

EFFICACY OF MODIFIED VERSUS STANDARD VALSALVA MANOEUVRE FOR TREATING SUPRAVENTRICULAR TACHYCARDIA IN AN EMERGENCY DEPARTMENT: A QUASI-EXPERIMENT

Nasir Iqbal,¹ Sania Tahir,² Hassan Abbas Abdullah,³ Muhammad Ijaz Bhatti,⁴
Usman Javed Iqbal,⁵ Mariam Tahir Siddiqi⁶

Abstract

Objective: To assess efficacy of modified Valsalva manoeuvre in comparison to standard Valsalva manoeuvre in treating Supraventricular tachycardia in an emergency department.

Methods: It was a quasi-experiment conducted in Azra Naheed Medical College Lahore including 132 patients presented with supraventricular tachycardia (SVT) in an emergency department. Patients were equally divided and randomly assigned to receive standard Valsalva manoeuvre and modified Valsalva manoeuvre. ECG was recorded before and after the Manoeuvre. Subjects reverted back to sinus rhythm within one minute of allocated manoeuvre were considered successful. SPSS version 21 was used to manage and analyze data.

Results: Mean age of participants was 40 ± 11 years with 33% male and 66% were females. Mean duration of paroxysmal SVT in participants was 5 ± 4 years. The mean systolic and diastolic blood pressure was 112 ± 15 and 72 ± 10 mmHg respectively. The range of pulse rate per minute was from 136 to 240 with a mean of 184 ± 24 . SVT was reverted by Valsalva Manoeuvre in 89 (67.4%) patients and did not revert by these Manoeuvres in 43 (32.6%) patients. Out of 89 reverted, 38 were reverted by performing Standard Valsalva method and 51 were reverted by performing modified Valsalva methods ($p=0.025$). There was no association between age, sex, duration of SVT, presence of Diabetes Mellitus, Hypertension or Ischemic Heart Disease with the effectiveness of Vagal Manoeuvre for termination to sinus rhythm.

Conclusion: Modified Valsalva manoeuvre is significantly effective than the standard manoeuvre in terminating SVT without increasing adverse effects or time spent in the emergency department.

Keywords: Modified Valsalva Manoeuvre, Standard Valsalva Manoeuvre, Supraventricular Tachycardia

How to cite: Iqbal N, Tahir S, Abdullah HA, Bhatti MI, Iqbal UJ, Siddiqi T. Efficacy of modified versus standard Valsalva manoeuvre for treating supraventricular tachycardia in emergency department: A descriptive study. *JAIMC*;20(4): 185-189

Supraventricular tachycardia (SVT) is one of the most common arrhythmia presenting in both pediatric and adult emergency departments in different hospitals.¹⁻⁵ It has an incidence of approximately 35 in 100,000 people/year.¹ A number of methods exist with

variable but limited success rates for cardioversion of acute attack of SVT.^{6,7} The Valsalva manoeuvre being one of the safest and recommended first line treatment having cardioversion rate of less than 20%.⁸⁻¹¹ The reason of low cardioversion rates is still unknown with one possibility being patient positioning during the procedure, Another being presence of no standardized method of performing the Valsalva manoeuvre.¹² It is important to identify SVT as only arrhythmia involving the atrioventricular node can be reversed by a vagal manoeuvre.^{15,16} There is lack of specific description on exact method to perform Valsalva Manoeuvre in reference books leading to difficult choice between Modified versus Standard Valsalva Manoeuvre.¹³⁻¹⁵ It

1,2. Department of Cardiology, Azra Naheed Medical College Lahore.

3. Department of Cardiology, Al-Aleem Medical College/Gulab Devi Teaching Hospital Lahore

4-6. Department of Cardiology, Gulab Devi Teaching Hospital Lahore

Correspondence:

Muhammad Ijaz Bhatti, Associate Professor of cardiology, Al-Aleem Medical College/ Gulab Devi teaching hospital Lahore

E-mail: drijazbhatti@gmail.com

Submission Date: 06-12-2022

1st Revision Date: 14-12-2022

Acceptance Date: 26-12-2022

is clinically accepted to perform the standard Valsalva manoeuvre in a semi-recumbent or sitting position.¹⁷ There is a hypothesis that modifications to this standard manoeuvre by elevating legs in a supine position after strain (that increases relaxation phase, venous return and vagal stimulation) may help in improving effectiveness but have not been tested in controlled trials yet.¹⁷⁻¹⁹ Unsuccessful Valsalva manoeuvres usually require intravenous adenosine, which is associated with extensive side effects due to its mechanism of action, including transient asystole of the heart, leading to sense of impending doom.¹⁹⁻²¹

