

Outcomes of patients with successfully converted paroxysmal supraventricular tachycardia after four hours of observation in an emergency department of a district hospital in Hong Kong

在香港一所地區性醫院的急症室成功復率的陣發性室上心搏過速病者觀察四小時後的結果

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Objective: Paroxysmal supraventricular tachycardia (PSVT) is a common problem encountered in the accident & emergency department (AED). Most patients can be successfully converted to sinus rhythm by vagal manoeuvres or adenosine tri-phosphate (ATP) or may even convert spontaneously in the AED. The objective was to test the safety of a protocol in managing this group of patients. The outcomes and recurrence rate of PSVT patients who had been converted to sinus rhythm and discharged from the AED after a period of observation using a simple protocol were studied. **Methods:** This was a prospective study on PSVT patients aged between 18-70 years from June 2003 to August 2005. The outcomes and recurrence rates of the PSVT patients within two periods, namely, 24 hours and 90 days after discharge from the AED, were assessed by the computerized system in public hospitals under the Hong Kong Hospital Authority. **Results:** A total of 42 PSVT patients after successful conversion were discharged from the AED after four hours of observation. None had recurrence of PSVT within 24 hours. Four patients (9.5%) presented with recurrent PSVT within 90 days after discharge without negative outcomes. The timing of recurrence ranged from 2 to 22 days (mean 15 days). All the four patients had past history of PSVT and three of them had already been on long term anti-arrhythmic medication. One recurrent PSVT patient was arranged to undergo radiofrequency ablation. **Conclusion:** PSVT patients successfully converted by vagal manoeuvre or ATP or converted spontaneously can be safely discharged from the emergency department after four hours of observation under the study protocol. (*Hong Kong j.emerg.med.* 2006;13:140-147)

目的：陣發性室上心搏過速是急症室經常遇到的問題，大部份病者都可在急症室利用迷走神經手法、三磷酸腺苷或甚至自發地成功回復為竇性心率。本研究旨在測試一個處理這群病者的議定程序之安全性；研究在急症室根據一個簡單的議定程序而成功將陣發性室上心搏過速回復為竇性心率的病者，經過一段期間觀察後出院之結果及復發率。**方法：**這是一個前瞻性的研究，由2003年6月至2005年8月期間進行，年齡由18至70歲因陣發性室上心搏過速求診的病者；透過香港醫院管理局轄下公營醫院的電腦系統，以急症室出院後24小時及90日內兩個時段來評估其結果及復發率。**結果：**共有42名陣發性室上心搏過速的病者在急症室成功復率及經過觀察4小時後出院，並無個案在24小時內復發；其中4名病者（9.5%）在出院後90天內出現陣發性室上心搏過速復發，但沒有不良後果，復發的時間範圍由2至22日不等（平均為15日）。4名病者全部都有陣發性室上心搏過速的病史，其中3人已長期服用抗心

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率失常藥物，一名陣發性室上心搏過速復發的病者被安排接受放射頻率部份切除術。**總結：**在研究的議定程序下，陣發性室上心搏過速經迷走神經手法、三磷酸腺苷或自發地成功復率的病者可於急症室觀察 4 小時後安全出院。

Keywords: Paroxysmal supraventricular tachycardia, recurrence

關鍵詞：陣發性室上心搏過速、復發

Introduction

Paroxysmal supraventricular tachycardia (PSVT) is a common cardiac arrhythmia encountered in the accident & emergency department (AED). It is usually caused by abnormal electrical connections that induce short-circuit in the heart including atrioventricular nodal reentrant tachycardia (AVNRT) – which is the most common type – and atrioventricular reciprocating tachycardia (AVRT). The latter is associated with the Wolff-Parkinson-White (WPW) syndrome that may be inherited. Overdose of certain drugs such as digoxin can also cause PSVT.

Most patients presenting with PSVT can be managed by a single straightforward protocol. Vagal manoeuvres can be tried to slow the heart rate and block the short circuit. If it does not work, intravenous adenosine triphosphate (ATP) or verapamil can be tried. Electrical cardioversion is indicated for haemodynamically unstable or resistant cases. Patients who either respond promptly to vagal manoeuvres or ATP injection or whose rhythm returns spontaneously to a sinus one seldom have complications from the attack. Patients with unstable presentation, persistent or repeated attacks of PSVT usually require inpatient management with ongoing treatment.¹ All PSVT patients should be referred to the medical team for further assessment. Some patients may need long-term anti-arrhythmic treatment or electrophysiological study to map out abnormal pathway for radiofrequency ablation.

