likelihood ratio in the included studies of in utero closure rate (Cl 95%, I^2 69.1%).

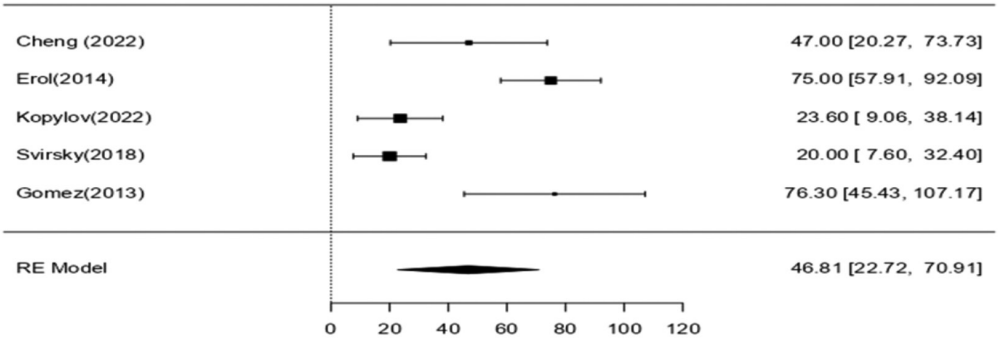

Figure 5. Forest plot showing the maximum likelihood ratios in the cases of spontaneous closure rate in the first year of life (Cl 95%, I^2 88.49%).

than that in the muscular VSDs **(Table 4)**. Another interesting point we looked into was what the closure rate was for the different types of ventricular septal defects. Cheng et al.[20] reported that muscular VSDs had a higher closure rate than perimembranous VSDs (40% and 15.4% closed in utero, and 61.1% and 30.8% closed in the first year of life, respectively). Erol et al.[22] analyzed only muscular VSDs reporting a rate of 6.8% for closure in utero and 75% closure in the first year of life. Kopylov et al.[21] reported a closure rate of 45.4% in utero and of 56.7% in the first year of life for the perimembranous VSDs. In their study, Svirsky et al.[9] found that after 12 months muscular VSDs were present in only 19.2% of their patients. Gomez et al.[1] proposed a model to predict spontaneous closure of the defects correlating the VSD/aorta ratio with the location of the VSD. In summary, their findings revealed higher rates

Table 4. Chromosomal aberration rate in different types of VSDs

Type of VSD	Total number	Chromosomal aberration n
Perimembranous	165	8 (4.8%)
Muscular	422	2 (0.4%)

Table 3. Number of perimembranous and muscular VSDs included in the different studies and number of chromosomal aberrations found in the two types of VSD

Study	Isolated VSD	Perimembranous VSD	Muscular VSD	Chromosomal aberrations in perimembranous VSD	Chromosomal aberrations in muscular VSD
	Total number	n	n	n	n
Cheng et al.[20]	168	78	90	7	0
Erol et al.[22]	76	Not included	76	N/A	0
Kopylov et al.[21]	55	55	Not included	0	N/A
Svirsky et al.[9]	40	Not included	40	N/A	2
Gomez et al.[1]	248	32	216	1	2
Total number	587	165	422	8	4

of spontaneous closure in utero in perimembranous VSDs and higher rates of spontaneous closure after birth in muscular VSDs **(Tables 5, 6)**.

Muscular VSDs had a lower in-utero closure rate than perimembranous VSDs (14.6% vs. 28.9%). After birth, the opposite was observed, with 53.4% for muscular VSDs and 22% for perimembranous VSDs.

DISCUSSION

Our main findings are as follows. Overall, the likelihood ratio of chromosomal abnormalities in antenatally diagnosed apparently isolated VSDs was 2.7%. The mean gestational age at diagnosis was 25^{+4} days. The spontaneous closure ratio in utero was 28.6% and spontaneous closure likelihood rate during the first year of life was 46.8%. In the present systematic review, we observed that a prenatally diagnosed isolated VSD was not associated with higher incidence of chromosomal aberrations. We observed a low mean incidence of genetic abnormalities in all included studies.