There are also some contraindications to Valsalva Manoeuvre including aortic stenosis, recent myocardial infarction, glaucoma, retinopathy, Individuals unable to follow verbal commands or lie flat and those with abnormal vital signs.²¹

Few studies also focused on the effectiveness of Modified Valsalva Manoeuvre (MVM) in comparison to Standard Valsalva Manoeuvre (SVM) in the emergency management of SVT. For instance, Appelboom et al²¹ reported that 43% of SVT patients who underwent MVM return to sinus rhythm successfully.²¹ There are still gaps in knowledge about efficacy of SVM against MVM for SVT. This study aims to assess the efficacy of modified Valsalva manoeuvre in comparison to standard Valsalva manoeuvre in treating Supraventricular tachycardia in an emergency department.

METHODS

This quasi-experiment was conducted in Azra Naheed Medical College Lahore from 15-04-2021 through 15-01-2022 (nine months) after taking institutional ethical approval. A sample of 132 was required with 95% confidence interval and at 5% margin of error. Patients with SVT were recruited consecutively as they present in emergency department fulfilling our inclusion criteria. We used non-probability convenient sampling technique. Patient aged between 18 to 60 years irrespective of gender having Supraventricular tachycardia determined on ECG as per operational definition were included in this study. While those having atrial fibrillation or flutter determined on ECG

(irregularly irregular rhythm), wide complex tachycardia or hemodynamic unstable patients (Systolic Blood Pressure <90mmH); those who were unable to perform the manoeuvre or having any contraindication to Valsalva manoeuvre (like aortic stenosis, recent myocardial infarction, glaucoma, or any retinopathy) were excluded from our study.

In this study, we labelled Supraventricular Tachycardia when ECG showing narrow complex regular tachycardia of heart rate more than 100/minute with absent or abnormal P wave. While Standard Valsalva Manoeuvre (SVM) was defined as the manoeuvre to breathe out strongly through mouth while holding your nose tightly closed (against closed glottis) to slow the heart rate, for 15 second by forced expiration in a syringe with a plunger in a semi recumbent position. On the other hand, Modified Valsalva Manoeuvre was defined as the manoeuvre when SVM is performed in a semi recumbent position and laid flat with legs raised to a 45° angle for 15 seconds at the end of the strain immediately before they are returned to the starting position.^{8,12,18}

Primary outcome of this study include the return of SVT to sinus rhythm at 1 minute after intervention, whereas secondary outcome was reversion of SVT with an Intravenous drug administration.

Informed consent was obtained from 132 eligible patients and they are equally divided into two groups (66 each) and randomly assigned to receive standard Valsalva manoeuvre and modified Valsalva manoeuvre. We did not use any blinding process. ECG was recorded before and after the manoeuvre. Subjects who reverted back to sinus rhythm within 1 minute of allocated manoeuvre were considered successful. Patient's detailed information about medical and demographic history, including sex, age, blood pressure and pulse rate were obtained and entered in a structured questionnaire.

Data were managed and analysed using SPSS version 21.0. Mean and standard deviation were calculated for quantitative variables like age, systolic blood pressure, diastolic blood pressure, pulse rate. Frequency and percentages were used in case of categorical variables like gender, duration of disease. Data were stratified for age, gender, blood pressure, pulse rate and dura-

tion of disease. Chi-square test was used to examine the difference of proportions and independent t-test was used to assess statistical significance for mean difference with $P < 0.05$ was considered as statistical significant.

RESULTS

Minimum age of 132 cases participating in this study was 19 years and maximum age was 60 years with mean age of 40 ± 11 years. There were 44 males (33%) and 88 (66%) participants were females with male to female ratio of 0.5. The mean duration of SVT in participants was 5 ± 4 years. The mean blood pressure was 112 ± 15 over 72 ± 10 mmHg. The range of pulse rate per minute was from 136 to 240 with a mean of 184 ± 24 . SVT was reverted by Valsalva Manoeuvre in 89(67.4%) patients and reversion was not achieved by these Manoeuvres in 43 (32.6%) patients. Of 89 reverted, 38 were reverted by performing Standard Valsalva Manoeuvre and 51 were reverted by performing Modified Valsalva Manoeuvre with the statistically significant p value of 0.025.

