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# Atrioventricular septal defect: An extended approach to prenatal sonographic imaging of the atrioventricular valves

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## Abstract

An atrioventricular septal defect (AVSD) is diagnosed with prenatal sonography using the 4-chamber view (4CV) of the fetal heart. Prenatal 2D sonographic imaging of normal and AVSD short axis (SAX) atrioventricular (AV) valve views have not been well described. The aim is to describe the 2D sonographic 4-chamber and SAX view of the AV valves when an AVSD is present compared to normal AV valves. The 4CV AVSD heart demonstrates no offset of AV valves due to the abnormal valve structure. Complete and intermediate AVSD has a septum primum defect and inlet ventricular septal defect (VSD). The partial AVSDs have either a septum primum defect or just an inlet VSD with an intact primum septum. The SAX view of AVSD demonstrates the common AV junction and the bridging leaflets. In ventricular diastole valves have a “figure 8” and “dumbbell” shape in partial and complete AVSD, respectively. These appearances are not seen in the normal heart in SAX as both tricuspid and mitral valve are separate valves. The SAX view can be obtained by locating a sagittal aortic arch view and then scanning slightly towards the left side of the fetus, near the base of the heart and the AV valves. An in-depth interrogation of the abnormal fetal heart is obtained without specialised 4D capable ultrasound machines providing information to assist in counselling during the pregnancy and for postnatal surgical planning. Future research to assess the feasibility of incorporating the SAX view into routine practice and by general sonographers is suggested.

## KEYWORDS

atrioventricular septal defect, prenatal, short-axis view, ultrasound

## 1 | INTRODUCTION

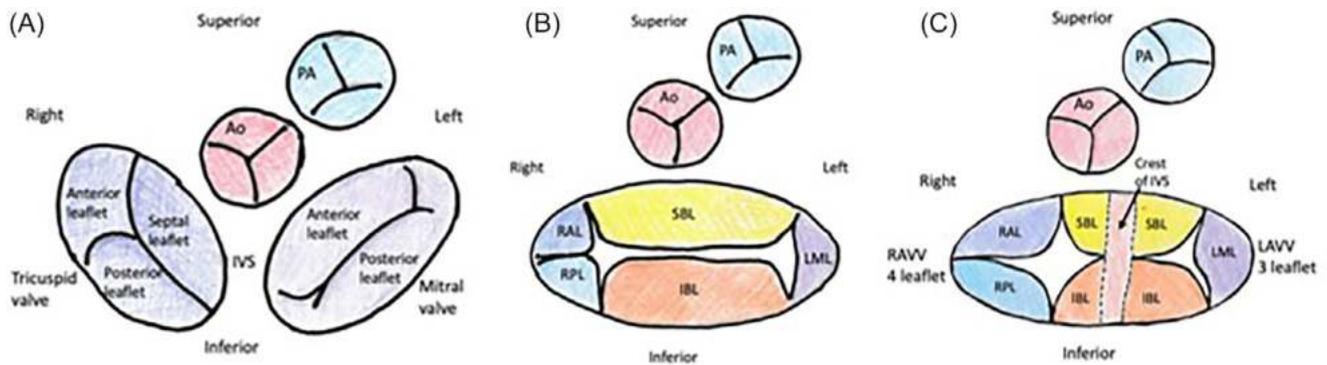
The term atrioventricular septal defect (AVSD) covers a collection of heart defects of the atrial and ventricular septum and atrioventricular (AV) junction and valves. The postnatal incidence of AVSD is approximately 4–5.3 per 10,000 births.<sup>1,2</sup> An AVSD can occur as an isolated defect, as part of a chromosomal anomaly particularly trisomy 21, heterotaxia syndrome or with other anomalies.<sup>3</sup> Prenatal detection of an AVSD has improved in

recent years especially in populations that have introduced routine combined first trimester screening for chromosome anomalies and a morphology scan.<sup>4</sup> There are different types of AVSD, knowledge of the types and their prenatal ultrasound appearance will help identify an AVSD.<sup>1,5</sup>

According to the International Paediatric and Congenital Cardiac Code (IPCCC) an AVSD can be subdivided into four types, that is, (1) a complete AVSD, (2) a partial AVSD, (3) an intermediate (or transitional) AVSD and (4) an unbalanced AVSD.<sup>1,5</sup> Unbalanced AVSDs will not be

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**FIGURE 1** En face representation of relationship of great arteries and atrioventricular valves with (A) normal atrioventricular valves (B) complete atrioventricular septal defect and (C) partial and intermediate atrioventricular septal defect. Ao, aorta; IBL, inferior bridging leaflet; IVS, interventricular septum; LAVV, left atrioventricular valve; LML, left mural leaflet; PA, pulmonary artery; RAL, right anterior leaflet; RAVV, right atrioventricular valve; RPL, right posterior leaflet; SBL, superior bridging leaflet.

