Could Descending Septal Artery Be Another Variant of the Dual Left Anterior Descending Artery?

¿Podría ser la arteria septal descendente otra variante de la doble arteria descendente anterior?

To the Editor,

We read with great interest the article by Montero-Cabezas et al., which prompted us to ask the question forming the title of this letter.

Absence of the first septal branch of the left anterior descending artery (LAD) on left coronary angiography not only raises the suspicion of the presence of a descending septal artery, or Bonapace’s branch, as mentioned by the authors themselves mention, but also clearly demonstrates the existence of a congenital coronary anomaly of the LAD.

According to Spindola-Franco et al., the LAD is the coronary artery with the most constant origin, course, and distribution in the human heart; however, many anatomical variants have been described in the literature.

Such congenital coronary anomalies are rare. Their incidence is between 0.64% and 1.3% but can reach almost 6%. Dual LAD represents 1.2% to 6.1% of all coronary anomalies.

Notably, the definition of the descending septal artery by Montero-Cabezas et al has similarities to the updated classification of type IV dual LAD, except that it could be considered the opposite: in the description by Montero-Cabezas et al, it is the short LAD (in this case the descending septal artery) that originates from the right coronary artery, or close to it, and the long LAD continues normally as a branch of the left coronary artery (Figure 1).

In such cases, the descending septal artery could be considered a new type of dual LAD, rather than an isolated variant of coronary anomalies. The types proposed by Montero-Cabezas et al would constitute its anatomical variants; therefore, the classification of dual LAD would remain as described in Figure 2.

The possibility of combining these types of anomaly of the origin, course, and distribution of the LAD could have important implications in clinical practice.

![Figure 1](http://dx.doi.org/10.1016/j.rec.2016.01.007)

**Figure 1.** Type V left anterior descending artery. Modified with permission from Moreno-Martínez et al, showing a graphical representation of the other types of dual left anterior descending artery. Cx, circumflex artery; LAO, left anterior oblique; LCA, left coronary artery; L-LAD, long left anterior descending artery; RAO, right anterior oblique; RCA, right coronary artery; S-LAD, short left anterior descending artery; RV, right ventricle; S-LAD, short left anterior descending artery.
Figure 2. Classification of the types and subtypes of dual left anterior descending artery (respecting the classic description by Spindola-Franco from 1983\textsuperscript{2}) Modified with permission from Moreno-Martínez et al.\textsuperscript{3} AVS, anterior interventricular sulcus; DSA, descending septal artery; LAD, left anterior descending artery; LCA, left coronary artery; LV, left ventricle; RCA, right coronary artery; RV, right ventricle.

- **Type I:** The short LAD crosses the AVS and is generally the origin of the main septal perforators. The long portion descends the left ventricular side of the AVS and re-enters the distal segment of the AVS until it reaches the apex.

- **Type II:** The short LAD is the same as in type I and the long LAD descends the right ventricular side of the AVS and re-enters the distal segment to continue its course to the apex.

- **Type III:** The short LAD corresponds with the descriptions of types I and II. The long LAD has an intramyocardial course through the interventricular septum and returns to the epicardial surface in the distal segment of the AVS until it reaches the apex.

- **Type IV:** The original LAD and the short LAD form a short vessel located very high in the AVS, from which the main septal perforating and diagonal branches originate. The long LAD is a branch of the RCA that runs anterior to the RV infundibulum and makes a sharp turn to reach the AVS, giving rise to the other septal and diagonal arteries on its course to the apex.

- **Type V:** The short LAD (described as the DSA by Montero-Cabezas et al\textsuperscript{1}) is a branch of, or originates near, the RCA, running anterior to the RV infundibulum and making a sharp turn to reach the AVS, where the first septal branch originates. The long LAD is a continuation of the LCA and gives rise to the other septal and diagonal branches on its course to the apex.

- **V(a):** Origen in the proximal segment of the RCA.
- **V(b):** Shares a common ostium with the RCA.
- **V(c):** Shares a common ostium with the conus branch.
- **V(d):** Independent origin in the right coronary sinus.

- **IV(a):** Tata (1999)\textsuperscript{6}: In addition to the classic type IV, the circumflex artery originates in the RCA.
- **IV(b):** Moreno (2005)\textsuperscript{6}: The short LAD may lack septal branches and the long LAD is not always a branch of the RCA, but may have an independent origin in the right coronary sinus.
- **IV(c):** Andreou (2009)\textsuperscript{7}: The short LAD gives rise to a diagonal branch that runs over the lateral wall of the left ventricle and crosses the obtuse margin of the heart, behaving like an aberrant marginal obtuse artery.
- **IV(d):** Cruz (2010)\textsuperscript{8}: In this case it is the LCA that originates from the RCA and gives rise to the long LAD; the short LAD comes directly off the left coronary sinus, is hypoplastic, only occupies the proximal third of the AVS, and does not give rise to any significant branches.
- **IV(e):** Manchanda (2010)\textsuperscript{9}: The short LAD originates directly from the left coronary sinus; the long LAD, from the right coronary sinus.
- **IV(f):** Maroney (2011)\textsuperscript{10}: The short LAD originates in the LCA and gives rise to the proximal septal perforating branches and a single large diagonal branch. The long LAD originates from the RCA, arriving at the AVS after crossing below the RV outflow tract, and gives rise to small septal perforating branches over its entire course.
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REFERENCES


Could Descending Septal Artery Be Another Variant of the Dual Left Anterior Descending Artery? Response

¿Podría ser la arteria septal descendente otra variante de la doble arteria descendente anterior? Respuesta

To the Editor,

We thank Moreno-Martínez et al for their comments regarding our letter.1 As they mention, the incidence of dual left anterior descending artery in healthy hearts is approximately 1%. Although the true incidence of descending septal artery based on coronary angiographic findings is unknown, its presence has been detected in a surprisingly high percentage of postmortem studies. Rodríguez et al2 identified the descending septal artery in 12% of 427 specimens; Taylor,3 in 68% of 112; and Sahni and Jit,4 in 85% of 500 autopsy subjects. As we stated in the above-mentioned letter, this could be explained by the high perfusion pressures used during these studies (reaching 280 mmHg) and the loss of muscle tone, or by the absence of surrounding tissue, which would facilitate the visualization of this vessel.5

This high detection rate, in contrast to the 1% reported for dual left anterior descending artery, could indicate that the descending septal artery is an anatomical variant that is underdetected by conventional angiography, rather than a coronary artery anomaly per se. Its development appears to be more evident in the presence of obstructive coronary artery disease,5 suggesting the “recruitment” of descending septal artery as a source of collateral circulation (Figure).

Figure. Anterior descending septal artery (arrows), which provides homocoronary collateral circulation (arrow heads) toward distal right coronary artery in the presence of an acute occlusion (A) and chronic occlusion (B) of right coronary artery.