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Efficacy of Modified Valsalva Maneuver Versus Standard Valsalva Maneuver in The Termination of Paroxysmal Supraventricular Tachycardia: A Single Center Study

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Abstract

Background: Supraventricular tachycardia is a common disturbance in the cardiac rhythm that originates above the cardiac ventricles, and include various forms like atrial fibrillation, atrial flutter, and others, as well as the paroxysmal form which is called paroxysmal supraventricular tachycardia that denotes a subset of supraventricular tachycardia that present in form of rapid regular tachycardia with a sudden onset and offset like atrioventricular nodal reentrant tachycardia, atrioventricular reentrant tachycardia, and atrial tachycardia. Management involves either non-pharmacological measures (vagal maneuvers) or pharmacological treatment. The Valsalva maneuver is considered a simple non-invasive measure for induction of increased vagal tone, with certain modifications are performed in order to increase venous return of relaxation phase.

Aim of the Study: To compare between the efficacy of modified Valsalva maneuver versus standard Valsalva maneuver in the termination of paroxysmal supraventricular tachycardia.

Methodology: This study is a randomized controlled trial conducted in the coronary care unit of Al-Hussein medical city – Kerbela during the period from January 2019 to January 2020, and included 103 patients presented with paroxysmal supraventricular tachycardia, who were subjected to either modified Valsalva maneuver or standard Valsalva maneuver, with documentation of the response.

Those who did not respond to non-pharmacological measures were treated with pharmacological treatment.

Results: Mean age of participants was (49.60 ± 11.88) years, females comprised 61.17% of them. Patients treated with modified Valsalva maneuver had significantly higher positive response compared to patients treated with standard Valsalva maneuver, with a P-value of 0.003 and odds ratio of 4.7 (CI 95%).

Response was significantly higher among males (P-value = 0.001) and significantly lower among long standing diabetic patients (P-value = 0.009).
All patients who had no response to non-pharmacological measures were treated successfully with pharmacological therapy.

Conclusions: modified Valsalva maneuver was significantly more effective than standard Valsalva maneuver in termination of paroxysmal supraventricular tachycardia. Males were better responder than females. Long standing diabetic patients had poor response.

Introduction

Supraventricular tachycardia is a common disturbance in the cardiac rhythm that originates above the cardiac ventricles[1].

It refers to a range of arrhythmia conditions that involve the atrioventricular node or the atrial tissue. In general, the mechanisms of supraventricular tachycardia involve: reentry, increased automaticity, and triggered activity[2].

The reentry, due to a circuit within the myocardium, occurs when a propagating impulse fails to die out after normal activation of the heart and persists as a result of continuous activity around the circuit to re-excite the heart after the refractory period has ended[3].

Increased automaticity denotes the spontaneous tachycardia that arise from certain foci of myocardial cells with pathological changes in the resting membrane potential, resulting in both atrial and ventricular arrhythmias. This phenomenon is linked to electrolyte disturbance and autonomic tone modification, among other factors[2].

Triggered activity arise due to intracellular calcium augmentation, and is suggested to cause the initiation of atrial fibrillation. Arrhythmias and extrasystoles due to triggered activity are caused by extra depolarization immediately after cellular repolarization (referred to as delayed after-depolarization)[4].

The term paroxysmal supraventricular tachycardia (PSVT) denotes a subset of supraventricular tachycardia that present in form of rapid regular tachycardia with a sudden onset and offset.

PSVT is usually narrow-complex tachycardia with a QRS interval of 120 milliseconds or less on an electrocardiography (ECG). Occasionally, they may present with a wide QRS interval in the case of a pre-existing conduction delay, an aberrancy due to rate-related conduction delay or a bundle branch block[5,6].

This introduction focuses on the three most common types of PSVT; atrioventricular nodal reentrant tachycardia (AVNRT), atrioventricular reentrant tachycardia (AVRT) and atrial tachycardia (AT).

PSVT affects about 225 individuals per 100’000 persons in the general population[2], and the most common forms being AVNRT and AVRT[7].

