CASE REPORT

Dextrocardia as an uncommon cause of inferior ST-segment elevation

Ravi Vazirani Ballesteros*, Eliomar García-Bello, Pablo Zulet

Cardiovascular Institute, Hospital Clínico San Carlos, Madrid, Spain.

*Correspondence: Ravi Vazirani Ballesteros, Hospital Clínico San Carlos, Calle Profesor Martín Lagos s/n. Postal code: 28040, Madrid, Spain. Phone: +34 91 330 31 49. Email: ravi.vazirani@salud.madrid.org

How to cite this article: Vazirani Ballesteros R, Garcia-Bello E, Zulet P. Dextrocardia as an uncommon cause of inferior ST-segment elevation. Arch Clin Cases. 2025;12(2):59-61. doi: 10.22551/2025.47.1202.10314

ABSTRACT

A 36-year-old woman with surgically repaired transposition of the great vessels was admitted with psychiatric symptoms. The 12-lead ECG showed ST-segment elevation in the inferior leads, a positive P wave in aVR, and an absent R wave progression in the precordial leads. The findings were attributed to atrial repolarization (Ta) waves in the setting of dextrocardia and low atrial rhythm, causing ST-segment elevation in the inferior leads. No cardiac symptoms were present, and additional tests ruled out ischemia. Atrial repolarization waves are typically imperceptible on ECG but can become evident in certain conditions, such as low atrial rhythm. This case represents a rare coexistence of dextrocardia and ST-segment elevation due to an inverted atrial repolarization wavefront in the setting of low atrial rhythm. Recognizing this pattern is essential to prevent misdiagnosis and avoid unnecessary procedures.

KEYWORDS: ST-segment elevation; ECG; dextrocardia; congenital heart disease; atrial repolarization; Ta

INTRODUCTION

ST-segment elevation is often linked to severe cardiac pathology, but benign etiologies have also been described. Among the various forms of non-ischemic ST-segment elevation, we present a particularly rare case in a patient with congenital heart disease.

CASE PRESENTATION

A 36-year-old woman with a history of surgically repaired transposition of the great vessels by arterial switch was admitted for auditory hallucinations and a feeling of imminent death. She had a history of psychotic symptoms and her current treatment was: olanzapine, paliperidone, aripiprazole and haloperidol.

An ECG was performed (Figures 1A and 1B) revealing ST-segment elevation in the inferior leads, a positive P wave in aVR and negative in V4-V6, inverted R wave progression in the precordial leads and extreme right axis deviation, suggesting dextrocardia and low atrial rhythm which was confirmed by chest X-ray (Figure 2). No chest pain was reported, and additional tests ruled out ischemia. Therefore, the ECG findings were attributed to a marked atrial repolarization wave (Ta) directed opposite to the P wave axis (negative in the inferior leads) in the setting of low atrial rhythm, causing ST-segment elevation. The patient was diagnosed with an anxiety attack and discharged by the psychiatry ward once the episode had resolved.

Received: December 2024; **Accepted after review:** April 2025; **Published:** April 2025.

DISCUSSION

Atrial repolarization wave (Ta) is usually imperceptible on ECG due to its low magnitude (100-200 microvolts) and is typically masked by the ensuing QRS complex [1]. However, when visible, it is often overlooked. Ta is directed opposite to the main P wave axis: negative in leads with an upright P wave, and positive in leads with an inverted P wave, such as leads II and III (Figure 1B). Certain factors can enhance its visibility, including a short PR interval, intra/interatrial conduction delay due to surgery, or other underlying conditions [2].

When atrial repolarization extends into the ST-segment, it can cause ST-segment depression, particularly in cases with a short PR interval. Conversely, when the P wave is negative, atrial repolarization can appear as ST-segment elevation, as previously described by Manne [3]. Notably, this is the first documented case where these two phenomena coexist. Unlike Manne's case, which involved a low atrial rhythm and levocardia, our patient had dextrocardia with a low atrial rhythm showing negative polarity in the inferior leads. Additionally, the fifth beat was an atrial extrasystole with polarity inverted relative to the other beats (Figure 1A).

