

ECG Diagnosis: Dextrocardia

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Perm J 2019;23:18.244

E-pub: 08/15/2019

<https://doi.org/10.7812/TPP/18.244>

INTRODUCTION

Dextrocardia with situs inversus (also referred to as situs inversus totalis) is a rare congenital anomaly whereby the position of the abdominal and thoracic viscera are reversed.¹ The occurrence of this congenital anomaly has been reported to range between 1/6000 to 1/35000 live births and affects males and females equally.² The affected population with dextrocardia with situs inversus usually does not need any specific treatment except when they are symptomatic or whenever any treatable congenital heart anomaly is present. However, the recognition of this congenital condition is essential when any interventional procedure or emergency surgery is going to be performed in order to avoid any mishaps.³ In our case, a 43-year-old woman presented to the Emergency Department (ED) with chest pain and was found to have dextrocardia with situs inversus by physical examination, electrocardiogram (ECG), and chest radiography.

CASE PRESENTATION

A 43-year-old woman with a self-reported medical history of abnormal position of the heart presented to the ED, reporting 3 days of nonproductive cough, tactile fevers, mild shortness of breath, and diffuse chest tightness, which worsened with coughing. Her vital signs were: Temperature, 99 °F (37.2 °C); pulse, 72 beats/min; blood pressure, 139/90 mmHg; respiratory rate, 20 breaths/min; and oxygen saturation, 97% on room air. Findings from her lung examination were normal, and her cardiovascular examination revealed right-sided heart sounds. A standard 12-lead ECG (Figure 1) demonstrated a sinus rhythm, a right axis deviation, a negative QRS complex, and inverted P and T waves in lead I, with biphasic T waves and progressively decreasing R-wave amplitude from leads V₁ to V₆. Results of a repeat ECG (Figure 2) obtained after right-sided repositioning

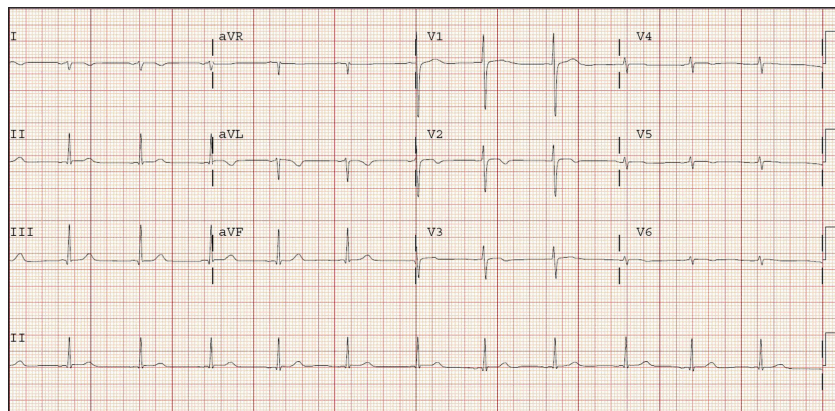


Figure 1. 12-lead electrocardiogram from a 43-year-old woman with dextrocardia and situs inversus. Results demonstrate a sinus rhythm, a right axis deviation, a negative QRS complex, and inverted P and T waves in lead I, with biphasic T waves and progressively decreasing R-wave amplitude from leads V₁ to V₆.

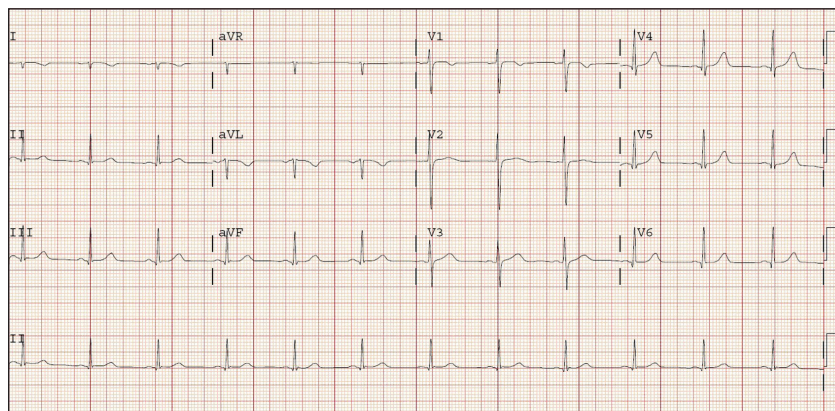


Figure 2. 12-lead electrocardiogram from same patient obtained after right-sided repositioning of the precordial leads (V₁-V₆). Results demonstrate a normal sinus rhythm with normal R-wave progression in the precordial leads.

of the precordial leads (V₁-V₆) demonstrated a normal sinus rhythm with normal R-wave progression in the precordial leads. Results of a posteroanterior chest radiograph (Figure 3) demonstrated the cardiac apex and aortic arch in the right side of the patient's chest, with the gastric air bubble in the right side of the upper abdomen. Laboratory test results, including a complete blood count, serum electrolytes, creatinine, and glucose, were normal, and a troponin I was not detectable (< 0.02 ng/mL; normal range,

0.00-0.04 ng/mL). The patient was discharged with the diagnosis of viral respiratory infection, and dextrocardia with situs inversus.