- AVNRT: It is regular narrow complex tachycardia with P waves visible at the end of the QRS complex or not visible at all, it involves the atrioventricular node; it is considered the commonest form of PSVT, accounting for about 60%, and commonly seen in healthy young adult women[6].

In AVNRTs, the reentry circuit is confined to the tissue immediately proximal to the AV node; It involves dual pathways (slow and fast); usually there is antegrade conduction down the slow pathway, and retrograde conduction up the fast pathway[7,8].

- AVRT: Accessory pathways or bypass tracts between the atrium and the ventricle bypass the compact AV node and can predispose to reentrant arrhythmias, such as AVRT and atrial fibrillation[6]. In AVRTs, one limb of the reentry circuit involves an accessory pathway that is outside of the AV node (and one limb of the reentry circuit involves the AV node); it is the next commonest form after AVNRT, accounting for about 30% of PSVT[6].

There are two types of AVRT, orthodromic and antidromic tachycardias according to the way of

conduction:

Orthodromic: involves anterograde conduction down the AV node, and retrograde conduction up the accessory pathway. The resulting arrhythmia is a narrow complex tachycardia (unless an underlying bundle branch block or interventricular conduction delay is present), with P waves often present after the QRS complex; it accounts for about 90% of AVRT.

Antidromic: in this instance, the circuit is conducted antegrade down the accessory pathway, and retrogradely up the AV node. Antidromic tachycardia produces a wide and often bizarre QRS complex on the ECG.

The AVRT therefore appears on the ECG as either a narrow or wide complex tachycardia which may be mistaken for ventricular tachycardia. Given that AVRT is associated with an accessory pathway, the resting ECG may show a delta wave, and manifest a Wolff-Parkinson-White (WPW) pattern (a short PR interval and a wide, slurred QRS complex owing to early ventricular depolarization of the region adjacent to the pathway). However, some of accessory pathways do not conduct from the atrium to the ventricle and are said to be concealed, as the ECG is correspondingly normal; or the accessory pathway is far from the sinoatrial node, as in a left lateral pathway, in which case the ventricles are predominantly activated via the AV node. They can still cause AVRT of the orthodromic type because they can conduct retrogradely (i.e. from ventricle to atrium and therefore does not cause ventricular pre-excitation and a delta wave)[6,9].

WPW syndrome involves a congenital malformation resulting in incomplete separation of the atria from the ventricles during fetal maturation. WPW syndrome refers to a patient with baseline WPW pattern on ECG associated with palpitations due to AVRT[9].

- AT: focal atrial tachycardia is regular atrial tachycardia with defined P wave; it may be either paroxysmal or sustained[10]; atrial tachycardia may be confused with sinus tachycardia, a good way to distinguish one from the other in this situation, is the abrupt onset and offset of the arrhythmia which is helpful in distinguishing atrial from sinus tachycardia, although electrophysiologic study is sometimes necessary[6].

- It is an uncommon form of PSVT characterized by paroxysms or bursts of rapid, regular arrhythmia due to focal atrial impulses originating outside of the normal sinus node[2,6,7].
- It is often associated with underlying cardiac abnormalities in adults, but can occur in patients with healthy hearts[10].
- Management of PSVT involves either non-pharmacological measures (vagal maneuvers) or pharmacological treatment[5]. It is recommended to perform a therapeutic trial of non-pharmacological measures in PSVT patients who are hemodynamically stable[11].
- Some cases require synchronized cardioversion especially in hemodynamically unstable patients[12].
- Non-pharmacological treatment (vagal maneuvers) used for PSVT include:

- Valsalva maneuver (standard and modified).
- Carotid sinus massage.
- Immersion of face with cold water.

Valsalva maneuver is considered the most effective non-pharmacological measure for terminating PSVT in adults[13], despite showing variable effectiveness in clinical practice[14].

The standard Valsalva maneuver (SVM) was first described in 1936, and considered a simple non-invasive measure for the induction of increased vagal tone[15]. It's done by placing the patient in semi-recumbent position, then asking the atient to perform forced expiration into a 10ml syringe for 15 seconds.