**TABLE 1** Comparison of normal heart with spectrum of atrioventricular septal defects.

Normal heart	Complete AVSD	Intermediate AVSD	Partial AVSD with atrial shunt	Partial AVSD with ventricular shunt
No primum ASD	Primum ASD	Primum ASD	Primum ASD	Bridging leaflets attach to atrial septum
No inlet VSD	Non-restrictive inlet VSD	Restrictive VSD (chordal attachment to ventricular crest)	No VSD-bridging leaflets attach to ventricular septum	Inlet VSD
RAVV (TV) has 3 leaflets, LAVV (MV) has 2 leaflets	Common AV valve with 5 leaflets	RAVV has 4 leaflets, LAVV has 3 leaflets	RAVV has 4 leaflets, LAVV has 3 leaflets	RAVV has 4 leaflets, LAVV has 3 leaflets
Two separate AV valve annulus	Common AV valve annulus	Common AV valve annulus	Common AV valve annulus	Common AV valve annulus
Two valvular orifices	Single AV valve orifice	Two valvular orifices	Two valvular orifices	Two valvular orifices
Separate AV valves with offset of valves at crux of heart	Two bridging leaflets (superior and inferior), overrides the ventricular septum. Linear insertion of AV valves	Fusion of bridging leaflets. Linear insertion of RAVV and LAVV	Fusion of bridging leaflets. Linear insertion of RAVV and LAVV	Fusion of bridging leaflets. Linear insertion of RAVV and LAVV
Shunting occurs at level of foramen ovale	Shunting occurs at atrial and ventricular level	Shunting occurs at atrial and ventricular level	Shunting occurs at atrial level only	Shunting occurs at ventricular level only

Abbreviations: ASD, atrial septal defect; AV, atrioventricular; AVSD, atrioventricular septal defect; LAVV, left atrioventricular valve; MV, mitral valve; RAVV, right atrioventricular valve; TV, tricuspid valve; VSD, ventricular septal defect.

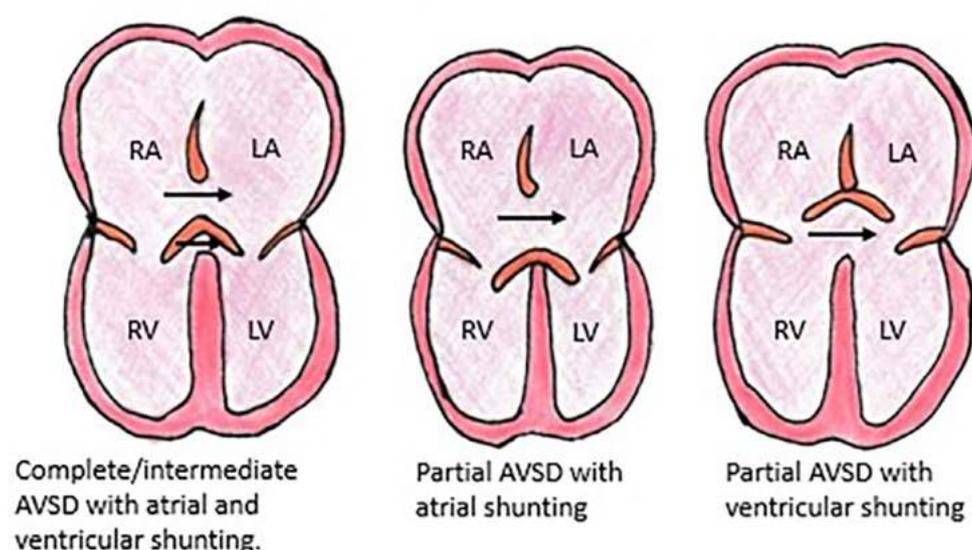
Source: Developed from Reference [1].

discussed in this paper. All AVSDs have abnormal AV valves with an unwedged aorta. An unwedged aorta occurs when the aorta is situated anterior to the AV valve/s rather than wedged between the valves.<sup>6</sup> (Figure 1B,C). The AVSD valve can have either five leaflets observed in a complete AVSD, or a three-leaflet left AV valve (LAVV) and four-leaflet right AV valve (RAVV) in both the partial and intermediate forms. The AV valves in AVSD are not offset and are seen at the same level either bridging the interventricular septum (IVS) or attaching to the IVS or atrial septum.<sup>1,5</sup> (Figure 1). Table 1 describes in more detail the distinct types of AVSD compared to the normal heart.

The prenatal sonographic appearances of a complete AVSD have been well described. Diagnosis is made with the 4CV demonstrating

an absent septum primum, large inlet VSD, and no offset of the five-leaflet AV valve at the level of the crux.<sup>7,8</sup> More difficult to differentiate and diagnose prenatally are the intermediate AVSD and the two partial forms of AVSD. The intermediate AVSD, has a septum primum defect and a small restrictive inlet VSD with separate abnormal LAVV and RAVV<sup>1,9</sup> and to the inexperienced sonographer may appear similar to a partial AVSD or a normal heart. The first partial AVSD type is where there is no VSD (no ventricular shunt) with a septum primum defect. The second demonstrates no atrial septal primum defect (no atrial level shunt) with an inlet VSD.<sup>1,10</sup> (Figure 2).