Luber et al conducted a 4-year study on PSVT outcome after AED care from January 1993 to December 1996 in the United States. His study showed that most patients with PSVT could be safely discharged from the emergency department after short-term observation

(3.8 hours) if therapy produced prompt conversion to normal sinus rhythm.¹

The AED of the Caritas Medical Centre proposed a protocol (Figure 1) to manage patients presenting with PSVT. The purpose of this study was to assess the safety of discharging patients with PSVT after a 4-hour observation in the AED when they had been managed with vagal manoeuvres, ATP or they had spontaneously converted to sinus rhythm. We stratified the risks of recurrence of PSVT into two groups – within 24 hours and within 90 days after discharge. Adverse outcomes of those patients discharged from the AED were identified. Patients who had been safely treated in the AED would be given an early medical outpatient clinic appointment.

Patients and methods

This was a prospective study to find out the outcomes and recurrence rates within 24 hours and 90 days in PSVT patients, after successful conversion and discharge from the AED. This study took place at the AED of the Caritas Medical Centre (CMC) from 15 June 2003 to 30 August 2005 for patients with a diagnosis of PSVT (narrow QRS-complex tachycardia with no discernible P waves and a ventricular rate of 120 to 300 beats per minute). The outcomes of the patients were traced by the computerised systems – Accident and Emergency Information System (AEIS) and Clinical Management System (CMS) – under the Hong Kong Hospital Authority after 24 hours and 90 days of discharge.

The study recorded the following patient information: age, sex, vital signs, cardiac rhythm, treatment, past