Postural modification to the SVM was done at 2015 by Andrew Appleboam et al to perform the modified Valsalva maneuver (MVM)* as follows:

1) Asking the patient to perform SVM.
2) The patient -immediately at the end of the strain- is repositioned into supine position with passive elevation of the legs by a member of staff to 45 degrees for another 15 seconds.
3) Finally, the patient is again repositioned into the semi-recumbent position for a duration of 45 seconds[12,17].

*If no response within one minute, we can try another trial.

MVM is composed for 4 phases of sequential changes in heart rate and arterial pressure[16]:

- <u>Phase 1:</u> is the transient increase in the thoracic aorta pressure, associated with reduction in heart rate, triggered by aortic baroreceptors.

- <u>Phase 2:</u> is the end of that transient change, with reduction in the pressure of the aorta and increase in heart rate.

- <u>Phase 3:</u> is the end of the strain phase of the maneuver, causing short-lasting decrease in the aortic pressure, with compensatory increase in the heart rate.

- Phase 4: is the result of rising venous return with the associated preload increase, which is further driven by raising the legs leading to increased vagal stimulation.

The rising cardiac output elevates aortic pressure, causing compensatory drop in heart rate[14,16,17].

Carotid sinus massage is a less commonly used vagal maneuver, mostly due to the risk of causing injury to the carotid artery[1]. The application of cold water to the face is known to be one of the non-invasive treatments for PSVT especially in pediatrics, which is considered quick, safe, and effective procedure[18,19].

Pharmacological treatments are required when the vagal maneuvers fail. The first recommended medication is adenosine, which is administered as a bolus rapid-push of 6 mg i.v. injection, followed by a flush of normal saline. The injection should be in an i.v. line proximal to the heart, because adenosine has a short half-life that does not exceed 10 seconds. Its action should be seen within 20 seconds of injection.

If no response is seen after 2 minutes it can be re-administered with 12 mg dose but no more than two more times. Adenosine may excite both atrial and ventricular tissue causing atrial fibrillation (in up to 12% of patients) or rarely ventricular arrhythmias and therefore administration should be performed with continuous cardiac monitoring and availability of an external defibrillator [10].

The broncho-constrictive effect of adenosine requires the avoidance of adenosine usage in asthmatic patients [11,12].

If adenosine fails, non-dihydropyridine calcium channel blockers or beta-blockers are used. Calcium channel blockers have longer onset of action, and contraindicated in congestive heart failure, shock, WPW syndrome, and 2nd or 3rd degree heart block. These calcium channel blockers include verapamil and diliazem:

- Verapamil: is given as an i.v. bolus of 2.5-5.0 mg dose over 2-4 minutes, and may be repeated up to 20 mg dose. It can also be given as an infusion of 1 mg per minute until total dose of 20 mg or termination of PSVT.

● Diltiazem: is similarly used either as a bolus of 0.25 mg/kg over 2 minutes, and repeated to a maximum dose of 20 mg, or infusion of 2.5 mg per minute until total dose of 50 mg or termination of PSVT [12].

Beta-blockers have less efficiency that calcium channel blockers, but they are beneficial in patients who are unable to tolerate calcium channel blockers. They are contraindicated in decompensated heart failure, shock, asthma (propranolol, but with caution for esmolol and metoprolol) and 2nd or 3rd degree heart block.

Beta-blockers include:

● Propranolol: given as an i.v. bolus of 1 mg over 1-minute duration, and can be repeated 3 times.

● Esmolol: can be given either as a bolus dose of 500 µg/kg over one-minute duration, or as an infusion of 50-300 µg/kg per minute.

● Metoprolol: given as an i.v. bolus dose of 2.5-5 mg over 2-minutes, and can be repeated 3 times [12].

Electrical cardioversion is required in patients who did not respond neither to vagal maneuvers nor to pharmacological treatment, and in those who are hemodynamically unstable (acute altered mental state, shock, or signs of acute severe heart failure). The procedure requires sedation of the patient, followed by biphasic cardioversion with a starting dose of 50-100J that can be repeated with double the dose if no response is obtained from the first impulse[2,12].

