

# Alterations in local peri-infarct blood gases in stroke patients undergoing thrombectomy

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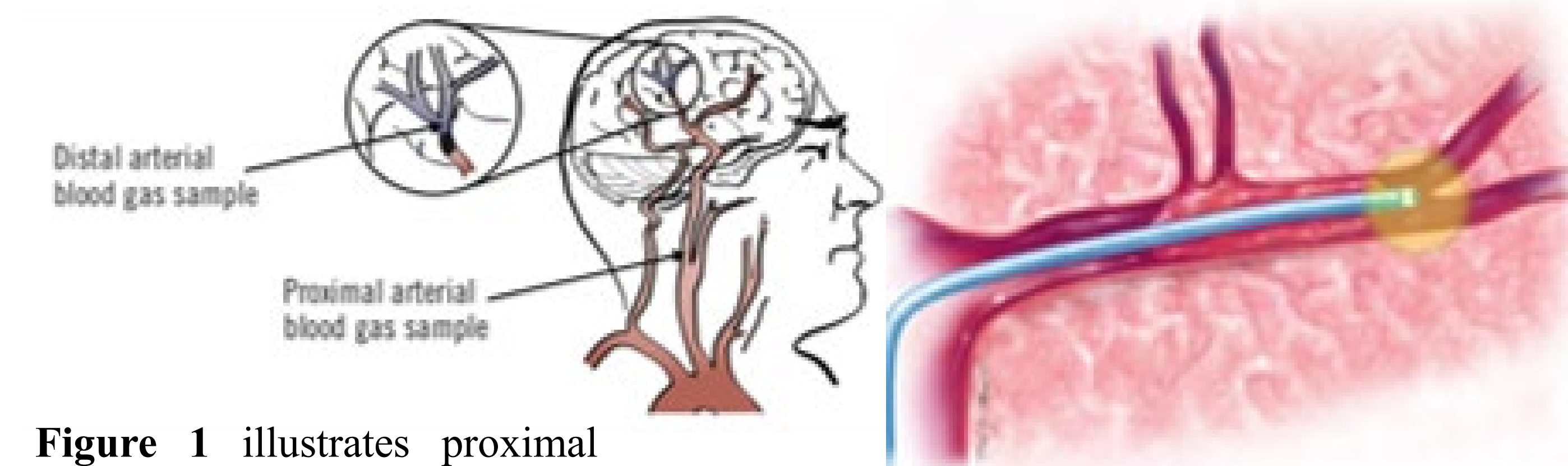
## Introduction

Ischemic stroke is a prevalent, devastating disease with high morbidity and mortality. Despite extensive research using animal models, there remain significant gaps in understanding pathological processes in human stroke. We previously developed a tissue bank to analyze blood immediately proximal in systemic circulation and distal (intracranial) to a thrombus in patients undergoing mechanical thrombectomy (www.clinicaltrials.gov NCT03153683). Our goal for this project was to use samples from this tissue bank to evaluate blood gas changes and acid/base balance during stroke, and to determine how these values correlated with clinical factors.