Extended views will improve evaluation of the fetal AV valves enabling greater confidence in diagnosis, especially if an intermediate



**FIGURE 2** Representation of atrioventricular septal defects (AVSD) demonstrating attachment of bridging leaflets and level of shunting (arrows). Note complete and intermediate AVSD have atrial and ventricular shunts. Complete AVSD has one valvular orifice. An intermediate AVSD has two valvular orifices and a restrictive VSD which may make it more difficult to image prenatally. Partial AVSD have two valvular orifices and either an atrial or ventricular shunt. AVSD, atrioventricular septal defect; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.

or partial AVSD is present. Postnatally the AV valve abnormalities have been described using the *en face* or short axis (SAX) view.<sup>2</sup> Prenatally the SAX views of normal AV and AVSD valves have been described using SAX 4D volume rendering.<sup>11-13</sup> The normal SAX AV valves have proved difficult to image and interpret using 2D ultrasound especially as the tricuspid valve (TV) sits more apically compared to the mitral valve (MV). As the AV valves are at the same level when an AVSD is present, 2D assessment of the valves is feasible with this method more readily available in non-specialist centres. The aim of this work is to describe the 2D sonographic 4CV and SAX view features of the AV valves when an AVSD is present compared to normal AV valves to increase prenatal detection of AVSD especially in the more difficult forms where there is no ASD or VSD present.

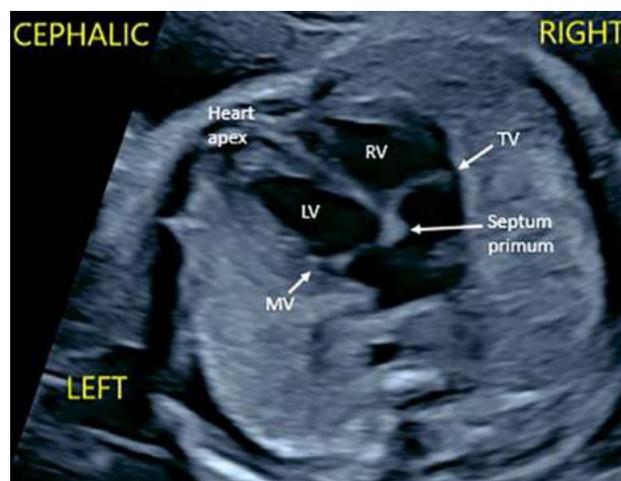
## 2 | SONOGRAPHIC IMAGING OF THE FETAL HEART

According to recent guidelines, the fetal morphology scan should include a thorough interrogation of the fetal heart.<sup>14</sup> Assessment of the AV valves are incorporated into routine and tertiary level scanning using the 4CV. The following sections will describe the sonographic techniques and appearances of the normal and AVSD heart in the 4CV and additionally the SAX view of the AV valves.

## 3 | NORMAL AV VALVE SONOGRAPHIC APPEARANCES

### 3.1 | Normal 4-chamber heart

The normal 4CV demonstrates AV valves that are offset with the TV set more apically. There is an intact interventricular septum and an atrial septum primum is visible posterior to the crux between the atria.



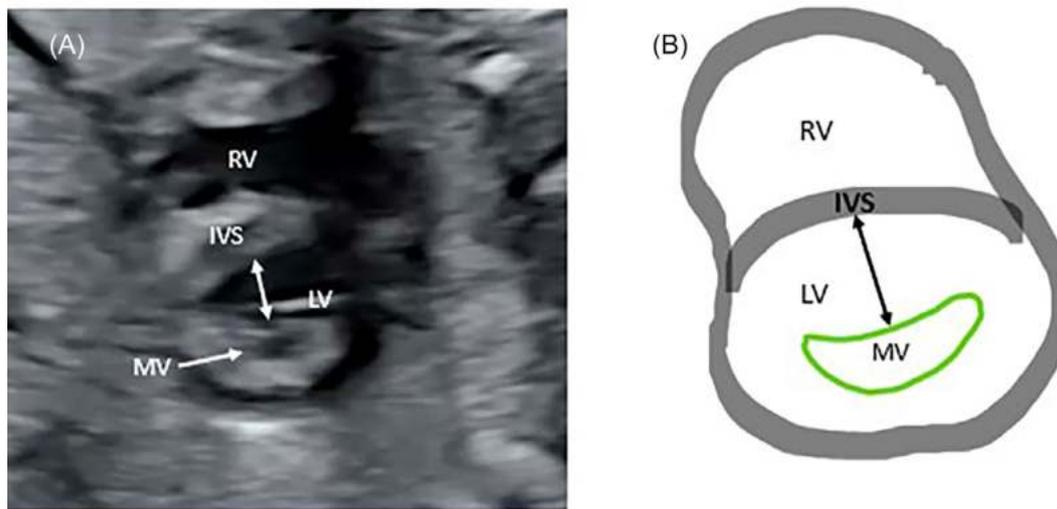
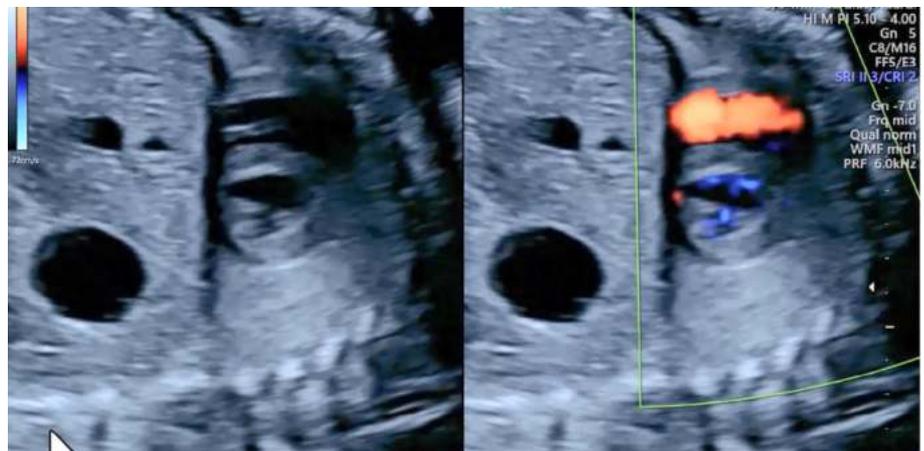
**FIGURE 3** Normal 4-chamber heart at 27 + 4 weeks gestation demonstrating offset of the tricuspid valves which is set more apically than the mitral valve. LV, left ventricle; MV, mitral valve; RV, right ventricle; TV, tricuspid valve.