Long-term pharmacological treatment for PSVT is provided through chronic prophylactic medication therapy using long-acting calcium channel blockers such as verapamil, diltiazem, and long-acting beta-blockers such as metoprolol succinate.

Patients who do not respond to agents that increase refractoriness of the AV node may be treated with antiarrhythmics. The class Ic agents (flecainide, propafenone) can be used in patients without underlying structural heart disease. In patients with evidence of structural heart disease, class III agents, such as sotalol or amiodarone, should be used because of the lower incidence of ventricular proarrhythmia during long-term therapy[2,11].

Catheter ablation is for the long-term management of many forms of cardiac arrhythmias, it is reserved for sustained or symptomatic PSVT [20]. It is achieved by disruption and ablation of the myocardial tissue using radio-frequency energy, with generally low occurrence of complications [2,21].

1.2 Aim of the Study

To compare between the efficacy of MVM versus the SVM in the termination of PSVT

Methodology

This chapter describes the characteristics of the study design, target population, administrative arrangements and approvals, ethical considerations, tools used for data collection, settings of the study, and the utilization of statistical analysis.

2.1. Study design:

This study is a randomized controlled trial conducted in the coronary care unit of Al-Hussein medical city – Kerbela in order to compare the effectiveness of MVM with the effectiveness of the SVM in treating PSVT.

2.2. Administrative Arrangements and Approvals:

Formal approvals were acquired before the initialization of data collection including:

- The approval for conducting this study from the Arab board of health specializations.
- The approval of the hospital from which data was collected
- Patient's permission was also obtained.

2.3. Study Population:

The study included patients with PSVT who admitted to the coronary care unit during the period from January 2019 to January 2020.

2.3.1. Selection Criteria:

Patients of both genders were included in this study who presented with PSVT and confirmed by ECG, regardless of their age.

2.3.2. Inclusion Criteria:

- Patients with PSVT

2.3.3. Exclusion Criteria:

- Patients who were hemodynamically unstable.
- Patients with atrial flutter.
- Patients with wide complex tachycardia.
- Patients with other contraindications to Valsalva maneuver, including acute myocardial infarction, history of aortic stenosis, history of glaucoma.
- Patients who refused the maneuver.

2.4. Data collection tools:

Data for the present study was collected by interviewing the patients before examination to obtain information such as demographic data and previous medical history using specially designed questionnaire. Then patients who conform to the inclusion criteria of the study with no exclusion criteria were divided to group A consisted of patients who had MVM done for them, and group B consisted of patients who had SVM done for them. Patients were assigned alternatively between group A and group B. In both groups, the Valsalva maneuver was repeated once if no success in the first trial, with documentation of the response clinically (return of heart rate to normal) and by ECG (resolve of tachycardia and appearance of p wave). Patients who did not respond to the assigned maneuver were then treated pharmacologically.

2.5. Ethical considerations:

Verbal informed consent was obtained from all patients included in this study after explaining for them the objectives of this study and clarifying the type of information required of the interview.

Collected information were treated with confidentiality throughout data collection, organization, analysis and presentation. Names of the patients were replaced with identification numbers (coding) in order to protect their privacy.

2.6. Statistical analysis:

Statistical analysis for the study was performed using SPSS® Software (version 23 for Linux®). Qualitative data were presented as numbers and percentages, while continuous numerical data were presented as mean ± standard deviation. Chi-square test was used to assess the significance of the relationships between qualitative variables, while Student's t-test was used to assess the significance between two populations regarding continuous numerical variables. Fisher exact test was used to determine if there are non-random association between 2 numerical variables.

P-value of < 0.05 was considered statistically significant

Results

This study included a total of 103 patients presented with PSVT, who were divided into two study groups: group A were given trial of MVM as the first line of treatment, while group B were given trial of SVM as the first line of treatment.

Age of participants ranged from (19 – 80) years with a mean age of (49.60 ± 11.88) years and a median age of (50) years. Figure (1) illustrate the age group distribution of the study participants by study group. No statistically significant difference in age was observed between group A (49.12 ± 11.36) and group B (50.08 ± 12.46), Student's t-test = 0.41, P-value = 0.684.

