

Fasciculoventricular Pathways: A Sailor's Return to Full Military Duty

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Abstract

Fasciculoventricular pathways (FVPs) are rare accessory pathways that result in preexcitation on the electrocardiogram (EKG). These pathways are not associated with clinically significant tachyarrhythmias. We present a case of a 34-year-old Navy diver found to have preexcitation on EKG during evaluation of syncope. Given his high-risk occupation, he underwent electrophysiology studies which confirmed a diagnosis of FVP. Given that this finding is not associated with increased risk of hemodynamically significant cardiac arrhythmias, the patient was able to continue his career in the Navy.

Keywords: Preexcitation, Fasciculoventricular pathways, electrophysiology study, tachyarrhythmias.

Introduction

Preexcitation or Wolff-Parkinson-White pattern on EKG describes a short PR interval and prolonged QRS complex with slurring of the initial upstroke. (1) This pattern can arise from a variety of accessory pathways that bypass the normal conduction system of the heart. Patients with preexcitation on EKG and history of a tachyarrhythmia are considered to have Wolff-Parkinson-White syndrome. Around 1-2% per year of asymptomatic patients with preexcitation on EKG will develop symptomatic supraventricular arrhythmias. Patients with Wolff-Parkinson-White syndrome have around 4% lifetime risk of sudden cardiac death. (2) As such, the finding of preexcitation on EKG is generally considered disqualifying for military service.

Fasciculoventricular pathways (FVPs) are benign accessory pathways that result in subtle preexcitation on EKG mimicking that of Wolff-Parkinson-White with anteroseptal accessory pathways. (3) Here, we present a case of a fasciculoventricular pathway in a Navy diver who was subsequently cleared to continue military service.

Case

A 34-year-old male Navy diver presented to our cardiology clinic for evaluation after Wolff-Parkinson-White pattern was seen on electrocardiogram (Figure 1) and exercise stress test. His past medical history was significant for anxiety and gastroesophageal reflux disease. For around two years, he noted episodes of abdominal discomfort described as spasm-like tightness in the mid-epigastrium that worsened with exercise and stress. He reported prior episodes of palpitations and an episode of syncope while on a one-week trial of trazodone.

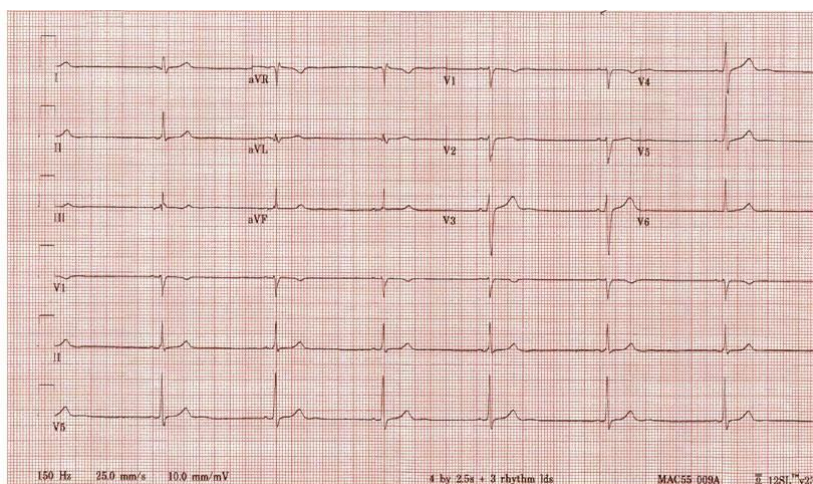


Figure 1: Patient's baseline EKG showing sinus bradycardia with short PR (108ms) and slurred QRS upstroke (delta wave) in lead II, V3 and V4.

Palpitations resolved after discontinuation of trazodone and the patient denied any other episodes of syncope. Transthoracic echocardiography revealed a structurally normal heart. Two-week ambulatory cardiac monitoring found normal sinus rhythm with rare isolated ventricular ectopy and no obvious pre-excitation. Episodes of abdominal pain corresponded to normal sinus rhythm on ambulatory cardiac monitor. Exercise stress testing showed short PR interval and delta waves that resolved with exercise related sinus tachycardia raising concern for Wolff-Parkinson-White syndrome. Given his career as a Navy

diver, the patient was then referred to an electrophysiologist for electrophysiology testing to meet US Navy physical standards for submarine duty given ventricular preexcitation is a disqualifying diagnosis.

