Summary of "An Adjusted and Time-Saving Method to Measure Collateral Ventilation with Chartis®: The VT20"

by Koster et. al. published June 11, 2021 as https://openres.ersjournals.com/content/early/2021/05/21/23120541.00191-2021.

Background and Purpose

The momentary appearance of sudden spikes in flow rate can confound some Chartis assessments. Integration of the flow rate over a fixed period of time during this situation can attenuate this artifact.

The Chartis software has been updated to include a feature that helps to interpret the Chartis measurement more easily and it effectively reduces procedure time. The software now continually measures and displays the total air flow over the last 20 seconds. This measurement is termed the "Volume Trend for the previous 20 seconds," or VT20.

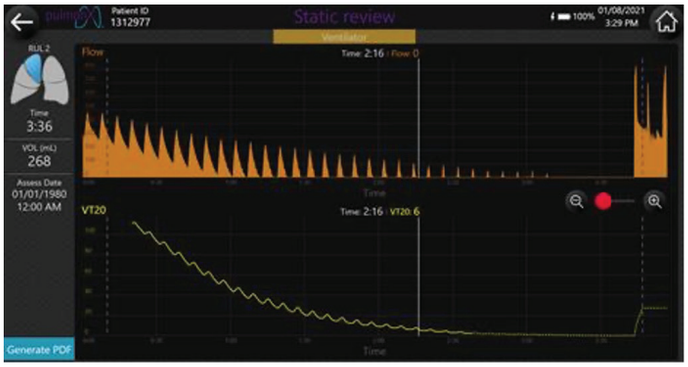
The validation of the VT20 is reported by David Koster et al. from the University Medical Center Groningen.[1] The study showed that the VT20 threshold is predictive of the absence of collateral ventilation in situations where the flow rate during the Chartis measurement is low. The study also evaluated whether the VT20 feature could impact procedure time. The study also evaluated whether this threshold could shorten Chartis procedure times.

Methods

The study was a single-center retrospective evaluation of 249 Chartis assessments for bronchoscopic lung volume reduction procedures. The Volume Trend over 20 Seconds (VT20) was calculated and compared for patients with collateral ventilation (CV+) and patients without collateral ventilation (CV-).

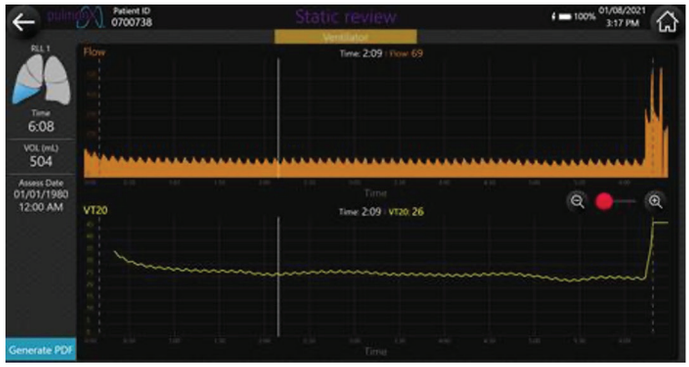
All Chartis assessments included in the analysis were performed under general anesthesia with patients intubated with a flexible 9 mm endotracheal tube. Positive pressure ventilation was applied in all patients. Ventilation frequency was low (8–10 times per minute), with an inspiratory/expiratory ratio of 1:3 to 1:4 and a positive end-expiratory pressure of 3 cm H_2O.