The offset of the AV valves is best appreciated with an apical 4CV (Figure 3).

### 3.2 | Normal short axis view of the AV valves

The SAX view allows imaging of the ventricles, IVS and AV valves in an additional dimension, obtained by rotating the transducer 90° to the 4CV. In this view, the AV valves can be visualised *en face*. The SAX view can be obtained in 2D by obtaining a sagittal aortic arch view then sliding or fanning the transducer slightly towards the left side of the fetus. Alternatively, should an apical SAX view of the ventricles be visualised then a small sliding or fanning movement to the right of the fetus will enable visualisation towards the base of

**VIDEO 1** Video at 27 + 4 weeks gestation demonstrating short axis view in a normal heart obtained by scanning from the apex of the heart where the short axis view of the ventricles are demonstrated on the left side of the fetus, to the right sided sagittal aortic arch. Note this is an alternative method to the technique described in the text where the sagittal heart has been scanned from right to left. Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>



**FIGURE 4** Sonographic image at 27 + 4 weeks gestation (A) and drawing (B) of short axis view at base of normal heart demonstrating “smiley face” mitral valve. Note distance of mitral valve from the interventricular septum (double arrow). Due to the apical offset a normal tricuspid valve is usually not seen at this level. IVS, interventricular septum; LV, left ventricle; MV, mitral valve; RV, right ventricle.

the heart and AV valves. (Video 1). When the AV valves are imaged in the SAX view, typically, only the MV is seen with the left and right ventricle separated by the IVS. The inlet and muscular components of the IVS can be seen, and an optimal zero degrees colour Doppler angle is obtained for interrogation of the IVS especially if the heart is imaged from the fetal anterior chest wall.<sup>8</sup> The MV has a “fish mouth” or “smiley face” appearance, is visualised distal to the IVS and can be seen opening and closing in real time. (Figure 4; Video 2). The TV is not visualised at this level due to its apical displacement.

## 4 | AVSD VALVE SONOGRAPHIC APPEARANCES

### 4.1 | Abnormal 4-chamber view

The 4CV of the AVSD heart demonstrates a linear insertion of the AV valves (no offset). In a complete AVSD there is an inlet VSD and a septum primum defect and one valvular orifice. (Figure 5; Video 3). An

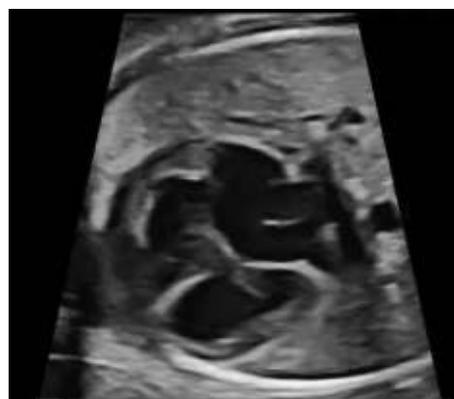
intermediate AVSD demonstrates similar valve and septal defect appearances except there are two valvular orifices present and the VSD is small (Figure 1; Table 1). The partial AVSD, will demonstrate a septum primum defect but no VSD visible, (Figure 6; Video 4) or an inlet VSD with no atrial septum primum defect (Figure 2). An inlet VSD is located inferior to the RAVV and is visualised by scanning inferiorly or towards the fetal diaphragm from the standard apical 4CV.<sup>8</sup>

### 4.2 | Abnormal short axis view of the AV valves

The AVSD SAX view of the valves will demonstrate the common AV junction (in partial AVSD) or common AV valves (in complete AVSD) more clearly. A partial AVSD (septum primum defect without a VSD component), will show a “figure 8” appearance when the AV valves are fully opened in ventricular diastole, with the LAVV and RAVV sitting closer to and at the same level as the IVS compared to a normal heart. The centre of the “figure 8” abuts the IVS. (Figure 7A,B; Video 5). If a complete AVSD is present the inlet VSD can be seen in



**VIDEO 2** Video at 24 + 2 demonstrating the mitral valve (arrow) short axis view in a normal heart. Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>



**VIDEO 3** Video demonstrating 4-chamber view of complete atrioventricular septal defect at 27 + 1 weeks gestation. Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>



**FIGURE 5** 4-chamber view of complete AVSD at 27 + 1 weeks gestation. Note septum primum defect (arrow head), no offset of atrioventricular valves (arrow), and inlet ventricular septal defect (dashed arrow).



