

## ORIGINAL ARTICLE

# Comparing Efficacy of Standard Versus Modified Valsalva Maneuver in Terminating Paroxysmal Supraventricular Tachycardia-PSVT

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## ABSTRACT

**Aim:** To know whether valsalva maneuver is more effective compared to modified valsalva in terminating paroxysmal supraventricular tachycardia or vice versa.

**Method:** The study design was randomized controlled trial. This research was conducted in accident & emergency department of Mayo hospital, Lahore. Duration of this study was nine months. Participants were divided in two groups, half were assigned in Standard VM group (Group A), and other half in Modified VM group (Group B). In both groups, assigned valsalva maneuver was repeated up to two times, only when paroxysmal supraventricular tachycardia did not revert to sinus rhythm on first time. In those patients, VM failed even after three attempts, antiarrhythmic medications were used. Primary outcome was defined on the basis of successful return of sinus rhythm after either by standard or modified valsalva maneuver.

**Results:** Sixty two patients were included in this study, thirty one in each group. Out of thirty one patients in group A, two patients (3.2%) rhythm reverted to sinus, while in group B, seven patients (11.3%) rhythm reverted to sinus. The number of patients who needed rescue treatment was lower in group B -21 (77.4%) as compared to group A- 29(93.5%).

**Conclusion:** The results of this study showed that modified VM was more effective in terminating PSVT as compared to standard VM. So, number of patients who required pharmacological cardioversion was lower in group B.

**Keywords:** Supraventricular tachycardia (SVT), Standard valsalva maneuver (SVM), Modified valsalva maneuver (MVM)

## INTRODUCTION

SVT is narrow complex tachydysrhythmia. It often originate from a focus within or above the AV node. Tachycardia is heart rate greater than 100 beats per min in adults. In SVT, usually heart rate varies from 140 to 250 per minute. There are two main types of SVT, atrioventricular nodal reentrant tachycardia (AVnRT) and atrioventricular reentrant tachycardia (AVRT)<sup>1</sup>. Patients with SVT can present with chest discomfort, palpitation, shortness of breath, or less commonly dizziness or syncope due to decreased cerebral perfusion. Management depends if the patient at presentation is hemodynamically stable or not. In stable patients, AHA guidelines recommend vagal maneuvers as first line treatment. Vagal maneuvers include carotid sinus massage, standard and modified valsalva maneuver and diving reflex<sup>2,3</sup>. Vagal maneuvers increases parasympathetic tone and may slow electrical conduction in the heart to a degree that abolishes sustained reentry, so reverting PSVT to sinus rhythm<sup>4</sup>.

Many researchers have conducted on different vagal maneuvers internationally, especially on valsalva maneuvers. In valsalva maneuver, forced expiration is done against a closed glottis. Effectiveness of this procedure can be increased by placing the patient in supine position during release phase<sup>5</sup>. Frequency of converting PSVT to sinus rhythm is higher in modified valsalva maneuver<sup>6,7</sup>. Vagal maneuvers are non-invasive and cost effective, so can be readily used in emergency department<sup>8</sup>. A case report was presented depicting successful return of sinus rhythm in PSVT in pre hospital setting using MVM<sup>9</sup>.

Patients in whom, vagal maneuvers failed, anti arrhythmic drugs were used which included adenosine, beta blockers and calcium channel blockers. In recent AHA algorithms, adenosine was mentioned where pharmacological cardioversion was required. But multiple researches are still ongoing to determine which drug is superior to other for terminating paroxysmal supraventricular tachycardia. Any of these medications can be used for pharmacological cardioversion after ruling out contraindications.

The rationale of this study is to compare the effectiveness of standard versus modified valsalva maneuver in terminating PSVT. As success of this procedure leads to avoidance of unnecessary administration of antiarrhythmic medications and indirectly their side effects<sup>10</sup>.

## MATERIAL AND METHOD

This is prospective, randomized controlled trial was conducted in Accident & Emergency department of Mayo hospital, Lahore. The duration of this study was 09 months stating from 01 April 2022 to 31<sup>st</sup> October 2022. Sampling technique used was probability simple random sampling. Total 62 patients were included in this study. 31 patients in standard VM (group A) and 31 in modified VM group B.

**Sample size calculation:** It was calculated by using 5.1 level of significance, 95% confidence level, 90% power of test with expected percentage of achieving of sinus rhythm standard VM as 10.7% and modified VM 42.9% by using software sample size determination in health studies.

**Inclusion criteria:** It included patients in age group of 20-60 years of both gender who presented with diagnosis of PSVT on 12 lead ECG.

**Exclusion criteria:** This study excluded those who were hemodynamically unstable, had rhythm other than PSVT, non-cooperative patients, obese (BMI>30), pregnant and those who did not give consent to participate in this study.

**Informed consent:** All participants provided written informed consent before participation.

**Data collection:** Total 62 patients were enrolled in this study after fulfilling inclusion/ exclusion criteria. Demographic profile (name, age, sex, contact number, address) was taken after written informed consent. Patients were reassured regarding the confidentiality and expertise use of the particular. Patients were assigned in two groups. Valsalva maneuver was performed in first group, modified VM performed in second group.

**Statistical Analysis:** All data was entered and analyzed by using IMB SPSS 20. Qualitative variables like gender, comorbid presented, reversion to sinus rhythm presented as frequency,

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mean and percentage. Quantitative variables like age presented as mean and percentage.