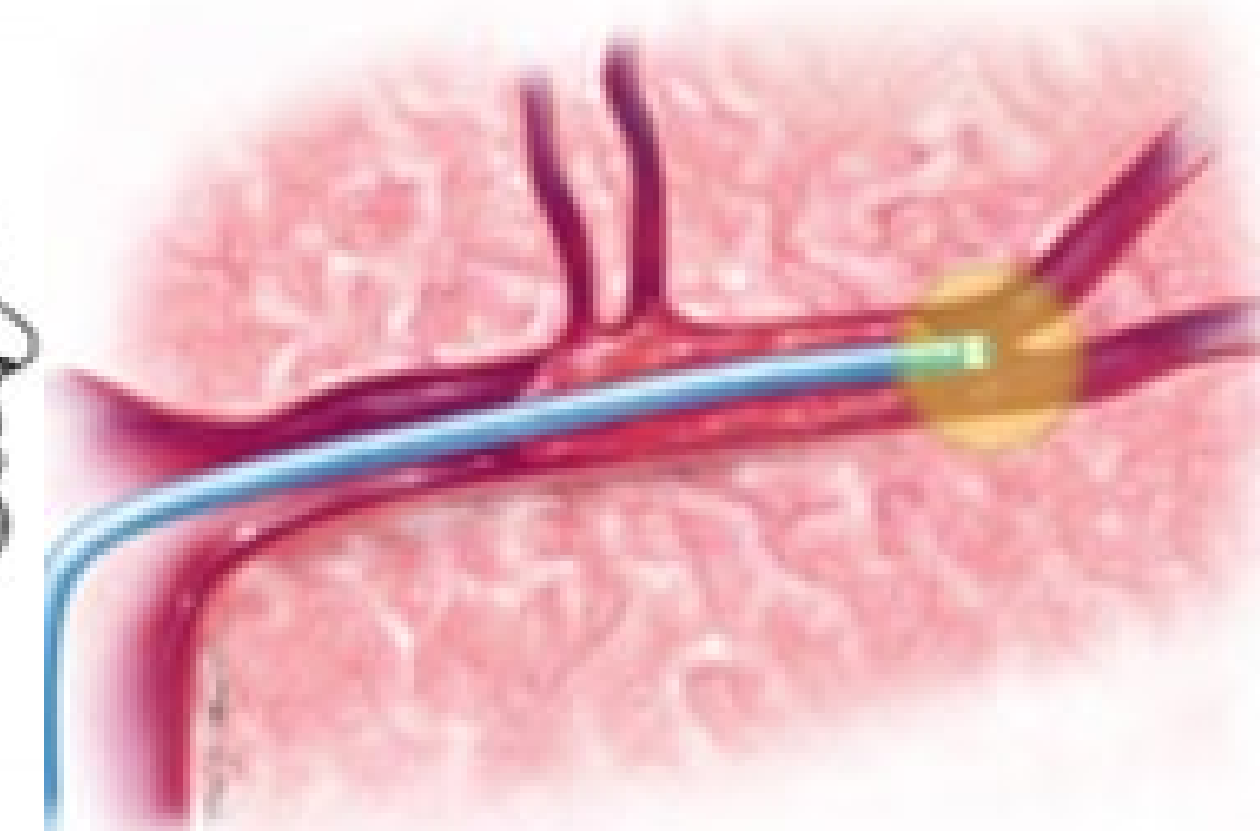
- Ischemic stroke affects approximately 800,000 people in the United States every year.<sup>1</sup>
- Ischemic stroke is the result of the deprivation of blood to brain tissue.
- Blood flow may often be restored with emergent mechanical thrombectomy.
- Animal model research has described blood gas changes following ischemic stroke.<sup>2,3</sup>
- Acid/base balance changes may be a major driver behind the pathology of ischemic stroke.
- This study aims to characterize the acid-base changes in the stroke microenvironment in humans and to describe factors that may contribute to these changes.

## Methods

- The Blood and Clot Thrombectomy Registry and Collaboration (BACTRAC) was designed for collecting and banking tissue samples from patients undergoing mechanical thrombectomy.<sup>4</sup>
- This study included the first 62 patients enrolled in BACTRAC.
- Blood samples distal and proximal to thrombi in large vessel occlusions during mechanical thrombectomy were collected and sent for analysis.