**FIGURE 6** 4-chamber view of partial AVSD at 27 + 6 weeks gestation demonstrating no offset of AV valves (arrow). There is attachment of the AV bridging leaflets to the interventricular septum with an atrial level shunt (septum primum defect) (arrow head).

the SAX view (Video 6) and during diastole with the AV valves fully open, a “dumbbell” appearance of the AV valves is demonstrated. (Figure 8A,B). If there is an atrial shunt only with a partial AVSD then the IVS appears intact at this level with the bridging valves attaching to the IVS. (Video 5).

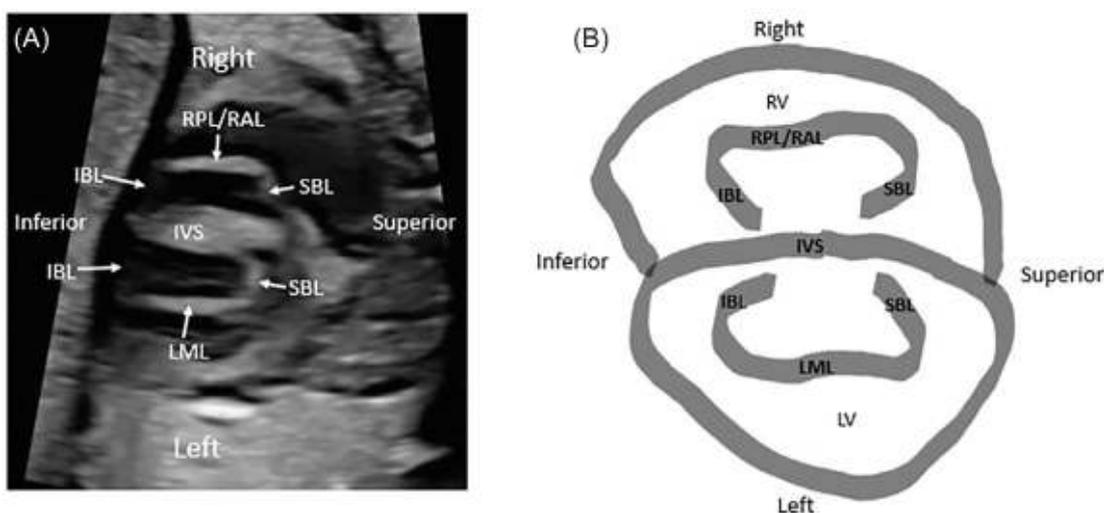
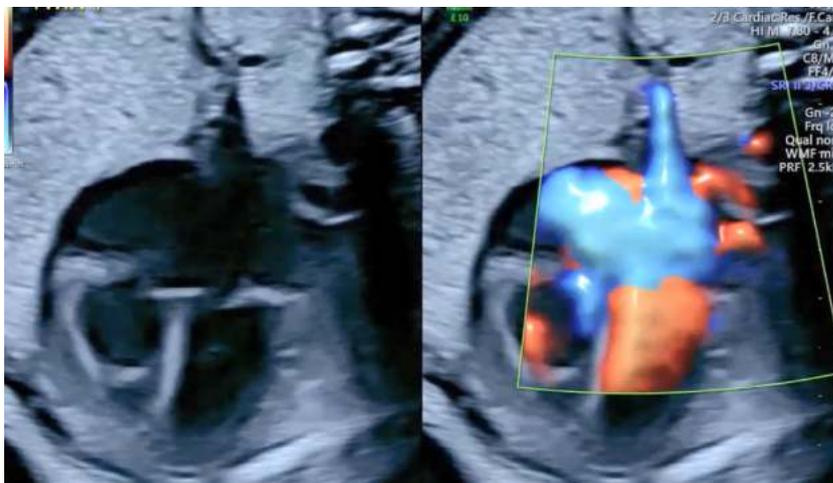
## 5 | DISCUSSION

This work describes the 4CV and SAX view of the AV valves for the diagnosis of partial and complete AVSD, this is important because all AVSDs have abnormal AV valves. A complete AVSD has a large non-restrictive inlet VSD resulting in bidirectional ventricular shunting in

the fetus,<sup>15</sup> one valvular orifice compared with the intermediate and partial forms which have two valvular orifices and separate ventricular inflows.<sup>1</sup> The complete AVSD demonstrates a common pathway of flow with colour Doppler, from the atria to the ventricles separating at the IVS.<sup>11</sup> Absolute identification of the intermediate type of AVSD may be difficult to achieve prenatally due to the separate abnormal AV valves and potentially very small inlet VSD. This restrictive inlet VSD results in similar pressure gradients between the ventricles with little left to right or no flow across the VSD. This absence of flow across the VSD makes the prenatal diagnosis of intermediate AVSD more difficult.<sup>16</sup> The separation of the AV valves can be difficult to appreciate on prenatal sonography and the appearances of intermediate AVSD can overlap with a complete AVSD and a partial AVSD with

**VIDEO 4** Video demonstrating 2D and colour Doppler of 4-chamber view of partial atrioventricular septal defect with septum primum defect at 27 + 6 weeks gestation.

Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>



**FIGURE 7** Sonographic image at 27 + 4 weeks gestation (A) and drawing (B) of short axis view at base of heart in partial atrioventricular septal defect (AVSD). Note the atrioventricular valve (AVV) forms a “figure 8” with the left and right sided AVV visible at the same level and sitting close to the interventricular septum. IBL, inferior bridging leaflet; IVS, interventricular septum; LML, left mural leaflet; LV, left ventricle; RAL, right anterior leaflet; RV, right ventricle; RPL, right posterior leaflet; SBL, superior bridging leaflet.

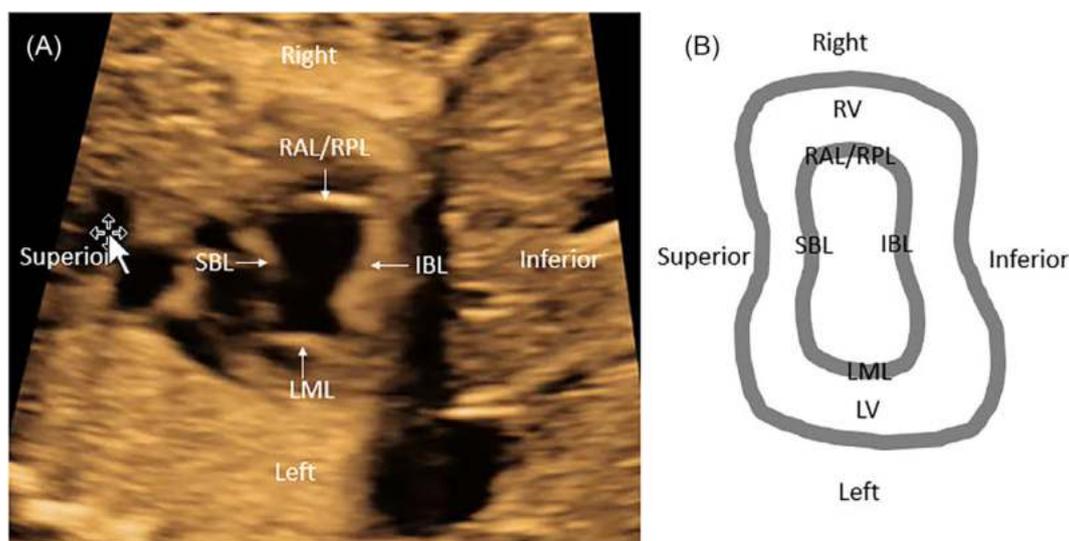
an atrial level shunt. The importance of recognising the linear AV valves in the 4CV and the “figure 8” and “dumbbell” SAX views when AVSD is present and not relying just on identifying a septum primum defect or VSD, is demonstrated from these cases.

While the SAX view has been described postnatally<sup>2</sup> and prenatally using 4D volume rendering<sup>11–13</sup> we believe this is the first report to describe the 2D SAX AVSD prenatal sonographic appearances. While the diagnosis of AVSD has traditionally been made by the 4CV, the SAX AV valve view which directly assesses the abnormal AV valves will improve the assessment, especially in the case of the more subtle partial or intermediate AVSD. Imaging the SAX view requires a degree of skill, however, if a sonographer can obtain a sagittal aortic arch view, then the SAX view is well within their skill set. We recommend magnifying the sonographic image of the AV valves to enable visualisation of the abnormal valves and storing a cine clip for later review as needed. Although fetal heart screening recommendations

only specify five axial views of the fetal heart,<sup>14</sup> many sonographers can and do scan beyond this. Indeed, sonographers scanning at a tertiary level routinely scan the fetal heart using extended views.

The diagnosis of a complete AVSD in the 4CV has been well described, however partial AVSD may be more difficult to diagnose,<sup>9</sup> especially for the sonographer performing routine screening with less exposure to abnormal hearts. Additionally, general sonographers often lack feedback on the final diagnosis of a heart anomaly which may limit their learning. Incorporating the SAX view where abnormal valves can be visualised may help in the diagnosis of partial and intermediate AVSD. It will also help in counselling during pregnancy and future surgical planning for the baby.<sup>2</sup> Recognition of abnormal AV valves should prompt a fetal cardiologist review.

Correct nomenclature should be noted, it is incorrect to label the AVSD AV valves as a bicuspid valve, MV or TV or state there is a “cleft in the MV.”<sup>2</sup> This is because the LAVV and RAVV are abnormal



**FIGURE 8** Sonographic image at 28 weeks gestation (A) and drawing (B) of short axis view at base of heart in complete atrioventricular septal defect (AVSD). Note the atrioventricular valve (AVV) forms a “dumbbell” shape with the left and right sided AVV visible at the same level in diastole. IBL, inferior bridging leaflet; IVS, interventricular septum; LML, left mural leaflet; LV, left ventricle; RAL, right anterior leaflet; RV, right ventricle; RPL, right posterior leaflet; SBL, superior bridging leaflet.



