Journal of Cardiology and Cardiovascular Research

Singh Y, 2024-J Cardiol Cardiovasc Res
ISSN:2583-259X
Case Report

Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report

Yogendra Singh[1], CB Pandey[2], Shashank Pandey[2], Nitin Chandola[3*] and Deeksha Agarwal[3]

[1]Interventional Cardiologist, Department of Cardiology, Max Super Specialty Hospitals, Dehradun, Uttarakhand, India

[2]Assistant Professor, Department of Cardiology, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh, India

[3]Clinical Research, Department of Research and Development, Sunfox Technologies, Uttarakhand, India

[*]**Corresponding Author:** Nitin Chandola, Clinical Research, Department of Research, and Development, Sunfox Technologies, Uttarakhand, India.

Received Date: 02-11-2024
Accepted Date: 02-20-2024
Published Date: 02-29-2024

Abstract

Background: Wolff-Parkinson-White (WPW) syndrome arises from the presence of an accessory pathway in the heart, disrupting normal electrical conduction between the atria and ventricles. Diagnosis via electrocardiography typically reveals characteristic features such as Delta waves, shortened PR intervals, and RR variabilities.

Case Summary: The authors present the case of a 23-year-old male with a history of tobacco and alcohol use, exhibiting electrocardiographic manifestations consistent with WPW syndrome.

Employing a Smartphone-based 12-lead ECG and bicycle ergometer, additional testing under resting and stressed conditions revealed a spectrum of abnormalities including T-wave inversions, tachyarrhythmias, conduction blocks, ST depressions, shortened PR intervals, and persistent Delta waves. Despite the absence of symptoms, a stress test achieving 10 METS over 5 minutes demonstrated the potential for ventricular tachycardia.

Discussion: Following evaluation by a cardiologist, a watchful waiting approach was recommended, with no pharmacological intervention prescribed. This report underscores the utility of smartphone ECG technology in managing WPW syndrome, offering insights into dynamic cardiac responses during stress and informing clinical decision-making.

Regular follow-up ECG assessments at six-month intervals were advised to monitor for emerging symptoms. The importance of prompt consultation with a cardiologist upon symptom onset cannot be overstated, given the inherent risk of life-threatening arrhythmias associated with WPW syndrome.

Keywords: Accessory atrioventricular pathway; Case report; Wolf parkinson white syndrome; Stress test.

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

Introduction

Wolf Parkinson White syndrome (WPW) arises from an anomaly in cardiac electrical conduction due to the development of an aberrant pathway connecting the atria to the ventricles, influenced by genetic factors [1]. The characteristic ECG pattern of WPW was initially described by Wilson and Wedd in the early twentieth century [2], with its nomenclature established in the 1930s by Louis Wolff, Sir John Parkinson, and Dr. Paul Dudley White [3].

WPW syndrome affects 1 to 3 individuals per 1,000 persons, with many cases being asymptomatic [4]. It involves an additional pathway allowing electrical impulses to bypass the atrioventricular (AV) node, leading to early ventricular depolarization, known as preexcitation [5].

Symptomatic WPW manifestations may include dyspnea, palpitations, dizziness, chest discomfort, and in severe cases, syncope or cardiac arrest. Diagnosis typically involves electrocardiographic changes, such as a short PR interval, delta wave, QRS widening, ST-segment depression, occasional T-wave inversion, tachyarrhythmia, and bundle branch block [6].

Untreated symptomatic WPW poses life-threatening arrhythmia risks [7]. Management options include pharmacological intervention for symptomatic episodes or long-term prophylactic treatment, as well as surgical interventions like interrupting the accessory pathway, implanting an anti-tachycardia device, or catheter ablation [8].

This case report focuses on ECG alterations in a WPW patient using the Smartphone-based 12-lead ECG device "Spandan Pro" by Sunfox Technologies Private Limited, Dehradun, Uttarakhand, India. Additionally, the patient, with a familial predisposition to WPW, underwent follow-up tests, including stress ECG conducted through stationary biking at 225 watts, corresponding to 10 METs, maintaining a speed of 60 revolutions per minute for 5 minutes on a bicycle ergometer [9].

