

# Comparing Point of Care Midline Versus Central Line Venous Blood Gas Oxygen Saturations: A Novel Pilot Study

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## BACKGROUND

- Midlines (ML) are inserted above the antecubital space via the basilic, cephalic, or brachial veins.
- They provide safe and comfortable mid-term vascular access for critically-ill patients.
- Central venous oxygen saturations (ScvO2) obtained from central venous catheters (CVCs) often used to approximate cardiac oxygen delivery.
- Small studies with correlation of peripheral and central venous O2 saturation.
- Focus on reducing CVCs to prevent associated complications.

## OBJECTIVE

To compare the equivalence of midline oxygen (MO2) saturation and ScvO2 to assess if midlines can provide additional physiologic data, while decreasing the need for invasive central venous catheters.

## METHODS

**STUDY TYPE:** Prospective observational

**Table 1.** Inclusion and exclusion criteria of the study.

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>• Adult patients with CVC in the internal jugular or subclavian veins</li> <li>• TLC, Introducer Sheath, HD catheters, or PICC</li> <li>• Plan for ML placement or with one in situ.</li> </ul>	<ul style="list-style-type: none"> <li>• Femoral CVC</li> <li>• VV ECMO</li> </ul>

### Blood Sampling:

- Aseptic Technique
- Trained research assistant sampled blood from CVC and ML
- 1mL drawn from each line for testing
- Bedside RN credentialed in iSTAT assisted with analysis

### Data Collection:

- POC Venous Blood Gas via CG4+ iSTAT cartridge
- Demographics, ICU admission diagnosis
- Vasopressor and VS change
- Shock state, SOFA, APACHE
- Renal Replacement Therapy

**Note:** Venous oxygen saturations were compared between both catheters using POC blood gas analysis on iSTAT (Abbott ©) machines and within a 15-minute period.