The first P wave exhibits a longer PR interval (280ms) and a diphasic waveform (mostly positive and negative in the end) in the inferior leads, with a negative polarity in I, suggesting sinus origin with interatrial block and intra-atrial conduction delay. The rest of the P waves exhibit an overall negative polarity in the inferior leads and positive in aVR,

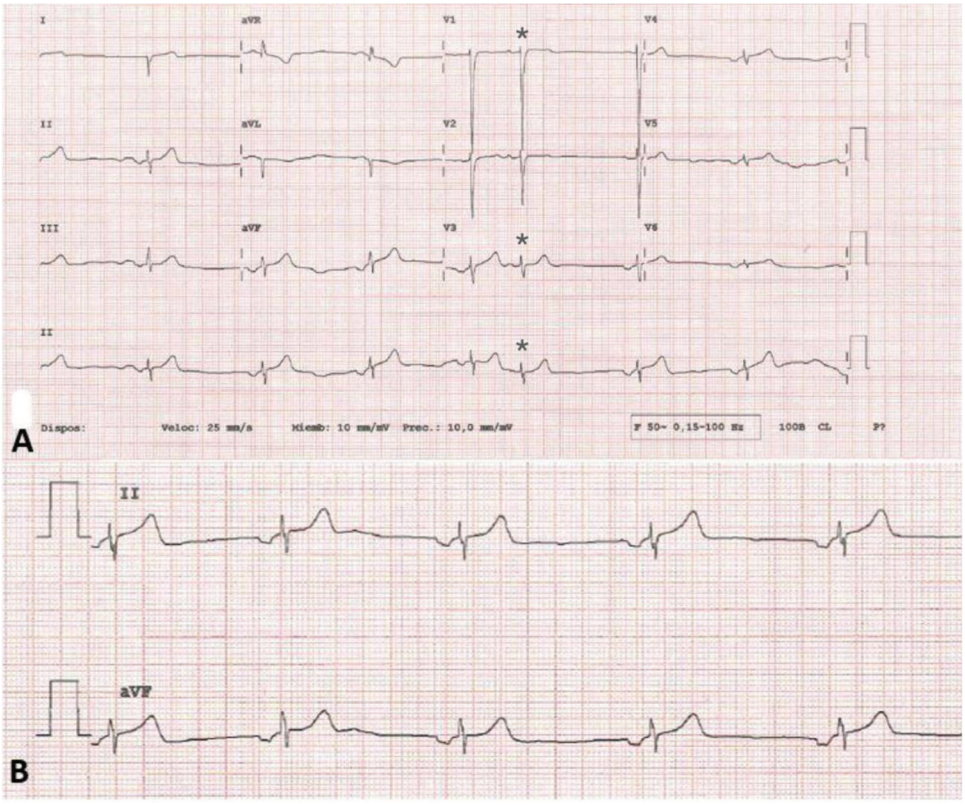

Fig. 1. A. a 12-lead-electrocardiogram showing low atrial rhythm in the setting of dextrocardia with a positive P wave in aVR and negative in V4-V5; inverted R wave progression in the precordial leads; 1mm ST-segment elevation in the inferior leads. Other findings are bradycardia at 42bpm, extreme right axis deviation, supraventricular ectopic beat (*) and a wide and slurred P wave suggesting interatrial conduction delay. The PR interval is around 280ms for the first beat in the rhythm strip and 160ms throughout the rest of the tracing, the QTc interval is 371ms; **B.** a rhythm strip of II and aVF to emphasize the ST-segment elevation.