Females comprised a proportion of (61.17%) while males comprised (38.83%) of study sample, as illustrated in Figure (2).

Regarding past medical history of study participants; the commonest disorder was hypertension in (33.01%) of patients, followed by DM in (32.04%) of them. Table (1) describes the details of past medical history of study participants.

No significant difference in past medical history was observed between the two study groups (P-value > 0.05).

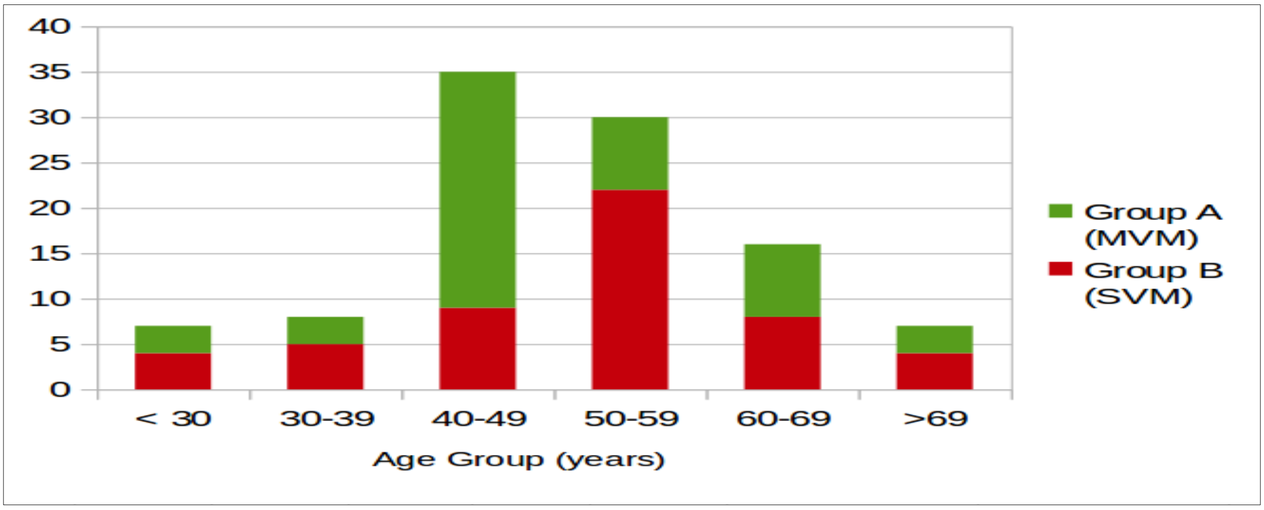

Figure (1): Age group distribution of study participants by group

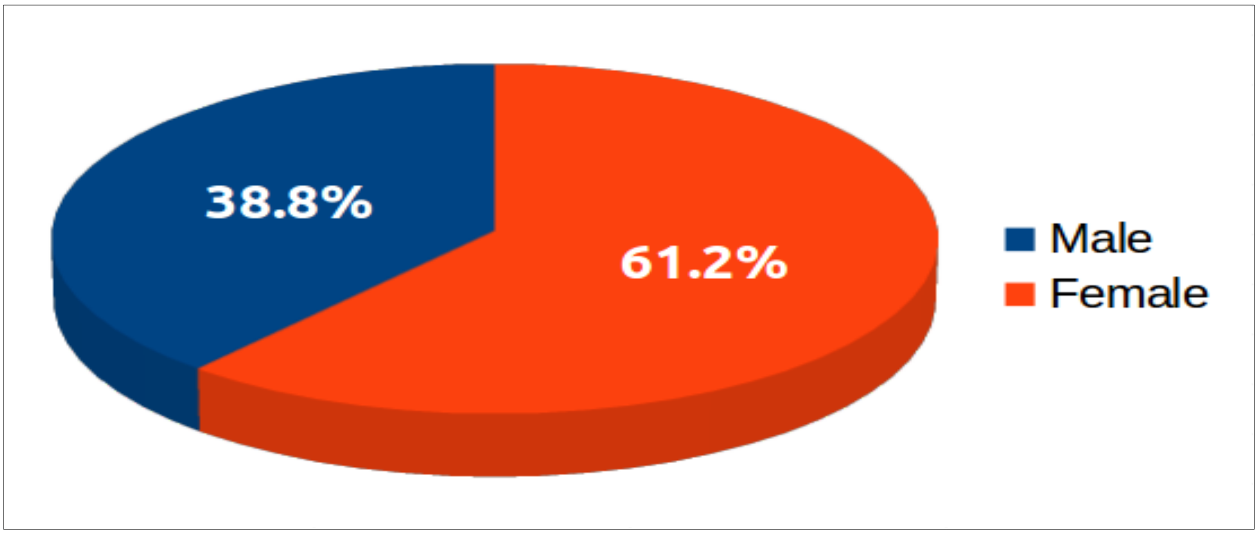

Figure (2): Gender distribution of study participants

Table (1): Past Medical history of study participants

Disorder	Group A No. (%)	Group B No. (%)	Total No. (%) (N=103)	P-Value
Hypertension	**13 (38.24%)**	**21 (61.76%)**	**34 (33.01%)**	**0.108**
Diabetes Mellitus	**14 (42.42%)**	**19 (57.58%)**	**33 (32.04%)**	**0.323**
Ischemic Heart Disease	**6 (31.58%)**	**13 (68.42%)**	**19 (18.45%)**	**0.083**
Asthma	**2 (40.00%)**	**3 (60.00%)**	**5 (4.85%)**	**1.000[F]**
Stroke	**1 (20.00%)**	**4 (80.00%)**	**5 (4.85%)**	**0.363[F]**
Hyperthyroidism	**1 (33.33%)**	**2 (66.67%)**	**3 (2.91%)**	**1.000[F]**
Heart Failure	**-**	**2 (100%)**	**2 (1.94%)**	**0.495[F]**
WPW Syndrome	**1 (100%)**	**-**	**1 (0.97%)**	**0.495[F]**

[F] Calculated using Fisher exact test

Recurrent PSVT was present in a proportion of (44.66%) of study participants, with no significant difference in the proportion between the two study groups, chi-square = 0.09, P-value = 0.758, as detailed in Table (2).

Table (2): Relationship between recurrent PSVT and study group