**Table 1.** Baseline Characteristics of Patients

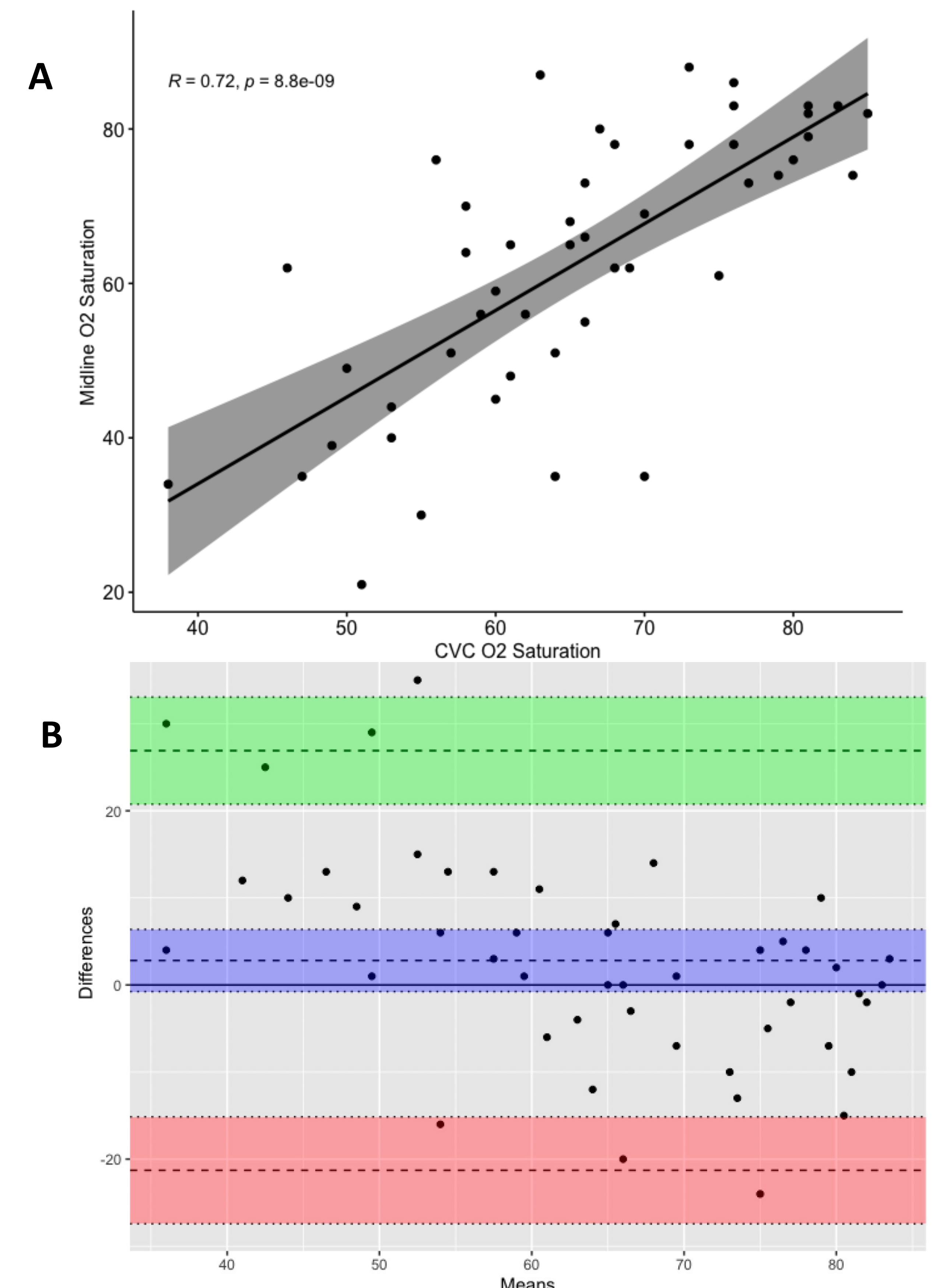
	Number of Patients (Percent)	Mean	95% Confidence Interval
Age (years)		60.65	56.64 - 64.66
BMI		30.38	28.31 - 32.45
SOFA		9.29	7.94 - 10.64
APACHE II		19.78	17.43 - 22.14
Sex			
Female	18 (37.50%)		
Male	30 (62.50%)		
Admission Diagnosis			
Respiratory Failure	18 (37.50%)		
Septic Shock	7 (14.58%)		
Post-Surgical	7 (14.58%)		
Cardiac Arrest	7 (14.58%)		
Sepsis	5 (10.42%)		
Cardiogenic Shock	5 (10.42%)		
Arrhythmia	5 (10.42%)		
Liver Failure	5 (10.42%)		
Heart Failure	4 (8.33%)		
Renal Failure	4 (8.33%)		
Gastrointestinal Bleed	4 (8.33%)		
Post Aortic Valve	4 (8.33%)		
Myocardial Infarction	3 (6.25%)		
Coronary Artery Bypass Graft	3 (6.25%)		
Pulmonary Embolism	3 (6.25%)		
Pulmonary Edema	2 (4.17%)		
Intraabdominal Surgery	2 (4.17%)		
Valvular Surgery	2 (4.17%)		
Encephalopathy	2 (4.17%)		
Stroke	1 (2.08%)		
Diabetes Mellitus	1 (2.08%)		
Emergency	1 (2.08%)		
COVID-19	1 (2.08%)		

**Table 2.** Mean values of oxygen saturations between Central Venous and Midline Catheters.

	CVC	ML	p-value	95% CI
Mean Oxygen Saturation	65.5% ± 11.2%	62.7% ± 17.6%	0.12	-0.76 to 6.38

CVC = central venous catheter, ML = midline

## RESULTS



**Figure 1. A:** ScvO2 vs MO2. **B:** Bland-Altman plots of the difference between ScvO2 and MO2. The bias is 2.8% +/- 12.3% (dashed +/- dotted). The 95% limits of agreement are -21.3% to 26.9%. ScvO2 = central venous oxygen saturation; MO2 = midline oxygen saturation.

Although the mean oxygen saturations between CVCs and MLs were not significantly different, the limits of agreement shown by the Bland-Altman analysis are very large at -21.3% to 26.9%. This means that approximately 65.5% of ScvO2 and SmcO2 values diverged by  $\geq 5\%$ . The large bias standard deviation and LOA could have considerable clinical implications due to the narrow therapeutic index of resuscitation.

## CONCLUSIONS

Investigating MO2 as a potential correlate of ScvO2 is intriguing; however, its clinical utility is still unclear. The approximate aggregate difference in mean MO2 vs ScvO2 was statistically insignificant; however, there was a significant divergence in  $>50\%$  of subjects. Further, preliminary analysis reports that concurrent vasopressor use, RRT, and shock states may also contribute to differences seen in mean MO2 vs ScvO2.