



## CASE STUDY: MODIFIED VALSALVA MANOEUVRE

Jaroslav Pekara<sup>\*1,2</sup>, Petr Zvolsky<sup>1</sup> and David Peran<sup>1,3</sup>

<sup>1</sup>Prague Emergency Medical Services.

<sup>2</sup>Medical College in Prague.

<sup>3</sup>Charles University, 3rd Medical Faculty, Prague.

Received date: 28 September 2018

Revised date: 19 October 2018

Accepted date: 09 November 2018

Corresponding author: Jaroslav Pekara

Prague Emergency Medical Services and Medical College in Prague.

### ABSTRACT

The paper describes the use of non-pharmacological cardioversion – the Valsalva manoeuvre – on a young woman. Studies confirm that vagal manoeuvres are generally recommended procedures of first choice to reverse supraventricular tachyarrhythmias in prehospital emergency care and that application of modified VM is significantly more efficient than standard VM to terminate (paroxysmal) Supraventricular tachycardia (SVT). The standard Valsalva Manoeuvre is performed by forceful exhalation against a closed glottis. Modified Valsalva Manoeuvre is performed by forceful exhalation against resistance (mostly against the injection plunger, tube with oxygen). In our case, we used it for normalisation of supraventricular tachycardia (180 pulses per minute). After the application of the modified Valsalva Manoeuvre, heart action decreased to 105 pulses with disappearing palpitations.

**KEYWORDS:** Case study, paramedic, supraventricular tachycardia, Valsalva Manoeuvre.

### INTRODUCTION

Valsalva Manoeuvre – forceful exhalation against a closed glottis, is a vagal manoeuvre (same as the oculocardiac reflex – pressure to the eyeballs, or carotid sinus massage). The Valsalva Manoeuvre is justified to cancel some tachyarrhythmias, when transfer of cardiac stimuli in the AV node slows down (most often supraventricular tachycardia). Other uses include differential diagnostics of murmurs during subaortic stenosis or mitral valve collapse. Manoeuvre is performed with the patient sitting down (modified manoeuvre with the patient subsequently transferring to lie down), it may pronounce varicocele, and the significant contraindications include diabetic retinopathy (adverse increase of intraocular pressure). In stomatology, a modified version, where the patient tries, with their mouth open and blocked nose forcefully exhale through the nose – the soft palate is arched with pronounced A-line, i.e. during orotracheal communication, air visibly or audibly escapes the nose cavity as part of the check following extraction of the top jaw molars.<sup>[1]</sup>

During modified Valsalva Manoeuvre (MVM), with forceful exhalation against resistance (mostly against injection plunger or oxygen tube), intrathoracic, abdominal and centrally venous pressure increase. Thus, venous return to the heart decreases – preload, afterload

and blood pressure in the aorta. After termination of forceful exhalation and change of the position of the patient (after 15 seconds) from Fowler's position (45°) to lying down with elevation of lower extremities by 45° (Trendelenburg position), heart output and the heart pressure in the aorta suddenly increase. Baroreceptors react to increased blood pressure by activating the vagus nerve. That decreases creation of stimuli in the SA node and transfer in the AV node. The manoeuvre stops air from spreading through the heart muscle tissue and can be, in case of success, called a non-pharmacological cardioversion in case of SVT. Essential indications include narrow-complex tachyarrhythmia, paroxysmal atrioventricular nodal re-entry tachycardia, supraventricular tachycardia, hyperventilation. Contraindications include the mentioned retinopathy with DM, glaucoma, hypercholesterolemia in anamnesis, known atheromatous plaques in veins (risk of rupture and occurrence of vascular brain stroke), profuse bleeding, hypotension, bradycardia, cephalalgia, relative indications include obesity and age of the patient (inability to cooperate).<sup>[2]</sup>

### CASE STUDY

In 8:25 a.m. the Emergency Medical Services Response Team (VS RZP) received an emergency call “ARHYTHMIA+, tachycardia”. According to the

information by the Medical Operations Centre, woman aged 40 reported general weakness and palpitations. In 8:33 VS RZP arrived, the patient (184cm, 95kg) was waiting outside and with the help of the paramedics entered the vehicle for examination.

On the current state, she reported that before 8:00 she was getting ready for work (after hot shower, she felt general weakness, palpitations, and swat significantly). She experienced this for the first time in her life. In personal anamnesis, she stated she is treated for varicose veins of the lower extremities, with corroborating pharmacological anamnesis (Detralex and Vesel duo). From allergies, she stated penicillin, iod, entizol and biseptol.

The patient was examined in the Fowler's position on bed. She described problem free perspiration (PR 16/min, oxygen saturation 98%), chest pain, dyspnoea, she negated injury or collapse. Palpitations persisted. With regard to circulation, symmetrical palpation was on both axes radialis, BP 120/85 mmHG, ECG: supraventricular tachycardia, 180 pulses per minute. The patient was started on IV and administered 100ml of physiological saline. The patient was without neurological problems, movement of extremities was symmetrical, she stuck her tongue out in the middle GCS 15. She had no marks of skin integrity deterioration on her body, BT 36.8°C.

Subsequently, the patient was informed about modified Valsalva Manoeuvre that might help eliminate her current medical problems. Before the manoeuvre was performed, the patient was informed that she will be continuously monitored and that we will also see her ECG on the monitor in real time. She was also informed about the performance of the therapeutic method (manoeuvre), which seemed curious to her however, she agreed to perform it.