Study Group	Recurrent PSVT		Total	P-Value
	Yes	**No**		
Group A (Mvm)	**22 (43.14%)**	**29 (56.86%)**	**51 (100%)**	**0.758**
Group B (Svm)	**24 (46.15%)**	**28 (53.85%)**	**52 (100%)**	
Total	**46 (44.66%)**	**57 (55.34%)**	**103 (100%)**	

The response of patients' condition to the non-pharmacological approach was compared between Group A (MVM) and Group B (SVM) using chi-square test. Group A treated with MVM had significantly higher proportion of positive response (33.33%) compared to the proportion of positive response in Group B (9.62%) who treated with SVM, with a P-value of 0.003. Details are presented in Table (3).

Table (3): Relationship between type of Valsalva maneuver and response

Study Group	Positive Response		Total	P-Value
	Yes	No		
Group A (Mvm)	**17 (33.33%)**	**34 (66.67%)**	**51 (100%)**	**0.003***
Group B (Svm)	**5 (9.62%)**	**47 (90.38%)**	**52 (100%)**	
Total	**22 (21.36%)**	**81 (78.64%)**	**103 (100%)**	

* Significant at P < 0.05

Odds ratio was calculated to be (4.7) with a 95% confidence interval of (1.58 – 13.98). This means that patients treated with MVM are approximately 5 times more likely to have positive response compared to those treated with SVM.

Overall response to non-pharmacological approach was significantly higher among males compared to females, with P-value of 0.001 (Table 4). Patients who had long standing history of DM had significantly lower response compared to those with no history of DM, with P-value of 0.009 (Table 5). No significant differences in response were observed regarding recurrent PSVT, history of ischemic heart diseases, or history of hypertension.

