

# Systematic Review Snapshot

## TAKE-HOME MESSAGE

The Valsalva maneuver appears to be a modestly effective intervention, with a low risk of adverse events, but is supported by only a small number of low-quality trials.

## METHODS

### DATA SOURCES

The authors of the review performed electronic searches, without language restrictions, of the Cochrane library (CENTRAL), MEDLINE, EMBASE, the Conference Proceedings Citations Index (ISI Web of Science), and conference abstracts (ISI BIOSIS Previews) databases from inception to 2012. An additional manual search was performed based on citations. A search for adverse events was performed on MEDLINE, without language restrictions, using different search terms than the initial search.

### STUDY SELECTION

By 2-author consensus, randomized controlled trials of Valsalva maneuver in atrioventricular reentry tachycardia or atrioventricular nodal reentrant tachycardia were identified. In this review, the term *supraventricular tachycardia* encompassed atrioventricular reentry tachycardia and atrioventricular nodal reentrant tachycardia but excluded atrial fibrillation/flutter and other atrial tachycardias. Atrioventricular reentry tachycardia and atrioventricular nodal reentrant tachycardia were defined by the reviewers as reentrant tachycardias

## Valsalva Maneuver for Termination of Supraventricular Tachycardia

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### Results

Study	Valsalva Maneuver Technique	Comparison Group	Number of Supraventricular Tachycardia Episodes Analyzed	Success Rate	Limitations
Mehta et al <sup>1*</sup>	Supine and standing 15-30 s 35 mm Hg	Carotid sinus massage Face in water	35 patients 418 events*	54% NNT 2.5	No description of randomization Medications stopped 72 h before study No report of time to conversion.
Wen et al <sup>2†</sup>	Supine 20 s 35 mm Hg	Ice to face Carotid sinus massage	133 patients 399 events <sup>†</sup>	45.9% NNT 2.5	No description of randomization. Medications stopped 5 half-lives before trial. Designed to assess electrophysiologic predictors of response to vagal maneuvers, not efficacy of individual maneuvers. No report of time to conversion.
Lim et al <sup>3</sup>	Seated 30 s 40 mm Hg	Carotid sinus massage	148	17.9% NNT 16.5	Included repeated visits One patient had an non-ST elevation myocardial infarction on postconversion electrocardiogram but no clarification whether this was the trigger for supraventricular tachycardia or a consequence of intramaneuver hypotension.

\*Each patient underwent Valsalva maneuver, right carotid sinus massage, left carotid sinus massage, and face in water at separate times and had supraventricular tachycardia induced for each strategy. Only 32 of 35 patients underwent face in water for undisclosed reasons.

<sup>†</sup>Each patient underwent Valsalva maneuver, carotid sinus massage, and ice to face at separate times and had supraventricular tachycardia induced for each strategy.

whose reentry was either within or included the AV node. An adequate Valsalva maneuver was defined as being performed with the patient supine, generating at least 35 mm Hg of pressure (as measured by blowing into tubing connected to a sphygmomanometer) and lasting 15 to 30 seconds.

Studies were included only if Valsalva maneuver was compared with no intervention and no other cardiac disease was present. The primary outcome was rate of conversion to sinus rhythm. Predefined secondary outcomes were unsuccessful conversion requiring repeated maneuver, cardiovascular effects of Valsalva maneuver, and adverse events of Valsalva maneuver.

## DATA EXTRACTION AND SYNTHESIS

The included trials were all crossover designs, tested different vagal maneuvers in different orders, and varied in performance technique of each maneuver, resulting in significant heterogeneity. This prevented any meta-analysis or sensitivity analysis, and data were presented descriptively. Potential bias and study quality were assessed by evaluating allocation concealment, blinding, control adequacy, and follow-up rates.

A total of 316 subjects were identified in 3 studies that met the inclusion criteria and adhered to the definition of supraventricular tachycardia. Though 316 subjects were included, a total of 965 events contributed to the analysis. The results are summarized in the [Table](#). The review and original articles did not report the numbers needed to treat; however, these were calculated according to the data reported.

In 2 studies (Mehta et al<sup>1</sup> and Wen et al<sup>2</sup>), subjects had supraventricular

Quality	Definition
High	We are very confident that the true effect lies close to that of the estimate of the effect
Moderate	We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low	Our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect
Very Low	We have very little confidence in the effect estimate: the true effect is likely to be substantially different.