At electrophysiologic testing, baseline measurements were remarkable for a PR interval of 100ms and a QRS morphology showing subtle preexcitation ms. The A-H interval was 90 ms. H-V interval was short at 28 ms (Figure 2).

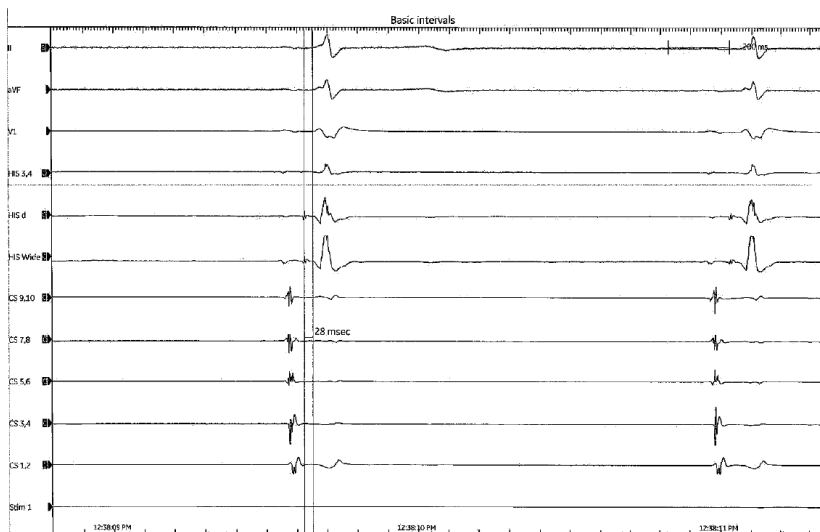


Figure 2: Intracardiac baseline recording with H-V interval of 28 ms.

With right ventricular pacing, VA Wenckebach was seen at 600 ms at baseline and at 350 ms on isoproterenol with earliest retrograde atrial activation seen at the His bundle. VA decrementation was noted with rapid pacing.

With right atrial pacing, Wenckebach AV block was seen at 500 ms. On isoproterenol, AV block was seen at 300 ms. Preexcitation remained constant and limited throughout rapid atrial pacing (Figure 3). The antegrade effective refractory period (ERP) of the AV node was 240 ms at a drive cycle length of 600 ms on isoproterenol. At a coupling interval of 260 ms, there was loss of preexcitation with normalization of the HV interval.

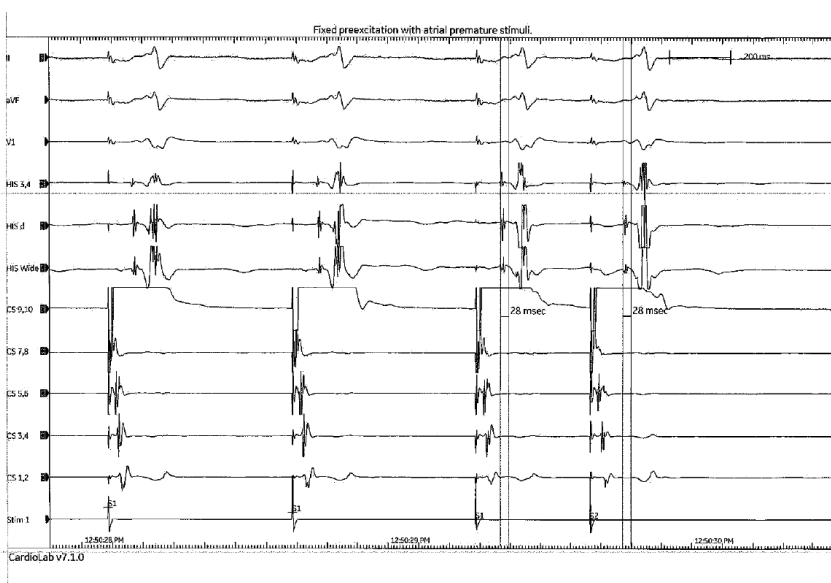


Figure 3: Intracardiac recording showing fixed preexcitation with atrial premature stimuli.

No supraventricular arrhythmias could be induced despite aggressive pacing including double extra stimuli on high-dose isoproterenol and burst pacing approaching atrial refractoriness. Data from the electrophysiology study was most consistent with a FVP, a rare preexcitation variant which results in relatively fixed preexcitation because of an accessory pathway connecting the His bundle to the ventricular summit. This was supported by the relatively fixed preexcitation noted throughout with normal retrograde conduction.