Case report

During a corporate health camp organized in his office on June 13, 2023, a 23-year-old male underwent a routine electrocardiogram (ECG) examination utilizing a Spandan 12 lead ECG device. The individual, asymptomatic and with a history of smoking and alcohol consumption but no prior cardiac issues, was evaluated. The ECG revealed a consistent sinus rhythm with a rate of 88 beats per minute. Positive Delta waves were observed in leads I, II, AVL, and precordial leads, while negative Delta waves were present in leads III and AVF.

Additionally, a shortened PR interval of 80 milliseconds, a widened QRS complex, and ST segment depression in leads I, AVL, V2, V3, V4, V5, and V6 were noted. These findings were indicative of Wolff-Parkinson-White (WPW) Syndrome or Pre-excitation syndrome (Figure 1).

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

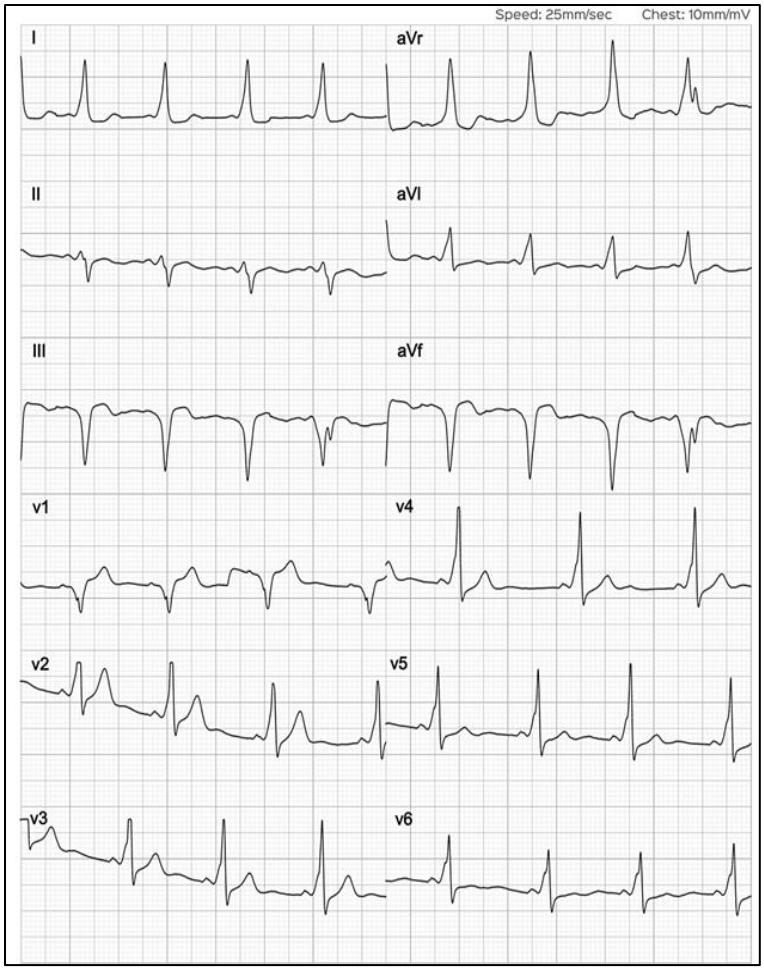

Figure 1: The initial examination for a routine checkup was conducted on June 13, 2023.

On December 18, 2023, a follow-up electrocardiogram (ECG) revealed an irregular sinus rhythm with a rate of 107 beats per minute. Delta waves were observed in Lead I, II, AVL, and the precordial leads, while a negative delta wave was evident in Lead III and AVF. The examination also disclosed a short PR interval of 80 milliseconds, tachyarrhythmia, and ST depressions in Lead I, AVL, V2, V3, V4, V5, and V6.

Notably, the ECG displayed a widened QRS complex, an R/S ratio greater than 1, and a pattern reminiscent of right bundle branch block (RBBB) with Wolff-Parkinson-White (WPW) Syndrome (Figure 2).

