INITIAL TREATMENT OF HEMODYNAMICALLY STABLE RECURRENT PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA

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Abstract/Introduction

A 64 year-old-man presented with a 2-year history of subjective recurrent paroxysmal supraventricular tachycardia (PSVT). Present history of illness management/treatment involved 4 hospital visits within 14-days. A MEDLINE and PubMed search to answer the question, “In a 64-year-old male, what is the appropriate initial treatment for PSVT?” generated several articles with the consensus of first-line treatments involving vagal maneuvers, adenosine, and calcium-channel blocker, beta-blocker and multi-channel blocker medication. Given the history and the multitude of recent hospital visits, the outcome involved administering a more aggressive rate control intervention. Initial treatment of PSVT should explore more assertive management plans based on the recurrence of the symptoms.

PSVT is a clinical syndrome that involves increased heart rate (150-250 bpm\(^1\)) generated by re-entry conduction arising from the atrium or atioventricular junction\(^2\). Further classified by location of the re-entry circuit, AV nodal re-entry and AV re-entry. AV nodal re-entry tachycardia (AVNRT) is the most common PSVT and involves two conducting pathways, slow and fast, both limited to the AV node and perinodal atrial tissue. In normal sinus rhythm, depolarization from atria to ventricles occurs via the fast pathway. If a premature atrial impulse occurs before the end of the fast pathway refractory period ends, the slow pathway takes over conduction. This impulse returns via the fast pathway, which has now recovered its excitability. AV re-entry tachycardia (AVRT) conduction circuit involves the AV node, the His Bundle, the ventricle and an accessory pathway back to the atrium, in the AV groove. Electrocardiogram (ECG) can differentiate between the two classifications of PSVT. In AVNRT, the ECG tracing demonstrates normal QRS complexes, ventricular rate of 140-240 bpm, and masked P waves by the simultaneous atrial and ventricular activation. In AVRT, atrial activation occurs after ventricular activation, revealing the P wave between the QRS and T wave\(^3\).

Case History/Report

The patient is a 64 year-old Caucasian male. Current weight 75.8 kg, height 170.2 cm and BMI 26.2. He is an active member of his community and lives with his wife and youngest son. His occupation as a courier driver has been significantly affected by his current condition. Previous medical conditions include; Parkinson’s disease, hypertension, hypercholesterolemia, and two transient ischemic attacks.

The history of the presenting condition involves subjective descriptions of symptomatic PSVT episodes over the past 2-years. These episodes are characterized as elevated heart rate, decreased blood pressure, and

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INITIAL TREATMENT OF HEMODYNAMICALLY STABLE RECURRENT PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA

lightheadedness, while remaining hemodynamically stable. Increased intensity and decreased time intervals between the episodes caused the patient to seek emergency medical care. Medical intervention took place over 4 separate hospital visits within 14-days.

Initial hospital visit involved patient being seen and treated within an emergency department. Diagnostics involved evaluation of Troponin T (34 ng/L), TSH (2.64 mU/L) and ECG (ventricular rate 169 bpm). Patient diagnosed with PSVT and treated with Diltiazem 20 mg IV x 1 dose. Once patient was stabilized, discharged with treatment plan of Diltiazem 30 mg po q.i.d. for 30 days and follow-up referral with Internal Medicine Specialist.

Second hospital visit occurred at another hospital’s emergency department 1 week later. At triage the patient’s vitals were 100 bpm and blood pressure 126/78. Diagnostics similar to previous visit, Troponin T 29 ng/L and ECGs ventricular rate 61-79 bpm with left axis deviation. Patient diagnosed with pre-syncope and treated with Adenosine for cardioversion back into sinus rhythm. Upon patient stabilization, discharged with treatment plan of Ramipril 8 mg po o.d. and Diltiazem 120 mg po o.d.

Third hospital visit occurred within 12 hours of discharge from previous visit. At triage the patient’s vitals were 114 bpm and blood pressure 144/102. Diagnostics once again included Troponin T 21 ng/L and ECGs ventricular rate 152 bpm, left axis deviation and SVT. Patient was diagnosed with the original condition of PSVT. The treatment plan was revised after consultation with Cardiology. Ramipril and Diltiazem were discontinued and Metoprolol 12.5 mg po b.i.d. was introduced. After stabilization the patient was discharged.

The fourth hospital visit occurred the following day. The patient was directly admitted to the medical ward at the same hospital. The physical exam was insignificant. Patient appeared well, no fever or diaphoresis. H&N, CVS, RESP, ABDO, exams were all normal, with only mild peripheral edema in left foot. The diagnostics on the ward included repeat TSH (2.59 mU/L), ECG (left deviated axis, SVT, heart rate average 130-150, with narrow QRS complex) and Troponin T (28 ng/L). Echocardiogram reported normal left ventricle size, thickness and systolic function, mildly dilated aortic root and no significant valvular abnormality.