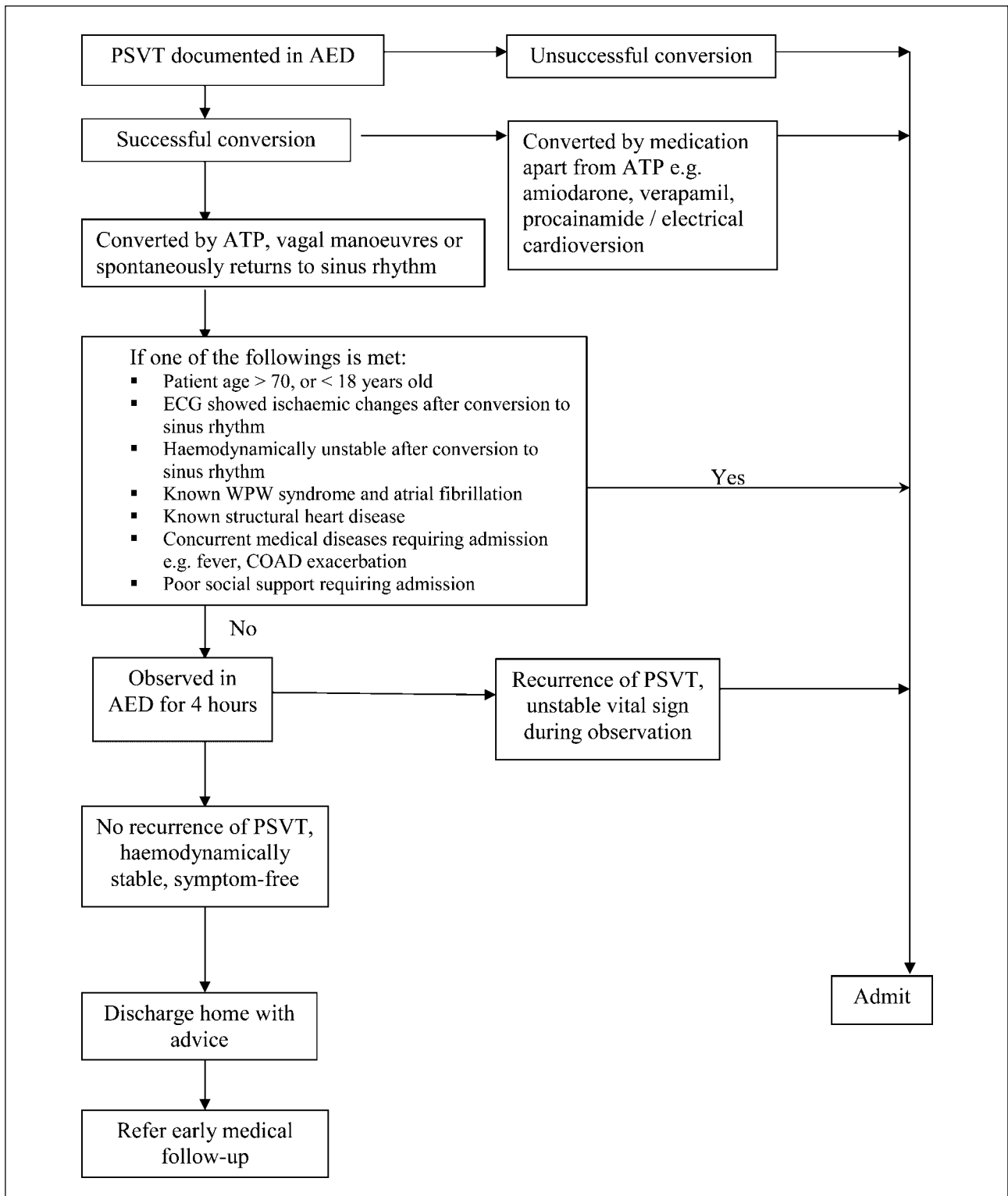


Figure 1. Management protocol of PSVT patients in CMC AED.

medical health, negative outcome after discharge from the AED and further management in the medical outpatient follow-up. "Negative outcome" was defined as any potentially life-threatening event that could compromise the cardiovascular status of the patient including syncope, seizure, arrhythmia, congestive heart failure, respiratory distress requiring intubation, or sudden death regardless of the primary aetiology. A "recurrence" of PSVT was not considered as a "negative outcome".

All data were analysed using the Statistical Package for Social Science (SPSS) for Windows, version 11.5. The Fisher's exact test and the Mann-Whitney test were applied to compare the clinical parameters of discharged patients with the recurrence of PSVT, with $p < 0.05$ defined as statistically significant.

Inclusion criteria for AED observation

1. Patients aged between 18 and 70 years old attending the CMC AED within the above period.
2. The electrocardiogram (ECG) done in the AED showed evidence of PSVT.
3. Patients with their PSVT returned to normal sinus rhythm by vagal manoeuvres, ATP or spontaneously in the AED.

Exclusion criteria for AED observation

1. The PSVT failed to respond to vagal manoeuvres or ATP.
2. Patients with known WPW syndrome and atrial fibrillation.
3. Patients with history of structural heart disease.
4. The ECG showed ischaemic changes after conversion to sinus rhythm.
5. Haemodynamically unstable after conversion to sinus rhythm.
6. Patients with concurrent medical disease requiring admission e.g. sepsis, chronic obstructive airway disease exacerbation.
7. Poor social support requiring admission.
8. Patients who refused observation in the AED or who disappeared from the AED.

Management protocol

Patients with ECG showing PSVT were triaged to the

resuscitation cubicle with vital signs checked. The patients were usually managed with vagal manoeuvres or pharmacological cardioversion e.g. ATP, verapamil, amiodarone or occasionally electrical cardioversion in the resuscitation cubicle. Only those patients with successful conversion by vagal manoeuvres, ATP or spontaneous conversion to sinus rhythm and met our study criteria were observed in the emergency department.

The patients were put on cardiac monitor, with blood pressure and pulse checked hourly and stayed in the observation ward for four hours. The ECG would be repeated after the first hour of observation and assessed by the doctor-in-charge for any serial ischaemic change during the observation. The patients would be discharged with verbal advice and priority referral to the CMC medical outpatient clinic if they were symptom-free, had no recurrence of PSVT and the vital signs were stable after four hours of observation in the emergency department.

The outcome of the patients after discharge was assessed by the AEIS and CMS computer systems of the Hong Kong Hospital Authority. If this group of patients re-attended any emergency department under the Hospital Authority within 24 hours and 90 days, their presentation, clinical condition, management and ultimate outcome were traced. All further investigation and treatment for PSVT such as Holter study and electrophysiological study after early assessment by the medical team were also recorded.