Out of 43 participants unable to achieve primary outcome, 33 (25%) achieved secondary outcome that was reversion of SVT by an intravenous drug. Out of which, 23 (17%) were successfully reverted by use of injection Isopten; 10 (7.5%) were reverted by use of

Table 1: Comparison of Standard Valsalva Manoeuvre (SVM) versus Modified Valsalva Manoeuvre (MVM) in reverting supraventricular tachycardia (SVT) (n=132)

Manoeuvre	Supraventricular tachycardia		p-value*
	Reverted	Not Reverted	
Standard Valsalva Manoeuvre (SVM)	38 (42.7%)	28(65.1%)	0.025
Modified Valsalva Manoeuvre	51(57.3%)	15(34.9%)	

injection Merol and in 10 (7.5%) cases, reversion was unsuccessful. Reversion of SVT was stratified for age, gender, presence of Type 2 Diabetes Mellitus, Hypertension and Ischemic Heart Disease (IHD).

Table 2: Response of Valsalva manoeuvre on supraventricular tachycardia by demographic characteristics and disease profile (n=132)

Characteristics	Reverted (n=89)	Not Reverted (n=43)	P-value*
Age			
Up to 50 years (n=103)	75	28	0.342
Above 50 years (n=29)	14	15	
Gender			
Female (n=88)	59	29	0.529
Male(n=44)	30	14	
Diabetes Mellitus			
Yes (n=36)	22	14	0.405
No (n=96)	67	29	
Hypertension			
Yes (n=35)	21	14	
No (n=97)	68	29	
Ischemic Heart disease			
Yes (03)	1	2	0.247
No (n=129)	88	41	

Chi-squared test was used. Values in 2x2 table are numbers.

DISCUSSION

Clinicians consider using vagal manoeuvres as first line therapy for termination of acute attack of SVT and should opt for the most effective and useful method, but the most effective vagal manoeuvre had not been well-discussed so far. In different studies, the success rate of different vagal manoeuvres were reported between 5-20%.^{8,9} However, MVM was preferred in the newest edition of adult advanced life support in European Resuscitation Council Guidelines.²² In a study done by Ceylan et al. all three vagal manoeuvres were compared and MVM was found superior to both SVM and CSM in terminating SVT.²³ In our current study, the results were consistent with the data but the presence of small number of participants in each group and the fact that carotid sinus massage was not considered part of the study were the limitations. Meta-analysis of Abdulhamid et al. showed that by performing MVM the sinus rhythm was achieved 2.5 times as compared to SVM.²⁴ In our study, MVM was 1.3 times more effective as compared to SVM with a statistically significant p value of 0.025. In another Cochrane analysis, the efficacy of the Valsalva manoeuvre was evaluated and the success rate of MVM ranged from 19.4% to 54.3%

with modifications in SVM.²⁵ In a study conducted by Walker and Cutting, patients were placed in the trelenderburg position and blown into a manometer to produce 40 mmHg pressure for 15 seconds. The success rate of Valsalva manoeuvre increased to 31% with this modification.¹⁷

Wallentin and Sjol,²⁶ reported that MVM was successfully applied without side effects in the case presented. In our present study, no major side effects of performing vagal manoeuvres were seen. In another case series published by Un et al.²⁷ MVM was successful in patients who did not respond to standard vagal manoeuvres.

The first scientific randomized study was conducted by Appleboam et al. which showed 17% success as compared to MVM, which had 43% success rates. Hence, MVM was superior.²¹ It was also concluded in this study that there were no major side effects and no effect by demographic changes. According to results of our current study, there was no association between age, sex, duration of SVT, presence of Diabetes Mellitus, Hypertension or Ischemic Heart Disease with the effectiveness of Vagal Manoeuvres for termination to sinus rhythm. But, the current study has some limitations as it is studied on a small subset of sample, in cardiology department of our hospital only with limited resources. So this study needs further workup in a bigger setting to elaborate further. The loops and holes of this study can only be filled with further research work in future.

CONCLUSION

Modified Valsalva manoeuvre is more effective than the standard manoeuvre in terminating SVT without increasing adverse effects or time spent in the emergency department. However, further Randomized Control Trials are warranted to confirm the efficacy and safety of the MVM and strengthen the evidence.

Conflict of interest: *None*

Funding Source: *None*

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