One member of the response team stood by the head of the patient in the Fowler's position on bed, with top part of her body leaning in 45° angle, and the second member stood by her feet. The patient was asked to forcefully exhale for 15 seconds in a 10ml injection against the plunger (until she is told to stop). After 15 seconds, the patient terminated forceful exhalation and then she was transferred to the Trendelenburg position (legs elevated by up to 45°). After 15 seconds the patient resumed the original position, and in the next 30 seconds, the heart rate was assessed. During continuous monitoring, adjustment to the sinus rhythm (105 pulses) occurred. Immediately after position stabilization, the patient felt relief with subsequent subsiding palpitations. In 8:45 a.m. the patient was without hemodynamic abnormalities transported to the nearest Target Provider of Inpatient Services for internal emergency care.

Before therapy	Therapy	After therapy
A – airways are clear, communicates	Modified Valsalva Manoeuvre	A – airways are clear, communicates
B – no trouble, no dyspnoea, oxygen saturation 98 %		B – no changes
C – 180 pulses (supraventricular tachycardia), BP 120/85 mmHg,		C – 105 pulses (sinus rhythm), BP 120/85 mmHg
D – GCS 15, pupils izo photo + +		D – no changes
E – BT 36.8 °C		E – no changes

In the medical facility, the patient was examined in detail – airways were clear, she experienced no trouble breathing (oxygen saturation 98%), palpitation disappeared, BP 138/100 mmHG, 75 pulses per minute, BT 37°C. X-ray of the chest and heart ECHO without pathological finds, biochemical blood tests and mineralogram without significant abnormalities (only lower levels of potassium). During hospital care (8-hour monitoring), the problems did not occur again. The patient was released the same day with bisoprolol therapy and increased-potassium-content diet.

## DISCUSSION

Vagal manoeuvres are generally recommended procedures of first choice to revert SVT in prehospital emergency care. Modified Valsalva Manoeuvre may be a novelty in a way, supported, however, by an excessive randomized study.<sup>[3]</sup> In the study, the total of 433 patients with SVT (216 patients in the standard variation – VM only sitting down and 217 patients in the modified VM). Total success rate of modified VM in the study was 43% compared to 17% success rate in the case of standard

VM. It may be observed that application of modified VM is the best practice in prehospital emergency care with significantly higher success rate than the standard VM. Also, it may be much more pleasant for the patents compared to potential pharmacotherapy with Adenosin as first choice, which is, from patients' descriptions, accompanied with uncomfortable feeling (dying sensation, close-death experience, sense of drowning, chest pain, dyspnoea, sensation that the heart stopped beating, palpitations).<sup>[4]</sup> Adenosin is sometimes called “chemical Valsalva Manoeuvre” and the success rate of Adenosin compared to VM is generally stated over 90%.<sup>[5]</sup> Also this parameter was examined in the Appelboom et al. (2015) study. With patients that underwent the modified VM, use of Adenosin was significantly lower (50%) than in the group with standard VM (69%). Only four patients experienced relapse requiring further care in ER. All patients with modified VM originally achieved the sinus rhythm. The differences in times spent on ER or the necessity to be admitted did not differ significantly between the groups.<sup>[3]</sup>

In other randomized control study.<sup>[6]</sup> 56 patients with paroxysmal SVT were randomized to a group with standard or modified VM with 28 patients in each treatment group. 3 out of 28 patients (10.7%) in the standard VM group and 12 out of 28 (42.9%) of the modified VM group achieved sinus rhythm after the treatment ( $p=0.007$ ). The number of patients (16) that required treatment was lower in the modified VM group (57.1%) than in the standard VM group (89.3%) – 26 out of 28 patients in the standard VM group ( $p=0.007$ ).

Bronzetti et al. (2018) performed VM with 24 paediatric patients admitted for SVT. 12 patients underwent standard VM and 12 modified VM: In the modified VM, compared to standard VM, during the first try 67% (modified VM) vs. 33% subjects achieved sinus rhythm and subsequently 50% (modified VM) vs. 0% achieved sinus rhythm adjustment with patients where the first try was unsuccessful. During monitoring, no adverse effects manifested.<sup>[7]</sup>

Comparing modified VM with carotid sinus massage to diagnose and terminate SVT, significant difference to the benefit of modified VM (43% for modified VM vs. carotid sinus massage of 20%) were ascertained. Moreover, during carotid sinus massage, 0.2-1% of patients may manifest neurological complications.<sup>[8]</sup>

## CONCLUSION

Studies confirm that treating with modified VM is significantly more efficient than the standard VM to terminate (paroxysmal) SVT. Modified VM also indirectly decrease the necessity of antiarrhythmic medicine and shows less adverse effects. Modified VM is a simple and safe technique and decreases also patient-feared adverse effects of Adenosin treatment. The conditions of modified VM are continuous monitoring and thorough explanation of the procedure. The patient cooperation is essential to the treatment.

## ACKNOWLEDGEMENT

This article received no specific grant from any funding agency in the public, commercial, or non-for-profit sectors. All of the authors made important intellectual contributions to the manuscript and all authors approved the final version before submission. The authors declare no conflicts of interest.

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