Results

A total of 42 PSVT patients (mean age of 50.3 years old) met our study criteria within this study period (Table 1); 17 patients (40.5%) were male and 25 patients (59.5%) were female. Treatment given for this group of patients included ATP in 30 (71.4%), and vagal manoeuvres in 4 (9.5%), while 8 patients (19.0%) spontaneously converted to normal sinus rhythm. Twenty-two patients (52.4%) had past medical history of PSVT with medical follow up and 19 of them had already been on regular anti-arrhythmic medication.

None of our patients had recurrence of PSVT within 24 hours after discharge. Four patients (9.5%) presented with recurrent PSVT within 90 days with mean age of 49.3 years old. Three of them were male patients ($p=0.286$). They all had known history of PSVT ($p=0.109$) and three of them were already on anti-arrhythmic drugs ($p=0.313$) (Table 2). The recurrence of PSVT ranged from 2 to 21 days (mean 15 days) after discharge from the AED. All of them responded to ATP given for their recurrent PSVT. There was no association between PSVT treatment, age, systolic and diastolic blood pressure and recurrence of PSVT ($p=1.000$, $p=0.881$, $p=0.607$ and $p=0.324$ respectively) (Tables 2 & 3). Holter study was performed for two patients and only one patient was arranged to receive radiofrequency ablation after medical assessment (Table 4).

None of the patients had negative outcome within 90 days after discharge (Figure 2). Two patients (4.8%) re-attended the AED for palpitation. The ECG documented sinus rhythm and they were treated and discharged after assessment.

Table 1. Age distribution of the patients

| Age | No. of patients | Percentage |
|--------------|-----------------|-------------|
| 18-25 | 1 | 2.4% |
| 26-35 | 7 | 16.7% |
| 36-45 | 9 | 21.4% |
| 46-55 | 10 | 23.8% |
| 56-65 | 9 | 21.4% |
| 66-70 | 6 | 14.3% |
| Total | 42 | 100% |

Table 2. Clinical parameters and recurrence of PSVT (N=42)

| Parameter | No PSVT recurrence | PSVT recurrence | p-value (Fisher's exact test) |
|---|--------------------|-----------------|-------------------------------|
| Male | 14/17 (82.4%) | 3/17 (17.6%) | 0.286 |
| Female | 24/25 (96.0%) | 1/25 (4.0%) | |
| History of PSVT | 18/22 (81.8%) | 4/22 (18.2%) | 0.109 |
| No history of PSVT | 20/20 (100%) | 0/20 (0%) | |
| Converted by ATP | 27/30 (90.0%) | 3/30 (10.0%) | 1.000 |
| Converted by vagal manoeuvre or spontaneously | 11/12 (91.7%) | 1/12 (8.3%) | |
| Taking anti-arrhythmic agents | 16/19 (84.2%) | 3/19 (15.8%) | 0.313 |
| Not taking anti-arrhythmic agents | 22/23 (95.7%) | 1/23 (4.3%) | |

Table 3. Clinical parameters not associated with recurrence of PSVT (N=42)

| Parameter | PSVT after discharge | Mean | Standard deviation | p-value (Mann-Whitney test) |
|---------------------------------|----------------------|--------|--------------------|-----------------------------|
| Age | No recurrence | 50.39 | 12.64 | 0.881 |
| | Recurrence | 49.25 | 16.32 | |
| Systolic blood pressure (mmHg) | No recurrence | 122.55 | 27.45 | 0.607 |
| | Recurrence | 131.00 | 29.27 | |
| Diastolic blood pressure (mmHg) | No recurrence | 71.34 | 20.16 | 0.324 |
| | Recurrence | 83.75 | 27.60 | |

Table 4. Investigation and treatment of recurrent PSVT patients in the medical clinic follow-up

| Age | Gender | Current treatment | Electrophysiological study | Holter | Day of recurrence after discharge |
|-----|--------|-----------------------------------|----------------------------|---------|-----------------------------------|
| 26 | M | Verapamil | Pending | Yes | Day 19 |
| 52 | M | Sotalol | No | Yes | Day 19 |
| 55 | F | Propranolol (Newly prescribed) | No | No | Day 21 |
| 64 | M | Verapamil | No | Default | Day 2 |