**VIDEO 5** Video demonstrating short axis view of partial atrioventricular septal defect valves at 27 + 6 weeks gestation. Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>



**VIDEO 6** Video demonstrating short axis view of complete atrioventricular septal defect valves at 20 + 3 weeks gestation. In this view, the bridging AV valves “dumbbell” shape and inlet VSD (arrow) can be seen. Video content can be viewed at <https://onlinelibrary.wiley.com/doi/10.1002/sono.12370>

valves, not variations of normal.<sup>17</sup> In the complete AVSD, the AV valves have superior and inferior bridging leaflets seen with the linear (bridging) insertion of the AV valves in the 4CV and SAX view, a left mural valve, and a right antero-superior and right inferior valves, five leaflets in total.<sup>10</sup> (Figures 1 and 8). In the partial and intermediate forms of AVSD the terminology used is a three leaflet LAVV and four leaflet RAVV.<sup>1</sup> (Figures 1 and 7). With a partial AVSD the bridging valves still demonstrate no offset at the heart crux but are attached to either the atrial or ventricular septum meaning there is only an atrial or ventricular shunt, not an atrioventricular shunt. The current definition of AVSD would support a sonographic view that enables better visualisation and interrogation of the AV valves in these more difficult cases.

## 6 | STRENGTHS/LIMITATIONS

This paper describes an additional view of the fetal heart that is easily obtained in routine fetal heart examinations. When imaged routinely this view will allow sonographers to recognise abnormal AV valves and increase the detection of fetal heart abnormalities. There is a clear description of the normal and abnormal appearances of the valves with a table, images, live videos, and line drawings to help recognise the relevant anatomy.

Many of the images used to illustrate the heart in this paper were at a gestation of 27+ weeks, as this was ideal for demonstrating the

AV valves, however this does not mean that abnormal valves cannot be recognised in the SAX view at earlier gestations as demonstrated by Video 6. We acknowledge that the AVSD images used in this article were obtained by experienced operators. Future research should evaluate less experienced sonographers' ability to obtain the SAX view of the AV valves and if obtaining this view improves the identification of an AVSD.

## 7 | CONCLUSION

We have described the 2D ultrasound 4CV and SAX view of the AV valves in the normal fetal heart and when an AVSD is present. The normal 4CV demonstrates an offset of the AV valves with the TV set more apically, an intact septum primum and IVS. The normal SAX AV valve view shows the MV as a "smiley face" which is placed distant to the intact IVS. The TV is not usually seen in this plane with 2D ultrasound due to the separate AV valves and apical displacement.

The AVSD 4CV demonstrates a linear AV valve insertion. The complete and intermediate AVSD has a septum primum defect and inlet VSD, the partial AVSD has either an atrial or ventricular level shunt. The complete AVSD SAX view demonstrates a "dumbbell" shape while the partial AVSD SAX view demonstrates a "figure 8" pattern in diastole with the AV valves visible in the same plane using 2D ultrasound.

Sonographers, with practice, will be able to obtain the SAX of the valves and learn to recognise abnormal valve formation, assisting in identification of an AVSD. This additional information will be of value when counselling the pregnant person and family. Future research to assess the ease of incorporation of extended views by sonographers into routine fetal heart assessment would be informative.

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## CONFLICT OF INTEREST STATEMENT

Ann Quinton and Narelle Kennedy are members of the Editorial Board for the Sonography journal. Alex Gooi reports no conflict of interest.

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# QUESTIONNAIRE

## A22(25) Part 1 of 2

### Atrioventricular septal defect: An extended approach to prenatal sonographic imaging of the atrioventricular valves

#### INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

#### Introduction

**Question 1:** What is the approximate postnatal incidence of atrioventricular septal defect (AVSD)?

- A:** 1-2.3 per 10,000 births
- B:** 2-3 per 10,000 births
- C:** 4-5.3 per 10,000 births
- D:** 6-7.2 per 10,000 births

**Question 2:** According to the International Paediatric and Congenital Cardiac Code (IPCC), there are ..... types of AVSD, and knowledge of these types and their prenatal ultrasound appearance will help identify an AVSD?

- A:** One
- B:** Two
- C:** Three
- D:** Four
- E:** Five

**Question 3:** What is meant by an "unwedged aorta" in AVSD?

- A:** The aorta is situated posterior to the atrioventricular (AV) valves
- B:** The aorta is situated anterior to the AV valves
- C:** The aorta is wedged between the AV valves
- D:** The aorta is situated inferior to the AV valves

**Question 4:** Regarding the characteristics of a complete AVSD, which of the following is more difficult to differentiate and diagnose prenatally?

- A:** The intermediate AVSD
- B:** An absent septum primum
- C:** Large inlet ventricular septal defect (VSD)
- D:** No offset of the five-leaflet AV valve
- E:** Two partial forms of AVSD

**Question 5:** The normal SAX AV valves have proved easy to image and interpret using 2D ultrasound, even as the tricuspid valve (TV) sits more apically compared to the mitral valve (MV). Is this statement **TRUE** or **FALSE**?