The initial diagnosis in the medical ward was PSVT- AVNRT, with spontaneous conversion to normal sinus rhythm with differential diagnoses of atrial fibrillation and atrial flutter. The initial treatment plan was Metoprolol 50 mg po b.i.d. The expected outcome was rate control with the beta-blocker and patient stabilization. The actual outcome involved continued SVT episodes during the hospital stay. After consultation with Internal Medicine, Amiodarone was introduced, with a tapered protocol: 400 mg po t.i.d. x 1 week, 400 mg po b.i.d. x 2 weeks, 400 mg po o.d. x 1 month, 200 mg po o.d. until further intervention. The patient consequently went
INITIAL TREATMENT OF HEMODYNAMICALLY STABLE RECURRENT PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA

into bradycardia and the Metoprolol was tapered down to 12.5 mg po b.i.d. Once the patient stabilized on Amiodarone and Metoprolol, he was discharged and was to follow-up with Cardiology for cardiac ablation.

Literature Review

The MeSH term to answer the clinical question, “In a 64-year-old-male, what is the appropriate initial treatment for hemodynamically stable paroxysmal SVT?” is “supraventricular tachycardias”. The PubMed terms to answer the clinical question include “supraventricular tachycardia intervention” or “PSVT, recurrent”.

The literature review concludes there are three first-line treatments recommended for patients with hemodynamically stable PSVT. Initially, vagal maneuvers are recommended for stable patients in relatively good health. These maneuvers include: Valsalva maneuver, carotid sinus massage and head down position⁴.

The next line of treatment is a 6-mg IV bolus of Adenosine. Adenosine is a nucleotide naturally found in the body. It is transported into cells via membrane-bound adenosine receptors and slows down atrioventricular nodal conduction⁵. This agent has a greater than 90% success rate of converting PSVT to sinus rhythm. Another advantage of this agent is the very short half-life of 6-10 seconds⁶. Therefore, any adverse effects, facial flushing, chest discomfort, and dyspnea, are mild and quickly dissipated⁷. Adenosine is also useful for differential diagnosis of AVNRT versus AVRT, both narrow QRS complex tachycardias. Since adenosine blocks the A-V node, as previously mentioned, AVNRT is abruptly terminated after the drug is administered. AVRT is also terminated, however, since Adenosine does not block the accessory pathway, the initial first few sinus beats postconversion usually demonstrates preexcitation, delta waves⁸.

The third line of initial treatment is Calcium-channel blocking drugs, Verapamil and Diltiazem. There are three main disadvantages with the use of intravenous Verapamil. It can cause hypotension and hemodynamic compromise⁹, it has an extended half-life of 15-30 min and it can accelerate the conduction in accessory pathway PSVT. The differentiation between AVNRT and AVRT usually has not been determined before initial treatment begins. With significant antidromic effects on the A-V node, these drugs are recommended for chronic therapy to prevent

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tachycardia\textsuperscript{10}. Beta-blocker drugs and the multi-channel blocker drug, Amiodarone, is also recommended for long-term management\textsuperscript{11}.

\textit{Discussion}

This case of PSVT is significant because the persistent episodes of tachycardia resulted in increased frequency in hospital visits. The relevant literature on first-line treatment for PSVT discusses vagal maneuvers and adenosine. In this case vagal maneuvers were never exercised and intravenous adenosine was administered during the second hospital visit. However, the outcome of this case resulted in the use of even more aggressive rate control medication. Therefore, the number of hospital visits required to stabilize this patient could possibly have been reduced by initially using more aggressive rate control measures.

The scientific observations of this case were collected and monitored through patient’s history of present condition, vital signs, Troponin T levels and ECG tracings. Based on this data, the treatment plan was adapted. With the continual episodes of SVT over the four hospital visits and consultation with Cardiology Specialists, the short-term management of the patient evolved from Calcium-channel blocking medication to A-V node blocker to Beta-blocking medication, to finally Multi-channel blocking medication.

\textit{Conclusion}

PSVT can be very distressing and have a profound effect on lifestyle\textsuperscript{12}, however, is rarely life threatening\textsuperscript{13}. As demonstrated in this case, chronic episodes result in increased frequency of hospital emergency room visits\textsuperscript{14}. The initial treatment and management plan for patients with this reoccurring clinical syndrome may require more aggressive initial measures in order to avoid repeated hospital visits and consequently healthcare resources.

\textsuperscript{13} Heart & Stroke Foundation. (2014, July). \textit{Arrhythmia}. Retrieved August 2014, from http://www.heartandstroke.com/site/c.ikIQLcMWJiE/b.3484057/k.6CP9/Heart_disease__Arrhythmia.htm#psvt
INITIAL TREATMENT OF HEMODYNAMICALLY STABLE RECURRENT PAROXYSMAL SUPRAVENTRICULAR TACHYCARDIA