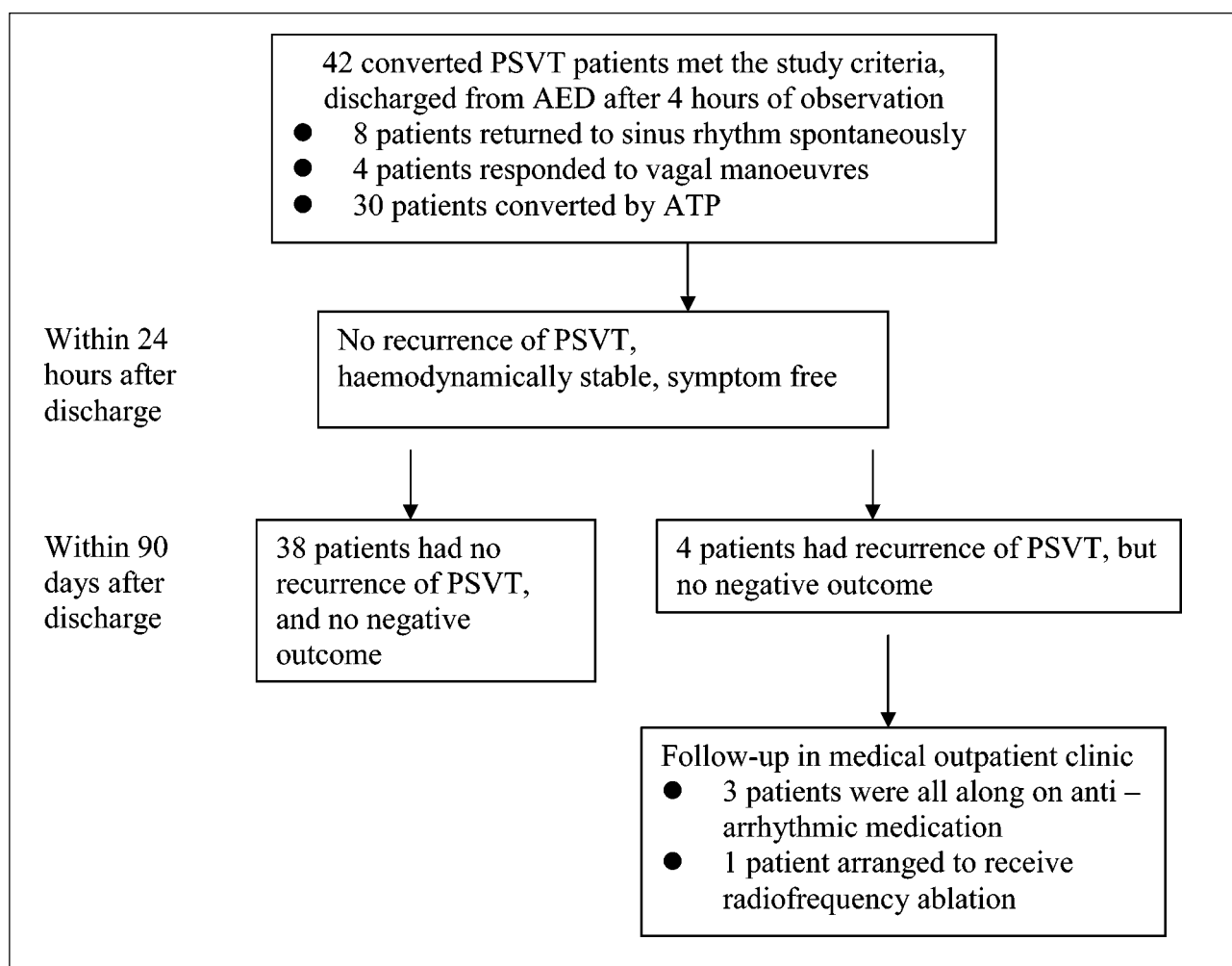


Figure 2. Outcome of PSVT patients within 24 hours and 90 days after discharge from AED.

Discussion

Reentrant rhythm accounts for most of the PSVT with typical abrupt beginning and ending which are often sensed by the patient. The reentrant rhythms are susceptible to vagal manoeuvres, pharmacological intervention, and cardioversion. However, the medical literature does not provide adequate guidance to emergency physicians for disposition.^{2,3} This study is the first local study on the outcomes of a proposed protocol to manage PSVT in Chinese patients at the AED.