After these findings, the individual was recommended to consult with a cardiologist. Consequently, the cardiologist performed another electrocardiogram (ECG) the subsequent day, which displayed identical changes as documented in the December 18 report. Given the patient's asymptomatic status, the cardiologist opted for no medication or treatment, advising the patient to seek consultation if any symptoms arise (Figure 3).

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

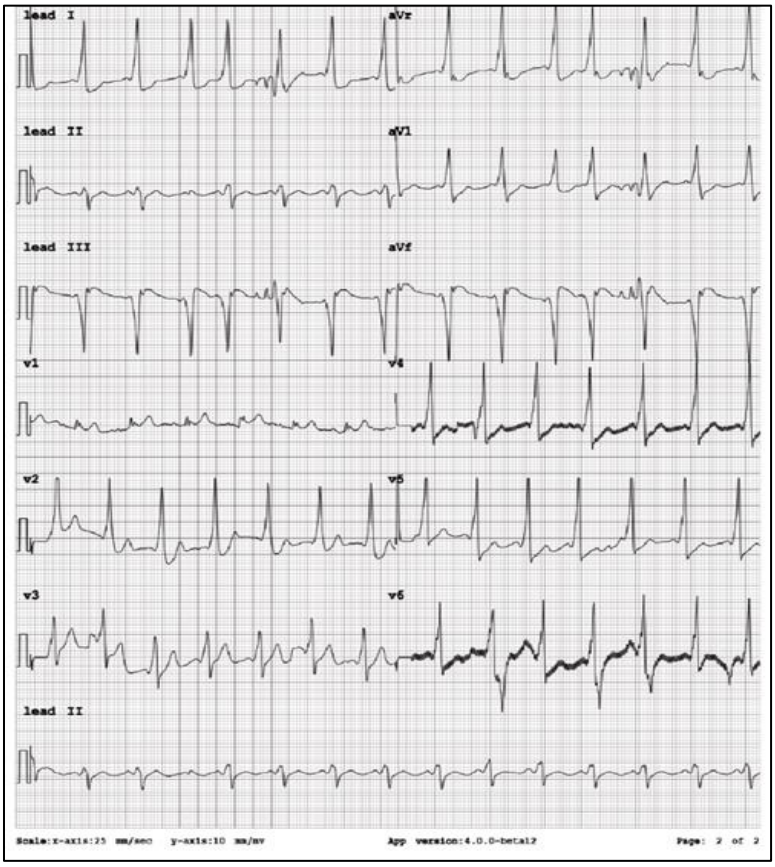

Figure 2: ECG was performed after 6 months on 18 December 2023.

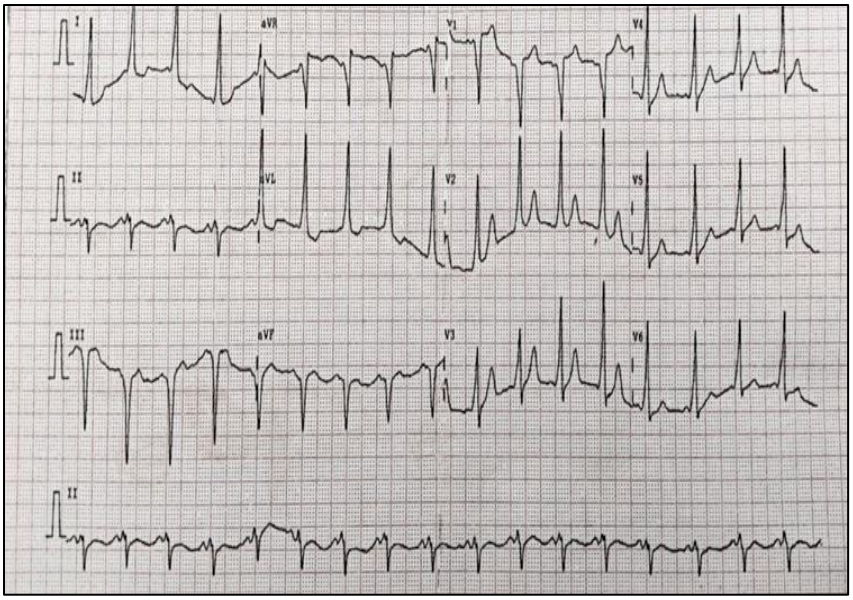

Figure 3: The Cardiologist take the test during the examination on 19 December 2023.