Figure 1: CV- Assessment



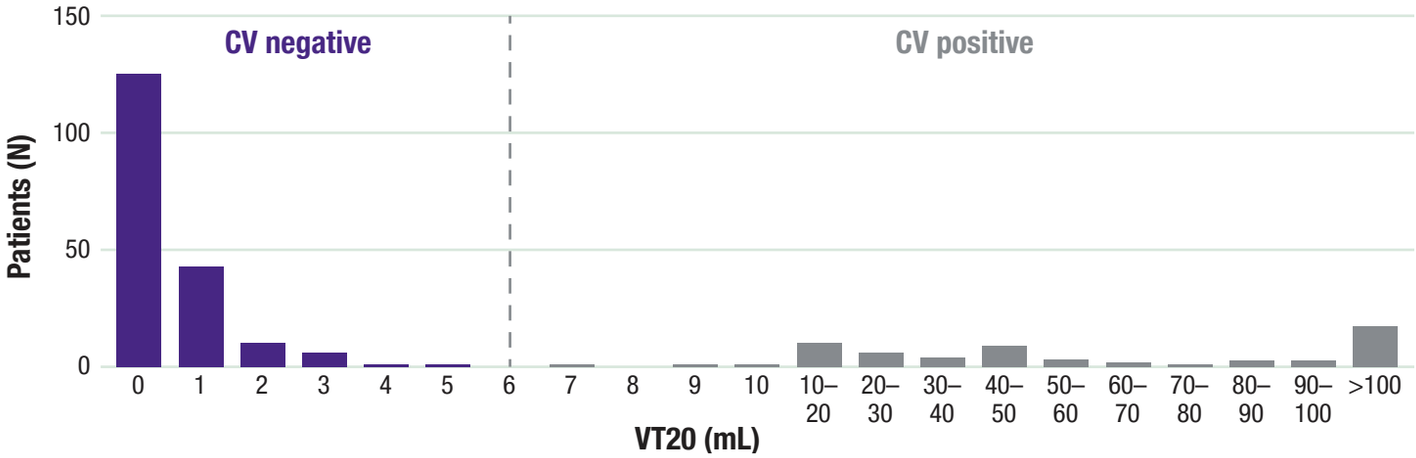
Chartis console screen image showing the VT20 plotted for a CV negative patient phenotype. This assessment reached VT20=6 mL at the 2 minutes, 16 second mark.

Figure 2: CV+ Assessment



Chartis console screen image showing the VT20 plotted for a CV positive patient phenotype. This assessment never reaches a VT20 value below VT20=26 mL.

Figure 3: Distribution of minimum VT20 values in CV- and CV+ measurements



Results

One hundred percent of the CV- patients reached a threshold of VT20 <6 mL. All CV+ patients reached a VT20 >7 mL. The median time spared between VT20=6 mL and end of assessment was 60 seconds (5–354 seconds).

Conclusion

The threshold of VT20 <6 mL is a reliable method to exclude the presence of collateral ventilation when air flow rates are low based on this single-center experience. The VT20 <6 mL threshold can therefore reduce bronchoscopic lung volume procedure times. The threshold may lead to less manipulation of the airways, less anesthesia time, and could facilitate the EBV treatment procedure.

Ventilator Considerations

The study is limited because the VT20 assessments analyzed included only Chartis measurements performed under general anesthesia with standard ventilator settings noted above. As such, these results cannot be extrapolated to measurements in patients under conscious sedation and spontaneous breathing. Although this may yield comparable results, there is no positive pressure ventilation and the methods of measurement differ. Therefore, the cutoff value of VT20 ≤6 mL should only be used in Chartis measurements in patients under general anesthesia.

1. Koster, TD, Klooster, K, McNamara, H, Shargill, NS, Radhakrishnan, S, Olivera, R, & Slebos, DJ. An adjusted and time-saving method to measure collateral ventilation with Chartis. ERJ Open Res, 2021. doi: https://doi.org/10.1183/23120541.00191-2021.

Brief Statement: The Zephyr® Endobronchial Valve is an implantable bronchial valve intended to control airflow in order to improve lung functions in patients with hyperinflation associated with severe emphysema with little to no collateral ventilation, and/or to reduce air leaks. The Zephyr Valve is contraindicated for: Patients for whom bronchoscopic procedures are contraindicated; Evidence of active pulmonary infection; Patients with known allergies to Nitinol (nickel-titanium) or its constituent metals (nickel or titanium); Patients with known allergies to silicone; Patients who have not quit smoking. Use is restricted to a trained physician. Prior to use, please reference the Zephyr Endobronchial System Instructions for more information on indications, contraindications, warnings, all precautions, and adverse events.

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Pulmonx Corporation
ABN 91 160 455 925, Suite 5, Level 6
65 York Street Sydney, NSW 2000 Australia
P: 1300 785 666 | E: Info@pulmonx.com.au
Visit our website: pulmonx.com.au

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