- A:** TRUE
- B:** FALSE

#### Sonographic imaging of the fetal heart

**Question 6:** According to recent guidelines, should the fetal morphology scan include a thorough interrogation of the fetal heart?

- A:** YES
- B:** NO

#### Normal AV valve sonographic appearances

**Question 7:** The short axis (SAX) view allows imaging of the ventricles, IVS and AV valves and is obtained .....?

- A:** By rotating the transducer 180° to the 4CV
- B:** By rotating the transducer 45° to the 4CV
- C:** By rotating the transducer 90° to the 4CV
- D:** By rotating the transducer 60° to the 4CV

**Question 8:** What is the appearance of the mitral valve in the short axis (SAX) view of a normal heart?

- A:** "Figure 8" appearance
- B:** "Dumbbell" appearance
- C:** "Fish mouth" or "smiley face" appearance
- D:** Triangular appearance

**Question 9:** Why is the tricuspid valve (TV) not usually visible in the normal SAX view?

- A:** Due to its apical displacement
- B:** Due to its basal displacement
- C:** Due to its non-apical displacement
- D:** Due to its inferior displacement

#### AVSD valve sonographic appearances

**Question 10:** A partial AVSD (septum primum defect without a VSD component) will show a ..... appearance when the AV valves are fully open in ventricular diastole?

- A:** "Smiley face"
- B:** "Figure 8"
- C:** "Dumbbell"
- D:** "Fish mouth"

**THE END**

**QUESTIONNAIRE**  
**A22(25) Part 2 of 2**

**Atrioventricular septal defect: An extended approach to prenatal sonographic imaging of the atrioventricular valves**

**INSTRUCTIONS**

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

**Question 1:** In a complete AVSD, what appearance do the AV valves have in the SAX view during diastole?

- A:** "Smiley face" appearance
- B:** "Figure 8" appearance
- C:** "Fish mouth" appearance
- D:** "Dumbbell" appearance

**Discussion**

**Question 2:** Which one of the following features makes the prenatal diagnosis of intermediate AVSD more difficult?

- A:** The presence of a large ventricular septal defect
- B:** Absence of a septum primum defect
- C:** A very small restrictive inlet VSD with little or no flow across the VSD
- D:** Offset of the AV valves

**Question 3:** What is the key advantage of incorporating the SAX AV valve view into AVSD assessment?

- A:** It allows better visualisation of the great arteries
- B:** It can directly assess the abnormal AV valve and improves assessment of the more subtle partial or intermediate AVSD
- C:** It is simpler to obtain than the 4CV

**Question 4:** Imaging of the SAX view requires a degree of skill, but if a sonographer can obtain a sagittal aortic arch view, the SAX view will be within their skill set. Is this **TRUE**?

- A:** YES
- B:** NO

**Question 5:** Why is it incorrect to label the AVSD AV valves as a "cleft in the MV"?

- A:** Because the defect is located in the septum, not the valve
- B:** Because the terminology is outdated
- C:** Because it should be labelled a bicuspid valve
- D:** Because the left atrioventricular valve (LAVV) and right atrioventricular valve (RAVV) are abnormal valves, not variations of normal

**Question 6:** In the complete AVSD, how many total leaflets do the AV valves have?

- A:** Three
- B:** Four
- C:** One
- D:** Two
- E:** Five

**Question 7:** In the partial and intermediate forms of AVSD, how many leaflets do the LAVV and RAVV have, respectively?

- A:** Two leaflet LAVV and three leaflet RAVV
- B:** Three leaflet LAVV and three leaflet RAVV
- C:** Three leaflet LAVV and four leaflet RAVV
- D:** Four leaflet LAVV and four leaflet RAVV

**Strengths / Limitations**

**Question 8:** The images used to illustrate the heart were at a gestation of 27 + weeks. Does this mean that abnormal valves cannot be recognised in the SAX view at earlier gestations?

- A:** YES
- B:** NO

**Question 9:** Future research should evaluate ..... sonographers' ability to obtain the SAX view of the AV valves?

- A:** Less experienced
- B:** Highly experienced

## **Conclusion**

**Question 10:** What is the key difference in how the AV valves relate to the interventricular septum (IVS) in normal versus AVSD hearts in 4CV?

- A:** In normal hearts, the AV valves are at the same level with no offset; in AVSD, the TV is set more apically
- B:** In normal hearts, both valves are apically positioned; in AVSD, both valves are basally positioned
- C:** There is no difference in valve positioning between normal and AVSD hearts
- D:** In normal hearts, an offset of the valves are demonstrated with the TV set more apically; in AVSD, the AV valves demonstrate a linear AV valve insertion

**THE END**



**MEMBER INFO**

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**ANSWER SHEET**

**A22(25)**

Atrioventricular septal defect: An extended approach to prenatal sonographic imaging of the atrioventricular valves

*Time spent on activity						hour	min				
PART 1						PART 2					
	A	B	C	D	E		A	B	C	D	E
1						1					
2						2					
3						3					
4						4					
5						5					
6						6					
7						7					
8						8					
						9					
						10					

How relevant was the content of this activity to your scope of practice?			
			
Not at all	Somewhat	Mostly	Extremely

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