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

On January 8, 2024, an evaluation was conducted to observe electrocardiogram (ECG) alterations following physical exertion. The individual underwent a stationary biking test at 225 watts, corresponding to 10 metabolic equivalents (METs), maintaining a speed of 60 revolutions per minute for 5 minutes. Prior to the stress test, a baseline resting ECG was obtained, indicating a heart rate (HR) of 103 beats per minute (bpm) and blood pressure (BP) of 130/100mmHg. Following the stress test, the HR increased to 136 bpm, while the BP rose to 160/120mmHg. Notably, the only noticeable change was the increase in heart rate; other parameters remained consistent (Figure 4,5).

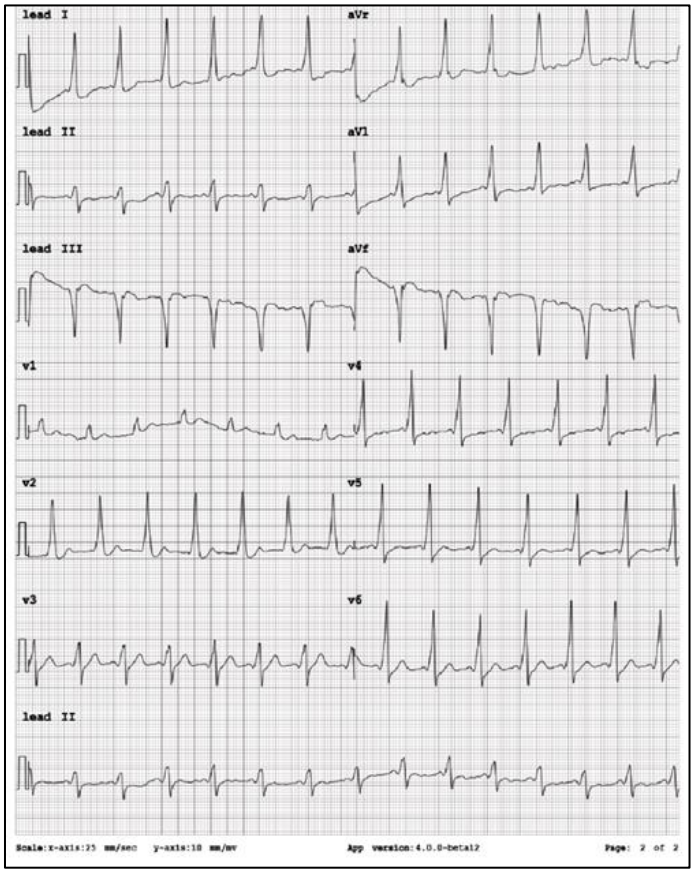

Figure 4: Before the stress test at resting.

Cardiologists concluded that ventricular tachycardia (VT) was not induced during the stress test, indicating that immediate intervention to treat the accessory pathway was not warranted.

However, this does not imply that this WPW case exhibits no signs of evolving into critical arrhythmias. The exercise test failed to abolish the delta R wave, suggesting that electrical impulses continued to travel through the accessory pathway, posing a higher risk of Sudden Cardiac Death. If symptoms manifest during further follow-ups, ablation should be considered. Hence, the patient was advised to follow up with the cardiologist every six months, but no medications and treatments were prescribed.

