

# Leg Lift Valsalva Maneuver for Treatment of Supraventricular Tachycardias

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## Clinical question

Can conversion to sinus rhythm for a supraventricular tachycardia be enhanced by a postural modification to the Valsalva maneuver?

## Article chosen

Appelboam A, Reuben A, Mann C, et al. Postural modification of the standard Valsalva manoeuvre for emergency treatment of supraventricular tachycardias (REVERT): a randomised controlled trial. *Lancet* 2015; 386(10005):1747-53.<sup>1</sup>

## Objective

To determine effectiveness of a postural modification of the Valsalva involving leg elevation and supine positioning.

## POPULATION STUDIED

Investigators enrolled patients older than 18 years with SVT confirmed by 12-lead electrocardiogram (ECG) as a regular narrow complex tachycardia (QRS < 120 ms). Exclusion criteria included unstable patients with systolic blood pressure less than 90 mm Hg or with indication for immediate cardioversion. Patients in atrial fibrillation and atrial flutter were also excluded. Additional exclusion included any contraindication to Valsalva (aortic stenosis, recent myocardial infarction, glaucoma, or retinopathy), inability to perform the maneuver, to lie flat, or to have legs lifted, third trimester pregnancy, or previous inclusion in the study.

**Keywords:** supraventricular tachycardia, modified Valsalva, cardioversion

## BACKGROUND

Supraventricular tachycardia (SVT) is a group of tachycardic arrhythmias with an incidence of approximately 35 in 100,000 people per year.<sup>2</sup> A number of methods exist for cardioversion in patients with acute SVT, though all with varying and limited rates of success.<sup>3,4</sup> The Valsalva maneuver is a safe and recommended first line treatment for SVT, but with cardioversion rates to sinus rhythm of less than 20%.<sup>5-8</sup> Patients who have remained in SVT after Valsalva are most often treated with adenosine, which is commonly associated with adverse and frightening effects for patients and requires IV access.<sup>9</sup> Modifications to the standard Valsalva that increase relaxation phase venous return and vagal stimulation may improve cardioversion effectiveness but have not yet been tested in controlled trials.<sup>10-12</sup>

## STUDY DESIGN

The study was a randomized, multicentre parallel group trial conducted in 10 EDs in southwest England between January 1, 2013 and April 30, 2015. Patients were randomly assigned to either a standard or modified Valsalva. For both groups, the Valsalva strain was standardized to 40 mm Hg for 15 seconds by single forced expiration as monitored by an aneroid manometer. The interventions were disguised from patients by using descriptive terms for each Valsalva maneuver. In the standard “stay sitting Valsalva” patients were positioned semi-recumbent at 45° and instructed to perform the strain and then remain in the same position for 60 seconds before assessment of cardiac rhythm by 3-lead ECG. The modified Valsalva maneuver was described as “lying down with leg lift Valsalva.” Participants performed the same standard Valsalva strain but immediately after were laid flat with their legs raised at an angle of 45° for 15 seconds. They were then returned to the semi-recumbent position

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for 45 seconds before their cardiac rhythm was reassessed using a 3-lead ECG. In either arm, if sinus rhythm was not restored, participants were able to do one additional attempt using their allocated Valsalva maneuver. A 12-lead ECG was recorded 1 minute after the final Valsalva maneuver.

**OUTCOMES MEASURED**

The primary outcome was the presence of sinus rhythm 1 minute after the Valsalva maneuver, as recorded by the treating physicians and confirmed by ECG. In cases where the ECG was missing, an endpoint committee confirmed outcomes. Secondary outcomes were the use of adenosine, the use of any emergency treatment for SVT, the need for and reason for admission to hospital, the length of time spent in the emergency department (ED), and adverse events.

**RESULTS**

Two hundred and fourteen participants were included in each arm of the study for primary analysis. Of these, 205 attempted at least one standard Valsalva and 201 tried at least one modified Valsalva. One hundred seventy nine patients in the standard Valsalva group went on to try a second attempt after failing to revert to sinus rhythm, whereas 131 did so in the modified Valsalva group.