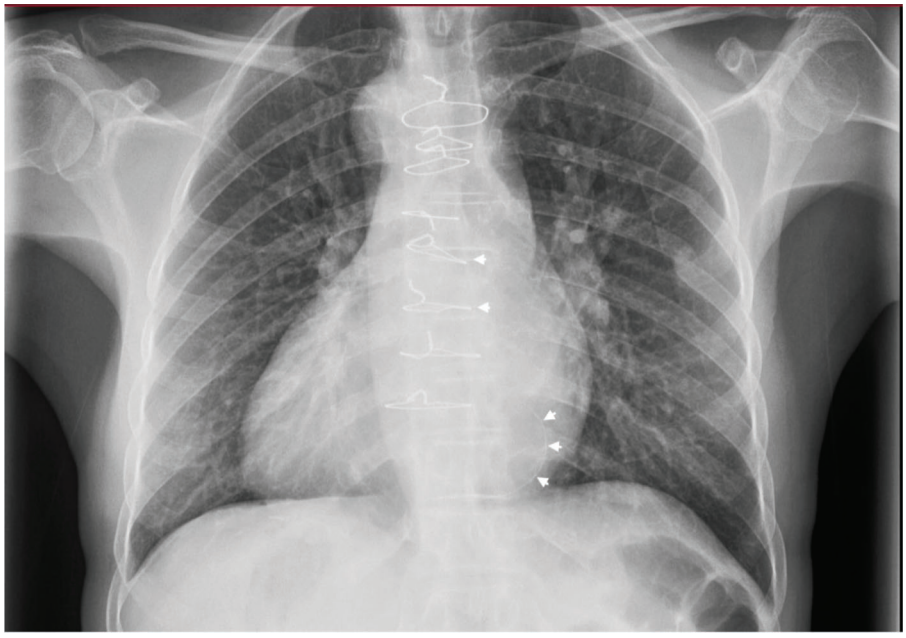

Fig. 2. Posteroanterior chest X-Ray showing dextrocardia and left aortic arch, with present sternal wires from the previous median sternotomy and an epicardial pacemaker wire (white arrows).

with a shorter PR interval (160ms) compared to the first beat, which is consistent with low atrial rhythm with intra-atrial conduction delay (which justifies the normal PR interval in the setting of low atrial rhythm). We believe that the 1 mm ST-segment elevation caused by the first beat is due to the final atrial depolarization wavefront, which is negative, rendering an inverted atrial repolarization wave, similar to the Ta of the rest of the low atrial rhythm beats from the rhythm strip.

This rare and often underdiagnosed condition can lead to unnecessary procedures. Our patient was admitted to psychiatric care without undergoing further cardiological evaluation.

CONCLUSION

Non-ischemic ST-segment elevation should be considered in patients with congenital heart disease and abnormal ECGs, particularly in the presence of low atrial rhythms or a history of cardiac surgery. Recognizing these findings can help avoid misdiagnosis and unnecessary testing.

Informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Funding

No fundings were required for the writing of this paper.

Acknowledgments

The authors thank Fundación Interhospitalaria para la Investigación Cardiovascular (FIC) for their support.

Conflict of interests

The authors do not have any conflict of interest.

REFERENCES

1. Surawicz B, Knilans T. Atrial abnormalities. In Chou's electrocardiography in clinical practice: Adult and pediatric. 6th ed. Philadelphia: Saunders/Elsevier. 2008:42. ISBN: 9781416037743
2. Childers R. New and neglected aspects of atrial depolarization and repolarization. J *Electrocardiol*. 1998; 30(Suppl. 1):44-52. https://doi.org/10.1016/S0022-0736(98)80019-8
3. Manne JRR. Atrial Repolarization Waves (Ta) Mimicking Inferior Wall ST Segment Elevation Myocardial Infarction in a Patient with Ectopic Atrial Rhythm. *Case Rep Med*. 2018 Jan 18;2018: 1015730. PMID: 29559997; PMCID: PMC5822924. doi: 10.1155/2018/1015730.