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

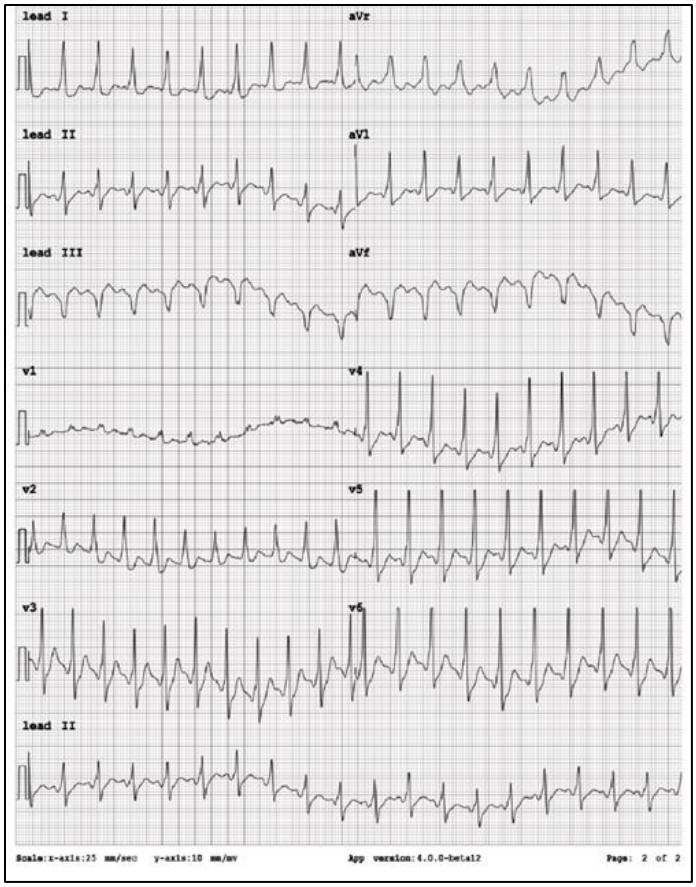

Figure 5: After Stress test (stationary biking test at 225 watts, corresponding to 10 metabolic equivalents (METs), speed of 60 rpm and duration 5 minutes).

Discussion

The Smartphone-based ECG device serves as a pivotal point-of-care instrument, facilitating the diagnosis of Wolff-Parkinson-White (WPW) syndrome and proving to be an invaluable aid in the diagnostic process [8]. Validation of 12-lead Smartphone ECG devices has been achieved by comparing interpretations to those of the Gold Standard 12-lead ECG and interpretations made by cardiologists [8]. WPW syndrome, the predominant manifestation of ventricular preexcitation, constitutes a prevalent conduction anomaly within the cardiac system [9]. This disorder arises from the presence of a pre-excitation accessory pathway, leading to tachyarrhythmias [10]. It is essential to differentiate Wolff-Parkinson-White syndrome from Wolff-Parkinson-White pattern when examining electrocardiogram (EKG) recordings, as individuals with the latter are typically asymptomatic. Globally, the prevalence of Wolff-Parkinson-White syndrome is estimated at 1-3 cases per 1,000 individuals, emerging as the most common cause of arrhythmia among the Chinese population [11].

The electrocardiographic (ECG) modifications demonstrate a discernible evolution in the morphological characteristics of Wolff-Parkinson-White

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088

(WPW) syndrome over a span of 6 months. The diagnostic report underscores the manifestation of a right bundle branch block (RBBB) pattern and Tachycardia.

Conversely, the stress test did not unveil substantial alterations; it merely recorded an elevation in heart rate. These findings suggest a temporal progression in the pathogenesis of the disease.

Consequently, it is recommended that the patient undergoes periodic ECG tests at intervals of 4-5 months to monitor the ongoing development of WPW syndrome. Limitations of this case study include the lack of clarity regarding the accessory pathway, as no intervention was conducted. Furthermore, the genetic history of the patient remains uncertain, and it is unclear whether any family members have a history of Wolff-Parkinson-White (WPW) syndrome.

Additionally, the patient's history of smoking and alcohol consumption presents potential challenges in the future, given that both smoking, and alcohol intake are known to accelerate heart rate. This report indicates that Wolff-Parkinson-White (WPW) syndrome imitates ischemia and conduction disorders, manifesting as a wide QRS complex, an R/S ratio exceeding 1, and the presence of ST depression in the findings [12]. Challenges in diagnosing Wolff-Parkinson-White syndrome arise due to prolonged refractory periods in both accessory pathways and atrioventricular conduction. There is currently no reliable algorithm for ECG diagnosis, posing diagnostic and therapeutic challenges, especially in cases of syncope [12].In this presented study, a patient was identified solely through a routine electrocardiogram (ECG) screening and diagnosed with asymptomatic Wolff-Parkinson-White (WPW) syndrome. Thus, the findings underscore the significance of routine ECG examinations in the detection and diagnosis of asymptomatic WPW.