The results of the study are summarized in Table 1. Ninety-three (43%) of the 214 participants in the modified Valsalva maneuver group achieved the primary outcome of sinus rhythm at 60 seconds, compared to 37 (17%) of the 214 participants in the standard Valsalva arm. These results equate to a 26.2% absolute difference and a NNT of 3.8 (95% CI 2.9-5.6). In addition, nine patients in the standard Valsalva group and 18 in the modified Valsalva group cardioverted with the second attempt. The use of adenosine was

significantly lowered with the modified Valsalva (50% in the modified group versus 69% with the standard Valsalva). Neither the time spent in the ED nor the need for admission differed significantly between the two groups.

No serious adverse events were reported. Non-serious adverse events, including increased heart rate, hypotension or light-headedness, nausea, electrocardiograph captured events, and musculoskeletal pain, occurred in a small minority of participants and did not demonstrate a statistically significant difference between groups.

**COMMENTARY**

The rates for conversion of acute SVT to sinus rhythm using non-pharmacologic therapies in clinical settings have historically been less than 20%.<sup>6,13</sup> A study published in 2010 by Walk and Cutting showed the highest rate of acute cardioversion in a clinical setting (31%) using a modified Trendelenberg version of Valsalva, where patients place their heads between their knees.<sup>12</sup> The 43% of participants who cardioverted using the postural modification of Valsalva described in this controlled trial was substantially higher than with any other reported technique for emergency treatment of SVT. The authors noted that the proportion of participants who converted using the control Valsalva was larger than that in most observational studies, although was within the range of routine practice.

Modification of the standard Valsalva using supine positioning with legs raised has long been postulated to augment conversion of SVT.<sup>4</sup> The principle of the posture is that it increases venous return to the heart and thus stimulates vagal tone during the relaxation phase of Valsalva that follows the cessation of strain. This increased cardiac parasympathetic tone slows atrioventricular node conduction sufficiently to interrupt the circuitous electrical activity of SVT and allow the underlying sinus node to reemerge.<sup>11</sup>

**Table 1. Summary of primary and secondary outcomes comparing the standard Valsalva to the modified Valsalva maneuver.**

	Standard Valsalva	Modified Valsalva	Effect size (95% CI)
Conversion to sinus rhythm 60 s after Valsalva	37 (17%)	93 (43%)	3.7 (2.3-5.8)
Adenosine use	148 (69%)	108 (50%)	0.45 (0.30-0.68)
Any adverse event	8 (4%)	13 (6%)	1.61 (0.63-4.08)
Time in ED (h; median; IQR)	2.83 (1.95-3.62)	2.82 (1.95-3.77)	0.90 (0.75-1.10)

Effect size = odds ratios with the exception of Time in ED (hazard ratio)

A major benefit of the modified Valsalva maneuver is its ability to be performed outside of the hospital and without specialist equipment. Rather than using a manometer to ensure a consistent 40 mm Hg strain, a 10 mL syringe blown to just move the plunger can be used to generate a similar pressure. The modified maneuver is cost-effective, safe, and can be easily taught to patients after their first episode of SVT to perform independently and in low-resource settings. The technique could further be incorporated into established EMS treat and release protocols for uncomplicated SVT that aim to decrease the burden on EDs.<sup>14</sup> The maneuver can thus prevent many individuals with SVT from requiring future hospital care or treatment with pharmacologics such as adenosine.

A major limitation of the REVERT trial is that practicing physicians and patients were unable to be blinded to treatment allocation due to the nature of the treatment. However, patients were kept unaware of which treatment was the control versus study intervention by using descriptive terms for the maneuvers and disguising trial paperwork. The authors further mitigated this limitation by implementing a stringent concealed randomization procedure and by using the objective primary outcome of conversion to sinus rhythm on ECG and confirmed by an independent cardiologist masked to the treatment.

## CONCLUSION

The findings of this study support the use of a 15 second, 40 mm Hg Valsalva maneuver in the semi-recumbent position immediately followed by supine repositioning and passive leg elevation as primary treatment for patients presenting to the ED for SVT. The rate of conversion to sinus rhythm using this postural modification of the Valsalva strain was greater than twice that seen with the use of a standard Valsalva. The maneuver is safe and can be taught to patients to do on their own at home when they notice symptoms of SVT, thus limiting hospital visits and the use of pharmacological therapies.

**Competing Interests:** None declared.

## REFERENCES

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