**Ethical approval:** This study was approved by Research Evaluation Unit of college of physicians & surgeons-CPSP, Pakistan.

All eligible participants were assigned groups randomly. Cardiac monitors were attached using chest electrodes. Participants in each group were monitored before, during & after intervention. Both group participants were asked to blow into 10ml syringe. In both groups, procedure was repeated total of 2 times in those participants who failed to respond first time. Participants in whom maneuver was unsuccessful, antiarrhythmic medications were used.

**Procedure:** In standard valsalva maneuver, while participant sat up vertically, researcher asked the patient to take deep breath, then to make a mouth seal around syringe & try to push the plunger by blowing into 10ml syringe for 15sec. In next 45 sec, response was assessed on cardiac monitor. In modified valsalva maneuver group, participant first sat vertically at 45 degree angle, was asked to take deep breath and then blow into 10ml syringe for 15 sec, then patient head position changed to supine immediately while legs raised to 45 degree angle for 15 sec. response was assessed in next 45 seconds<sup>11</sup>.

## RESULTS

In total data collection time, total 86 patients were received in emergency with PSVT. Out of which, 24 were excluded from study because they did not meet eligibility criteria for the study. Remaining 62 were divided randomly in two groups, 31 were assigned into group A of SVM, remaining 31 were included in MVM.

Table 1: Clinical characteristics and demographic of patients.

	Standard VM* (n=31%)	Modified VM (n=31%)	Mean Difference
Age (years)	42.2	45.1	2.9
<b>Gender</b>			
Male	14 (45.2%)	14 (45.2%)	N/S*
Female	17 (54.8%)	17 (54.8%)	N/S
<b>Comorbidities</b>			
Diabetes	9 (29%)	9 (29%)	N/S
Hypertension	14(45.2%)	18(58.15)	12.95
Ischemic heart disease	3(9.7%)	8(25.8%)	16.1
Smoker	7 (22.6%)	12(38.7%)	16.1
Systolic blood pressure (mmhg)	103.8	104.5	0.7
Diastolic blood pressure (mmhg)	68	69	01
Pulse rate per minute	190	185.3	4.7
O2 Saturation at room air (%)	96	95.6	0.4

Data presented as Mean (n) and percentage of n.

VM=Valsalva maneuver; n=number of patients; N/S=not significant.

Table 2: Outcomes of this study.

	Standard VM* (n=31)	Modified VM (n=31)	Mean difference
Patients in whom sinus rhythm achieved	2 (3.2%)	7 (11.3%)	8.1
<b>Patients required antiarrhythmic medications:</b>	29 (93.5%)	24 (77.4%)	12.9
Adenosine	21 (67.7%)	17 (54.8%)	16.1
Beta blockers	6(19.4%)	5(16.1%)	3.3
Calcium channel blockers	2(6.5%)	2 (6.5%)	N/S*

VM: Valsalva maneuver; N/S=not significant

Basic demographic, vital signs and past medical history was almost similar in both groups (Table 1). Two out of 31 patients

(3.2%) in group A returned to sinus rhythm. While in group B, seven patients (11.3%) achieved sinus rhythm (Table 2). Remaining fifty three patients needed pharmacological cardioversion by adenosine, metoprolol or verapamil, depending upon patient history and examination findings and availability of drug.

## DISCUSSION

This study purpose was to compare the effectiveness of standard VM and modified VM, to return the PSVT into sinus rhythm. It showed that modified VM is more effective as compared to standard VM as 7 patients (11.3%) achieved sinus rhythm with modified VM, while only 2 patients (3.2%) reverted to sinus rhythm by using standard VM, and MVM only required simple, safe postural modification. Therefore, on basis of this research results, modified Valsalva maneuver can be used as an effective alternative of standard Valsalva maneuver.

Valsalva maneuver is named after Antonio Maria Valsalva, who was an Italian anatomist born 3 centuries ago. This maneuver is based on forced expiration against a closed glottis, causing parasympathetic activation and affect cardiovascular system by altering heart rate. According to previously conducted researches in emergency departments of various hospitals, modified Valsalva maneuver was found to be far superior than standard method in every research<sup>12,13</sup>, but success rate varied from 25% to 43%<sup>7,14</sup>. Results of this research showed less success rate with modified VM as compared to previous studies<sup>15,16</sup>. Nonetheless, this technique is still superior to standard VM for terminating paroxysmal supraventricular tachycardia<sup>17,18</sup> & it is cost effective and easy to perform. It can be readily applied to patients presenting with PSVT & it does not have any side effects. This study also showed that vagal maneuvers were most successful in patients of age group fifty or less than fifty. This can be due to decrease autonomic response in aging patients.

Vagal maneuvers are the first line treatment in PSVT. It includes carotid sinus massage, SVM, MVM and diving reflex. If these maneuvers does not return the PSVT into sinus rhythm, then antiarrhythmic medications are used, which includes adenosine, beta blockers and calcium channel blockers. In which, adenosine has a high success rate as 38 patients (60.3%) achieved sinus rhythm as compared to metoprolol (17.5%) and verapamil (6.3%).

## CONCLUSION

This study showed that both vagal maneuvers were effective in some patients but MVM is more effective compared to SVM in returning the PSVT into sinus rhythm.

**Limitations:** This study had some limitations. First limitation is decrease sample size, so results could not be generalized. Second limitation is that pressure measurement when patient blowed into 10ml syringe to move the plunger, could not be measured by manometer.

**Declaration of interest:** There is no conflict of interest.

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