To the best of our knowledge, the study reporting the highest rate of chromosomal aberrations rate is that of Svirsky et al.[9] and the studies reporting the lowest rates are those of Erol et al.[22] and Kopylov et al.[21] Regarding the type of defect, chromosomal aberrations were found in 2 (0.4%) of 422 muscular VSDs. Eight (4.8%) of 165 perimembranous VSDs showed genetic anomalies. There was substantial heterogenicity in the spontaneous closure rates both in utero and the first year of life. Vedel et al.[14] reported the highest intrauterine closure rate of 46.4%. The lowest closure rate in utero (5.3%) was reported by Gomez et al.[1] The closure rate in the first year of life was the highest in Gomez et al.[1] (76.3%) and the lowest in Svirsky et al.[9] (20%). Vedel et al.[14] did not report any data of closure in the first year of life. Regarding the type of defect, the in-utero closure rate in muscular VSDs was lower (14.5%) than the closure rate in utero in the perimembranous VSDs (28.9%). Muscular VSDs had a higher closure rate after birth (53.8%) than the same rate for the perimembranous VSDs (22%).

The ventricular septal defects are the most commonly diagnosed congenital heart defects, with a 1/1000 live births incidence. The number of prenatal diagnoses of isolated VSDs has steadily increased in recent years, which can be attributed to the use of more advanced ultrasound equipment in terms of resolution and precision, better training of both doctors and technicians, and the increased number of ultrasound scans. These factors increase the prenatal detection rate of VSDs. This has resulted in the need for a more precise parental consultation in terms of management, which is directly outcome related.

These findings can contribute to more effective parental counseling by providing parents with the expected outcomes. For isolated VSDs and depending on the type of defect, we can expect high intrauterine or postnatal closure rates. Additionally, improved imaging techniques increase the detection of VSDs which may or may not be associated with aneuploidy. The results of this study can be applied to prenatal counseling and assist parents in making decisions. Only studies from the last ten years that present up-to-date information in the era of sophisticated fetal echocardiography and improved genetic findings have been included in the present systematic review.

Limitations

The number of studies included here is insufficient due to time constraints (only studies from the last ten years were included). The primary limitation is that only studies that combined primary and secondary outcomes were included. Many studies that reported only chromosomal abnormalities

Table 5. Spontaneous closure rates in the different types of VSD in utero and after the first year

Study	Perimembranous VSD	Muscular VSD	Perimembranous VSDs		Muscular VSDs	
			Closure in utero	Closure in the first year	Closure in utero	Closure in the first year
	n	n	n	n	n	n
Cheng et al.[20]	78	90	12	12	36	19
Erol et al.[22]	Not included	76	N/A	N/A	3	33
Kopylov et al.[21]	55	Not included	25	17	N/A	N/A
Svirsky et al.[9]	Not included	33	N/A	N/A	13	8
Gomez et al.[1]	26	185	9	6	4	145
Total	159	384	37	35	56	205

Table 6. Closure rates in utero and in the first year of life in perimembranous and muscular VSD available for follow-up after 12 months

Type of VSD	Total N	Closure in utero	Closure in the first year of life
Perimembranous	159	46 (28.9%)	35 (22%)
Muscular	384	56 (14.6%)	205 (53.4%)

and spontaneous closure rates were excluded. Another important limitation is that the study reports all chromosomal anomalies and does not take into consideration whether they are clinically significant or not. However, despite these limitations, this review represents the most up-to-date assessment of the total evidence related to apparently isolated VSDs, genetic abnormality rates, and closure rates.

CONCLUSIONS

Our systematic review demonstrates that prenatally diagnosed isolated VSDs are not associated with a sufficient increase in the prevalence of chromosomal aberrations and higher rates are expected in the perimembranous VSDs. Moreover, these findings are associated with a good postnatal outcome for most cases spontaneously closing before the age of 12 months with higher closure rates in utero to be expected in the perimembranous group and in the muscular ones after birth. Most of the VSDs will be diagnosed in the second trimester and using both greyscale and color Doppler ultrasound in diagnosing, the defect will be associated with higher detection rates.