Given that this pathway is not expected to support a significant arrhythmia, the patient was medically cleared to continue service in the military as a Navy diver.

Discussion

Fasciculoventricular pathways (FVPs) are rare accessory connections between the bundle of His or more distal fascicles and the ventricle. The estimated prevalence of FVPs is approximately 1.2-5.1% in symptomatic patients undergoing cardiac evaluation. FVPs are not associated with reciprocating tachyarrhythmias.

On surface EKG, FVP can be difficult to distinguish from anteroseptal accessory pathways which could be capable of rapid conduction. This distinction is important as patients with anteroseptal accessory pathways could benefit from ablation. A recent retrospective review of FVPs found the following to be most characteristic on EKG: not so short PR interval (110-120ms), S-wave amplitude less than 20 mm, and flat or negative delta wave. (3,5) Ultimately, electrophysiological testing is needed to confirm the diagnosis. Atrial pacing will produce AH prolongation without change in degree of preexcitation as seen in our patient. Once the diagnosis is confirmed, no intervention is warranted. FVPs do not incur risk of sudden cardiac death and ablation of the pathway carries significant risk of damage of the conduction system. (4)

This case highlights the importance of a thorough evaluation of syncope especially in patients with active, high-risk occupations or hobbies. The 2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients with Syncope recommends a 12-lead EKG of all patients presenting with syncope. This EKG can identify valuable clues to the cause of syncope; however, several prospective studies suggest that EKG findings may not affect subsequent management of most patients presenting with syncope. A detailed history provides additional information that can be helpful when distinguishing arrhythmogenic from non-arrhythmogenic syncope especially in patients presenting with Wolff-Parkinson-White pattern on EKG. Tachyarrhythmias generally need to be very rapid to induce syncope in younger patients. The report of palpitations and lightheadedness in this population should raise concern for arrhythmogenic syncope even though these symptoms may precede non-arrhythmogenic syncope. Further diagnostic evaluation of syncope is patient dependent, but it is generally

recommended that athletes and patients with high risk occupations who have syncope and Wolff-Parkinson-White pattern should be referred for further subspecialist evaluation. (6).

Conclusion

In conclusion, we presented a case of FVP diagnosed in a patient after thorough evaluation for syncope. His presentation with syncope and preexcitation on EKG raised concern for possible Wolff-Parkinson-White syndrome. He underwent electrophysiologic studies given his high-risk occupation as a Navy diver. Through this, an FVP was definitively diagnosed, and the patient was able to continue his career in the Navy.

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References

1. Chhabra L, Goyal A, Benham MD. Wolff Parkinson White Syndrome. 2022 Aug 8. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. PMID: 32119324.
2. Olen MM, Baysa SJ, Rossi A, Kanter RJ, Fishberger SB. Wolff-Parkinson-White Syndrome: A Stepwise Deterioration to Sudden Death. *Circulation*. 2016 Jan 5;133(1):105-6. doi: 10.1161/CIRCULATIONAHA.115.019703. PMID: 26719390.
3. Oh S, Choi YS, Choi EK, Kim HS, Sohn DW, Oh BH, Lee MM, Park YB. Electrocardiographic characteristics of fasciculoventricular pathways. *Pacing Clin Electrophysiol*. 2005 Jan;28(1):25-8. doi: 10.1111/j.1540-8159.2005.09371.x. PMID: 15660798.
4. Rohrhoff NJ, Finne HA, Rodriguez Y. A sailor's dilemma: A case of preexcitation via a fasciculoventricular pathway. *Heart Rhythm Case Rep*. 2017 Jun 3;3(7):364-367. doi: 10.1016/j.hrcr.2017.05.013. PMID: 28748146; PMCID: PMC5511980.
5. de Alencar Neto JN, Ramalho de Moraes SR, Back Sternick E, Wellens HJJ. Atypical bypass tracts: can they be recognized during sinus rhythm? *Europace*. 2019 Feb 1;21(2):208-218. doi: 10.1093/europace/euy079. PMID: 29788238.
6. 2017 ACC/AHA/HRS Guideline for the Evaluation and Management of Patients with Syncope: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines, and the Heart Rhythm Society. *J Am Coll Cardiol* 2017; Mar 9.