It was suggested that patients with serious medical illness presenting with recurrent PSVT, or haemodynamically unstable would require admission.⁴ The 1992 edition of Current Emergency Diagnosis and Treatment recommended inpatient treatment after

emergency department management of PSVT if the rhythm is complicated by shock or chest pain, caused by drug intoxication, related to pre-excitation syndromes or the patient has a serious underlying disease that would require hospitalisation.⁵ This was the reason why we did not include these groups of patients for AED observation in this study.

Our management protocol suggested admitting all paediatric (<18 years old) and geriatric (>70 years old) PSVT patients. Pudup et al found that paediatric patients, especially those less than 3 months or with immediate recurrent PSVT, had a higher rate of recurrence and required inpatient management.⁶ In 1993, Clair et al found that advancing age was significantly associated with a decreasing time to first recurrence.⁷

We referred all discharged patients for early medical follow-up. A study by Sintetos et al evaluated PSVT patients who were referred to physicians for further evaluation.⁸ The study found a high rate (20%) of early recurrence in patients who did not have medical follow-up within 90 days.

In our study, of all patients ultimately discharged from the emergency department, none was admitted for recurrent PSVT within 24 hours. Only 4 patients encountered recurrence within 90 days of discharge. They all had known history of PSVT. The overall late recurrence rate after discharge from the emergency department in our study was 9.5%. These recurrences, however, did not represent unstable events. Owing to the small number of patients in our study, we were unable to identify predictors (age, sex, vital signs, PSVT history, drug history) for the recurrence of PSVT. We planned to use the study protocol as the guideline in the management of supraventricular tachycardia patients in our department and continue our study to collect more patients for further analysis.

Luber's study on PSVT outcome after AED care in the United States, apart from patients treated by ATP or vagal manoeuvres, also included patients treated by other pharmacological therapy and electrical cardioversion.¹ Their study included 79 patients and the mean duration of stay in the emergency department was 3.8 hours, and 3 patients (3.8%) had recurrence of PSVT within 24 hours after discharge but none had negative outcome. In our study, after 4 hours of close monitoring in the observation ward, none had recurrence of PSVT or emergency department re-attendance within 24 hours. The outcomes of Luber's and our studies were compared in Table 5. Further studies are required to elucidate the risk for recurrence

of PSVT when treated by other pharmacological therapy or cardioversion compared with those converted by ATP.

Concerning limitations of our study, we admitted that the patient population was small. The outcomes of patients discharged from the AED after PSVT conversion were only obtained by using the computer system of the Hong Kong Hospital Authority. The study might be improved by using telephone survey to enquire on recurrent PSVT subsequently being managed in private hospitals. Another pitfall was that patients might not be able to notice a recurrence of PSVT. There might be some PSVT that spontaneously resolved and not being recorded. Due to the low prevalence of this disease, it was difficult to obtain a large sample size, as our study had lasted for two years and Luber et al was only able to recruit 79 patients in four years. We expected that only multicentre prospective studies could recruit enough patients to generate more useful data.

Conclusion

Our study showed that PSVT patients after successful conversion could be safely discharged from the emergency department after four hours of observation. PSVT recurrence was not common (90-day recurrence rate 9.5%). No patient presented with negative outcomes associated with recurrence of PSVT or re-attendance to the AED.

Guidelines on the management of PSVT patients are advocated in this study. Safe and standardised protocols for the majority of patients encountered in the AED can reduce unnecessary admissions, reduce health care

Table 5. Comparison of outcomes of Luber's and our study

| Study | Number of patients | Mean age | Observation duration | Recurrence of PSVT (at 24 hrs) | Negative outcome |
|--|--------------------|----------|----------------------|--------------------------------|------------------|
| Caritas Medical Centre study 2003-05 (2 years) | 42 | 50 | 4.0 hours | 0% (0/42) | 0% (0/42) |
| Luber's study 1993-96 (4 years) | 79 | 49 | 3.8 hours | 3.8% (3/79) | 0% (0/79) |

cost and increase our working efficiency. Currently the study is ongoing and more data will be available for further evaluation.

Acknowledgement

We would like to thank Dr. KK Ma, Dr. WT Tsang and Dr. YW Li for their opinions and express our appreciations to the colleagues of our department for their endless support in this study.

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