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Competing Interests

The authors have declared that no competing interests exist.

Author contributions

All authors have contributed equally to this study.

REFERENCES

1. Gómez O, Martínez JM, Olivella A, et al. Isolated ventricular septal defects in the era of advanced fetal echocardiography: risk of chromosomal anomalies and spontaneous closure rate from diagnosis to age of 1 year: outcome of isolated fetal VSD. Ultrasound Obstet Gynecol 2014; 43(1):65–71.
2. Cresti A, Giordano R, Koestenberger M, et al. Incidence and natural history of neonatal isolated ventricular septal defects: Do we know everything? A 6-year single-center Italian experience follow-up. Congenit Heart Dis 2018; 13(1):105–12.
3. Hoffman JIE, Kaplan S. The incidence of congenital heart disease. J Am Coll Cardiol 2002; 39(12):1890–900.
4. Dolk H, Loane M, Garne E. The prevalence of congenital anomalies in Europe. In: Posada de la Paz M, Groft SC, eds. Rare Diseases Epidemiology [Internet]. Dordrecht: Springer Netherlands; 2010 [Accessed 07 February, 2023] p. 349–64. (Advances in Experimental Medicine and Biology; vol. 686). Available from: http://link.springer.com/10.1007/978-90-481-9485-8_20
5. Kirk JS, Comstock CH, Lee W, et al. Sonographic screening to detect fetal cardiac anomalies: a 5-year experience with 111 abnormal cases. Obstet Gynecol 1997; 89(2):227–32.
6. McBrien A, Hornberger LK. Early fetal echocardiography. Birth Defects Res 2019; 111(8):370–9.
7. Axt-Fliedner R, Schwarze A, Smrcek J, et al. Isolated ventricular septal defects detected by color Doppler imaging: evolution during fetal and first year of postnatal life. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol 2006; 27(3):266–73.
8. Maya I, Singer A, Yonath H, et al. What have we learned from 691 prenatal chromosomal microarrays for ventricular septal defects? Acta Obstet Gynecol Scand 2020; 99(6):757–64.
9. Svirsky R, Brabbing-Goldstein D, Rozovski U, et al. The genetic and clinical outcome of isolated fetal muscular ventricular septal defect (VSD). J Matern Fetal Neonatal Med 2019; 32(17):2837–41.
10. Shen O, Lieberman S, Farber B, et al. Prenatal isolated ventricular septal defect may not be associated with trisomy 21. J Clin Med 2014; 3(2):432–9.
11. Paladini D, Pistorio A, Wu LH, et al. Prenatal diagnosis of total and partial anomalous pulmonary venous connection: multicenter cohort study and meta-analysis. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol 2018; 52(1):24–34.
12. Paladini D, Palmieri S, Lamberti A, et al. Characterization and natural history of ventricular septal defects in the fetus. Ultrasound Obstet Gynecol Off J Int Soc Ultrasound Obstet Gynecol 2000; 16(2):118–22.
13. Callaway JLA, Shaffer LG, Chitty LS, et al. The clinical utility of microarray technologies applied to prenatal cytogenetics in the presence of a normal conventional karyotype: a review of the literature. Prenat Diagn 2013; 33(12):1119–23.
14. Vedel C, Rode L, Jørgensen FS, et al. Prenatally detected isolated ventricular septum defects and the association with chromosomal aberrations – a nationwide register-based study from Denmark. Prenat Diagn 2021; 41(3):347–53.
15. Anderson RH, Lenox CC, Zuberbuhler JR. Mechanisms of closure of perimembranous ventricular septal defect. Am J Cardiol 1983; 52(3):341–5.
16. Alpert BS. Spontaneous closure of small ventricular septal defects: probability rates in the first five years of life. Am J Dis Child 1973; 125(2):194.
17. Miyake T. A review of isolated muscular ventricular septal defect. World J Pediatr 2020; 16(2):120–8.
18. Meberg A, Otterstad JE, Frøland G, et al. Outcome of congenital heart defects – a population-based study. Acta Paediatr Oslo Nor 2000; 89(11):1344–51.
19. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372:71.
20. Cheng K, Zhou H, Fu F, et al. Should prenatal chromosomal microarray analysis be offered for isolated ventricular septal defect? A single-center retrospective study from China. Front Cardiovasc Med 2022; 9:988438.
21. Kopylov LG, Dekel N, Maymon R, et al. Prenatally diagnosed isolated perimembranous ventricular septal defect: Genetic and clinical implications. Prenat Diagn 2022; 42(4):461–8.
22. Erol O, Sevket O, Keskin S, et al. Natural history of prenatal isolated muscular ventricular septal defects. J Turk Ger Gynecol Assoc 2014; 15(2):96–9.