Table (4): Relationship between gender and response among study participants

Gender	Positive Response		Total	P-Value
	Yes	No		
Male	**15 (37.50%)**	**25 (62.50%)**	**40 (100%)**	**0.001***
Female	**7 (11.11%)**	**56 (88.89%)**	**63 (100%)**	
Total	**22 (21.36%)**	**81 (78.64%)**	**103 (100%)**	

Table (5): Relationship between medical history and response among study participants

Medical History	Positive Response		Total	P-Value
	Yes	No		
Recurrent PSVT	9 (19.57%)	37 (80.43%)	46 (100%)	0.690
Hypertension	4 (11.76%)	30 (88.24%)	34 (100%)	0.095
Diabetes Mellitus	2 (6.06%)	31 (93.94%)	33 (100%)	0.009*
Ischemic Heart Disease	2 (10.53%)	17 (89.47%)	19 (100%)	0.202

* Significant at P < 0.05

Regarding MVM, males had significantly higher response than females, with P-value of 0.001 (Table 6). Long standing diabetic patients had significantly lower response with P-value of 0.002 (Table 7).

Table (6): Relationship between gender and response in group A (MVM)

Gender	Positive Response		Total	P-Value
	Yes	No		
Male	13 (50.00%)	13 (50.00%)	26 (100%)	0.010*
Female	4 (16.00%)	21 (84.00%)	25 (100%)	
Total	17 (33.33%)	34 (66.67%)	51 (100%)	

* Significant at P < 0.05

Table (7): Relationship between medical history and response in group A (MVM)

Medical History	Positive Response		Total	P-Value
	Yes (N=17)	No (N=34)		
Recurrent Psvt	7 (31.82%)	15 (68.18%)	22 (100%)	0.842
Hypertension	2 (15.38%)	11 (84.62%)	13 (100%)	0.112
Diabetes Mellitus	-	14 (100%)	14 (100%)	0.002*
Ischemic Heart Disease	2 (33.33%)	4 (66.67%)	6 (100%)	1.000

* Significant at P < 0.05

For the SVM group, no significant difference in response was observed between males and females, Fisher exact P-value = 0.699 (Table 8). Similarly, no significant difference was observed in response regarding recurrent PSVT, hypertension, DM, or ischemic heart disease (Table 9).

Table (8): Relationship between gender and response in group B

Gender	Positive Response		Total	P-Value
	Yes	No		
Male	2 (14.29%)	12 (85.71%)	14 (100%)	0.699^F
Female	3 (7.89%)	35 (92.11%)	38 (100%)	
Total	5 (9.62%)	47 (90.38%)	52 (100%)	

^{F} Calculated using Fisher exact test

Table (9): Relationship between medical history and response in group B

Medical History	Positive Response		Total	P-Value
	Yes (N=5)	No (N=47)		
Recurrent Psvt	2 (8.33%)	22 (91.67%)	24 (100%)	1.000[f]
Hypertension	2 (9.52%)	19 (90.48%)	21 (100%)	1.000[f]
Diabetes Mellitus	2 (10.53%)	17 (89.47%)	19 (100%)	1.000[f]
Ischemic Heart Disease	-	13 (100%)	13 (100%)	0.314[f]

[F] Calculated using Fisher exact test

All patients who had no response to Valsalva maneuver (whether modified or standard) had positive response to pharmacological therapy, with adenosine being the most commonly used medication (66.02%) followed by verapamil in (11.65%). Amiodarone was used only in one case (0.97%)

4.1 Discussion

This study consists of 103 PSVT patients and this number is considered acceptable in comparison with other studies like Mohammad AM[22], a cohort prospective study, consisted of 93 patients that was condcuted in Azadi teaching hospital, Duhok, Iraqi Kurdistan, Iraq. Also similar to Ceylan E[19] which included 98 patients and was done in Sanlıurfa research and training hospital, Sanlıurfa, Turkey.