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Keywords: dextrocardia with situs inversus, electrocardiogram, Kartagener syndrome

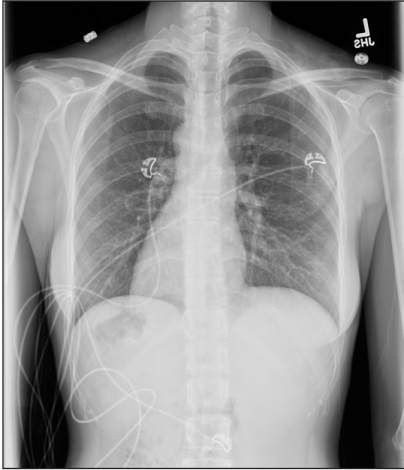


Figure 3: Posteroanterior chest radiograph from same patient. This image demonstrates the cardiac apex and aortic arch in the right side of the chest, with the gastric air bubble in the right upper abdomen; findings consistent with dextrocardia and situs inversus.

DISCUSSION

Dextrocardia is defined as a cardiac position that is a mirror image of normal anatomy. When the position of both the thoracic and abdominal viscera are reversed, this is referred to as dextrocardia with situs inversus (situs inversus totalis). The physical finding in patients with dextrocardia is the presence of right-sided heart sounds on auscultation, with the maximum cardiac impulse located on the right side of the chest.⁴ In patients with dextrocardia, the standard 12-lead ECG will show marked right-axis deviation of the P wave and QRS complex, with lead I frequently demonstrating a largely negative QRS complex and inverted P and T waves.⁵ The QRS complexes in leads aVR and aVL are reversed so that the R wave in lead aVR is positive.⁵ The typical QRS complex progression in the precordial leads is reversed, most noticeably in V_4 to V_6 .⁶ There is a loss of amplitude toward V_6 , and V_1 and V_2 also are reversed.^{7,8} These precordial lead findings

are valuable in differentiating mirror-image dextrocardia from reversed right/left limb lead-placement error, which yields R waves progressing normally from V_1 through V_6 .⁵ For patients with known dextrocardia, reversal of the arm leads results in a “normal” P-wave pattern and QRS axis in the frontal plane limb leads. In addition, reorientation of the precordial leads to a right-sided approach (leads V_{1R} - V_{6R}) results in a typical pattern of septal depolarization and R-wave progression on the 12-lead ECG.^{6,8} To our knowledge, current ECG machines do not have algorithms to detect dextrocardia. Chest radiography can aid in confirming the diagnosis of dextrocardia with situs inversus, in which case the cardiac apex and aortic arch will be located in the right side of the chest, with the gastric air bubble located in the right upper abdomen. Both transthoracic and transesophageal echocardiography are useful in confirming the diagnosis of dextrocardia; because of the position change of the heart, certain ultrasound probe angle manipulations are required to obtain the recommended views.

Although patients with dextrocardia and situs inversus typically lead healthy lives, it is important to consider the possibility of heterotaxy syndrome and Kartagener syndrome, as both have long-term ramifications. Kartagener syndrome should be suspected in the setting of the classic triad of situs inversus, associated with chronic sinusitis, and bronchiectasis caused by ciliary dyskinesia.^{9,10} Dextrocardia with heterotaxy involves variably positioned internal organs, and can be associated with polysplenia, asplenia, and bowel malrotation, but most concerning is that it is often associated with cardiac defects.¹¹ These defects can be severe, but are usually recognized early in life. Most commonly, patients will have left or right atrial isomerism, resulting in interrupted vena cava, anomalous pulmonary

venous return, absence of a sinus node, or endocardial cushion defects.¹¹ Patients with dextrocardia with situs inversus and additional cardiac or extracardiac complications should follow-up with the appropriate specialist. ♦

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

How to Cite this Article

Mozayan C, Levis JT. ECG diagnosis: Dextrocardia. Perm J 2019;23:18.244. DOI: <https://doi.org/10.7812/TPP/18.244>

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