Conclusion

The study concluded that the Smartphone-based 12-lead ECG device is a valuable point-of-care tool for initial screening and provides a potential tool for continuous monitoring.

This case highlights the potential role of point-of-care ECG devices in managing WPW Syndrome, offering insights into dynamic cardiac responses during stress, thus informing clinical decisions. The findings of this study emphasize the importance of regular follow-up ECG tests at six-month intervals.

Additionally, if the patient encounters any symptoms, it is imperative to seek immediate consultation with a cardiologist. This proactive approach is crucial in mitigating the risk of life-threatening arrhythmias associated with Wolff-Parkinson-White syndrome.

Financial Support

The work reported in this manuscript received no financial support or benefits from commercial sources.

Potential Conflict of Interest

The authors declare no potential conflicts of interest or any other financial interests that could create a conflict of interest or the appearance of a conflict of interest with regard to the work.

References

1. Wolff L, Parkinson J, White PD. Bundle-branch Block with Short P-R Interval in Healthy Young People Prone to Paroxysmal Tachycardia. Ann Noninvasive Electrocardiol. 2006;11(4):340. PubMed | CrossRef
2. Wilson FN. A Case in Which the Vagus Influenced Form of the Ventricular Complex of the Electrocardiogram. Ann Noninvasive Electrocardiol. 2002;7(2):154. PubMed | CrossRef
3. De Bacquer D, De Backer G, Kornitzer M. Prevalences of ECG Findings in Large Population Based Samples of Men and Women. Heart. 2000;84(6):625-33. PubMed | CrossRef
4. Paul S. Nursing Grand Rounds. J Cardiovasc Nurs. 1993;7(3):73-80. PubMed | CrossRef
5. Conover MB. Understanding Electrocardiography: Arrhythmias and the 12 Lead ECG. 5th ed. St Louis, Mo: CV Mosby; 1988.
6. Milstein S, Sharma AD, Klein GJ. Electrophysiologic Profile of Asymptomatic Wolff-parkinson-white Pattern. Am J Cardiol. 1986;57(13):1097-100. PubMed | CrossRef
7. Waldo AL, Akhtar M, Benditt DG, Brugada P, Camm AJ, Gallagher JJ, et al. Appropriate Electrophysiologic Study and Treatment of Patients with the Wolff-parkinson-white Syndrome. J Am Coll Cardiol. 1988;11(5):1124-9. PubMed | CrossRef
8. Koplan BA, Stevenson WG. Ventricular Tachycardia and Sudden Cardiac Death. Mayo Clin Proc. 2009;84(3):289-297. PubMed | CrossRef
9. Valderrama AL. Wolff-parkinson-white Syndrome: Essentials for the Primary Care Nurse Practitioner. J Am Acad Nurse Pract. 2004;16(9):378-83. PubMed | CrossRef
10. Kesler K, Lahham S. Tachyarrhythmia in Wolff-parkinson-white Syndrome. West J Emerg Med. 2016;17(4):469. PubMed | CrossRef
11. https://ghr.nlm.nih.gov/condition/wolffparkinson-white-syndrome
12. Marrakchi S, Kammoun I, Kachboura S. Wolff-Parkinson-White Syndrome Mimics a Conduction Disease. Case Rep Med. 2014;2014. PubMed | CrossRef

Citation: Singh Y, Pandey CB, Pandey S, Chandola N, Agarwal D. Smartphone ECG Based Successful Diagnosis of WPW Syndrome Under Both Resting and Stress Test Conditions: A Case Report. J Cardiol Cardiovasc Res. 2024;5(1):117-24.
DOI: https://doi.org/10.37191/Mapsci-JCCR-5(1)-088