**Figure.** Current GRADE working group levels of evidence definitions.

tachycardia induced in a laboratory setting. Valsalva maneuver was effective in 45.9% to 53.4% of subjects ([Table](#)). Mehta et al<sup>1</sup> and Wen et al<sup>2</sup> repeatedly induced supraventricular tachycardia in all included patients, such that all included patients underwent every intervention strategy.

Lim et al<sup>3</sup> evaluated Valsalva maneuver in the setting of patients presenting to the emergency department (ED) with regular, narrow complex tachycardias (excluding those presenting in sinus tachycardia or atrial fibrillation/flutter). A total conversion rate of 17.9% with Valsalva maneuver at any point in the intervention strategy was reported. Lim et al<sup>3</sup> randomized patients to receive either Valsalva maneuver or carotid sinus massage as the initial intervention, and all patients received the converse strategy if the initial intervention failed. When Valsalva maneuver was the initial intervention, Lim et al<sup>3</sup> reported a conversion rate of 19.4% versus 10.5% when carotid sinus massage was the initial strategy ([Table](#)).

Adverse events were not explicitly defined or recorded in any of the studies. Pulse rate and blood pressure during Valsalva maneuver were not recorded by Lim et al,<sup>3</sup> and although Wen et al<sup>2</sup> and Mehta et al<sup>1</sup> collected continuous ECG monitoring and intermittent blood pressure measurements, the data were not reported.

A separate literature search for adverse events during Valsalva maneuver for conversion of supraventricular

tachycardia yielded 86 studies but identified only 1 adverse event. This was not included in the review because the event was not thought to be related to the Valsalva maneuver.

The authors assigned all studies “unclear to high risk” of selection, detection, and performance bias because randomization and allocation concealment were not described or were of low quality. None of the studies were blinded. Attrition bias was described as “low risk” because there was no loss to follow-up. According to this, all studies were assigned a low quality of evidence, based on the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group grades of evidence<sup>4</sup> ([Figure](#)).

## Commentary

The incidence of supraventricular tachycardia is approximately 35 in 100,000 people per year.<sup>5</sup> For stable patients, vagal maneuvers, including Valsalva maneuver, are recommended first-line interventions by the American Heart Association.<sup>6</sup> Unfortunately, there is a paucity of evidence for their efficacy. Valsalva maneuver is of specific interest because of the lack of standardized performance technique.<sup>7,8</sup> Though there were no adverse events reported in this systematic review, this should be interpreted cautiously.<sup>9</sup>

Potential explanations for the discrepancy in conversion rate between

Mehta et al<sup>1</sup> and Wen et al<sup>2</sup> compared with Lim et al<sup>3</sup> include a shorter duration of supraventricular tachycardia before vagal maneuver in the laboratory setting versus the ED, the possibility that patients presenting to the ED may have failed vagal maneuvers in the out-of-hospital setting, and a successful conversion being defined as sinus rhythm of at least 2 hours in the ED. This limits the generalizability of the conversion rates reported by Mehta et al<sup>1</sup> and Wen et al.<sup>2</sup>

Fortunately, research in this area is ongoing. A recent prospective study by Walker et al<sup>8</sup> compared the efficacy of Valsalva maneuver before and after implementation of a standardized technique adhering to the 3 criteria previously described and noted an increase in successful conversion from 5.6% to 31.6% (n=19). The randomized evaluation of modified Valsalva maneuver effectiveness in re-entrant tachycardias (REVERT) trial is actively enrolling in the United Kingdom, comparing classic Valsalva maneuver to a modified technique in patients

presenting to EDs with supraventricular tachycardia.<sup>10</sup>

Editor's Note: This is a clinical synopsis, a regular feature of the *Annals'* Systematic Review Snapshot (SRS) series. The source for this systematic review snapshot is: Smith GD, Dyson K, Taylor D, et al. Effectiveness of the Valsalva manoeuvre for reversion of supraventricular tachycardia. *Cochrane Database Syst Rev.* 2013;(3):CD009502. doi: 10.1002/14651858.CD009502.pub2.

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Michael Brown, MD, MSc, Alan Jones, MD, and David Neuman, MD, serve as editors of the SRS series.

### Future Meetings of the American College of the Emergency Physicians

The following are the planned sites and dates for the future annual meetings of the American College of Emergency Physicians:

2014	Chicago, IL	October 27-30
2015	Boston, MA	October 26-29
2016	Las Vegas, NV	October 15-18
2017	Washington, DC	October 30-November 2
2018	San Diego, CA	October 1-4
2019	Denver, CO	October 28-31
2020	Dallas, TX	October 26-29
2021	Boston, MA	October 25-28