Gender distribution was 61.2% females in the present study, this is corresponding to the study of Abdulqadir DF[23], which was done in Rozhalat emergency hospital, Erbil, Iraqi Kurdistan Iraq, in which a total of 60 PSVT patients were enrolled, about 65% of the participants were females and 35% of them were males.

The present study had compared the response rate of patients managed with the SVM with the response rate of those managed with the MVM, the response rate among the latter was significantly higher, with P-value of 0.003 and odds ratio of 4.7 . This reflects that patients with PSVT are approximately 5 times more likely to respond to MVM than their response to the SVM. This is similar to Appelboam et al. in their randomized controlled trial study conducted in ten emergency departments in England, which enrolled a total of 433 patients during the period from Jan 11, 2013 to Dec 29, 2014 and observed that the response to the MVM was significantly higher than that observed to the SVM, with a P-value of less than 0.0001 and odds ratio of 3.7[17]. Also similarly, to Corbacioglu et al. a randomized controlled trial that was conducted in the emergency department of a training and research hospital between Dec, 2015 and Dec, 2016, participants were also divided into two groups, randomly assigned into SVM or MVM, had also demonstrated a similar significant difference in response between patients managed with SVM and MVM, with P-value of 0.007[24].

In the present study, response to the MVM maneuver was 33.33% compared to only 9.62% for the SVM. These proportions were similar or slightly lower than the proportions reported by:

1) ylan E, in their study conducted from 2016 to 2017, which included 98 patients, who reported a first response of 43.7% in MVM group compared to 24.2% for the SVM group[19]. They also reported that response to the MVM was significantly higher than the response to carotid sinus message as well[19].
2) Appelboam et al. had reported a response proportion of 43% among patients managed with MVM[17].
3) Corbacioglu et al[24] had reported a response of 42.9% among patients who managed with MVM.

Our explanation to these slight differences in proportions with the present study may be related to the larger sample number in some studies. Also the repetition of the maneuver was done up to three times in some studies, while in the present study it was done up to two times.

Other explanations include: ethnic differences, differences in medical staff training, uncooperativeness of patients, as well as to the delay in time of admission to the coronary care unit, because early patient presentation after onset of symptoms has better response to the MVM as found in the study of Abdulqadir DF[23], as more than half of responded patients (53.3%) had the onset of <1 hour, and none of the responders had the onset for more than 3 hours. In contrary, only 22.2% of non-responded patients had an onset of <1 hour and 31.1% of them had the onset for more than 3 hours. Chi-square test was used to find out the association and P = 0.01 which is statistically significant.

However, 33.33% of the patients were well responded to MVM in the present study, and this is enough to consider the maneuver as a good technique for treating PSVT patients, as well as it is safe and indirectly reduce the need for antiarrhythmic medications and avoiding its side effects that may occur.

Overall response to the vagal maneuvers (both SVM & MVM) in the present study was 21.36%, while the remaining 78.64% required pharmacological intervention. This proportion was similar to the proportion reported by Corbacioglu et al. of 26.79%[24].

Response to MVM was found to be significantly higher among males compared to females. This is similar to the finding reported by Abdulqadir DF, who also observed a better response to MVM among male patients compared to female patients[23], this may be related to the difficulties in handling female patient in our community due to shyness issues, or may be related to hormonal changes.

Patients with long standing DM had significantly lower response to non-pharmacological approach in the present study. This could be attributed to the effect of DM in the occurrence of autonomic neuropathy as one of its common complications. This explanation is supported by the fact that Valsalva maneuver is recommended as one of three tests to assess diabetic patients for the presence of cardiovascular autonomic neuropathy[25,26].

Conclusion and Recommendations

5.1 Conclusions

This study concluded that MVM was significantly more effective than SVM in the termination of PSVT, with a positive response in one-third of the patients, more effective in males than females, and less effective in patients with long standing DM.

5.2 Recommendations

1. Performing a trial of MVM for PSVT patients as the first routine treatment as it is effective and safe.

2. Repeating the MVM more than one time.

3. Training the medical staff as well as the patient's relatives about the MVM, in order to perform it instead of the SVM.

4. Further studies with larger sample size are recommended to validate the findings of the present study.

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