Явно изолированный дефект межжелудочковой перегородки, пренатальная диагностика, связь с хромосомными аберрациями, частота спонтанных закрытий в утробе матери и в течение первого года жизни: систематический обзор

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Резюме

Цель: Оценить частоту хромосомных аберраций при явно изолированных дефектах межжелудочковой перегородки (VSD), количественно определить сроки диагностики пренатально диагностированных VSDs и определить частоту спонтанного закрытия пренатально как внутриутробно, так и в течение первого года жизни.

Материалы и методы: Поиск в Medline, PubMed и Cochrane базах данных проводился для выявления исследований, опубликованных в период с января 2013 по январь 2023 года, с использованием ключевых слов и комбинаций вариантов слов для изолированного дефекта межжелудочковой перегородки, эхокардиографии плода, кариотипа, генетики, массивной CGH (сравнительная геномная гибридизация), спонтанного закрытия, и исхода. Критерии включения: исследования, сообщающие об явно изолированном дефекте межжелудочковой перегородки. Первичные результаты: выявить частоту хромосомных аберраций при явно изолированных дефектах межжелудочковой перегородки и количественно определить сроки постановки диагноза. Вторичный результат: определить частоту спонтанного закрытия внутриутробно и на первом году жизни. Статистический анализ проводился с использованием основного пакета Jamovi Meta-Analysis 2.3.21 Solid. Для объединения данных мы использовали пропорции и отношения максимального правдоподобия.

Результаты: В целом максимальное отношение правдоподобия хромосомных аберраций при антенатально диагностированном явно изолированном VSD составило 2.7%. Различные типы дефектов показали существенно разную частоту хромосомных аберраций. При мышечных VSD частота хромосомных аберраций составляла 0.4% против 4.8% при перимембранозных VSD. Средний гестационный возраст диагноза составил 25+4 дня. Максимальный коэффициент правдоподобия спонтанного закрытия внутриутробно составил 28.6%. Более высокая скорость закрытия внутриутробно наблюдалась для перимембранозного типа, тогда как мышечные VSD показали более высокую скорость закрытия после рождения. Закрытие внутриутробно наблюдалось в 28.9% перимембранозных VSDs и в 14.5% мышечных VSDs. Закрытие через 12 месяцев было обнаружено у 22% перимембранозных дефектов и у 53.8% мышечных дефектов. Представленные результаты могут быть полезны при информированном дородовом консультировании и оказать большую помощь родителям в принятии решений.

Заключение: В данное систематическое исследование включено 740 изолированных дефектов межжелудочковой перегородки, 422 из которых были мышечными и 165 из них были перимембранозными. Другие не уточнялись. Сто пятьдесят девять перимембранозных и 384 мышечных VSD были доступны для наблюдения через 12 месяцев жизни. Хромосомные аберрации выявлены в 4.8% перимембранозных VSDs и в 0.4% мышечных VSDs.

Ключевые слова

эхокардиография плода, изолированный дефект межжелудочковой перегородки, кариотип, спонтанное закрытие, исход