**Figure 1** illustrates proximal and distal blood samples collected during mechanical thrombectomy.



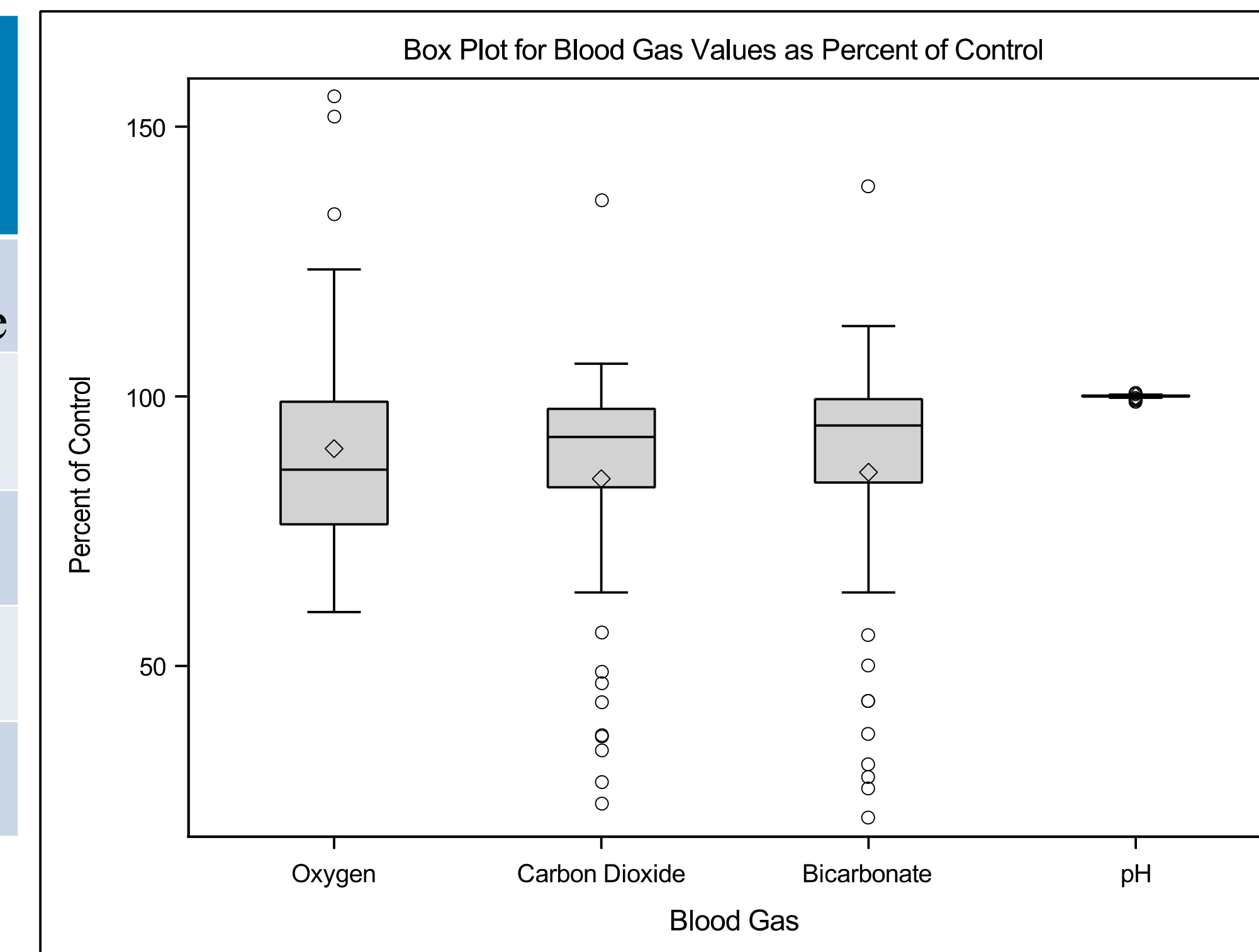
**Figure 2** illustrates microcatheter position when collecting distal blood samples during mechanical thrombectomy.

## Results

**Table 1.** Comparison of Systemic and Intracranial Blood Gases

	Intracranial	Systemic	p-value
pO <sub>2</sub>	211.39 (66.08)	246.91 (87.04)	<.001
pCO <sub>2</sub>	32.19 (8.98)	38.12 (4.77)	<.001
Bicarbonate	18.90 (5.63)	22.20 (3.20)	<.001
pH	7.37 (0.06)	7.37 (0.06)	0.646

**Table 1** presents systemic and intracranial blood gas values.



**Figure 3** reveals pO<sub>2</sub>, pCO<sub>2</sub>, and HCO<sub>3</sub><sup>-</sup> values of distal blood compared to systemic blood gas values (control).

**Table 2.** Comparison by Gender of Systemic and Intracranial Blood Gases

	Female (n = 33)	Male (n = 29)	p-value
<b>Systemic</b>			
pO <sub>2</sub>	265.85 (92.65)	225.32 (76.09)	0.067
pCO <sub>2</sub>	36.60 (4.24)	39.84 (4.82)	0.007
Bicarbonate	22.35 (3.81)	22.02 (2.38)	0.689
pH	7.39 (0.06)	7.35 (0.04)	0.005
<b>Intracranial</b>			
pO <sub>2</sub>	221.52 (57.27)	200.52 (73.94)	0.238
pCO <sub>2</sub>	30.70 (9.20)	33.80 (8.61)	0.200
Bicarbonate	18.71 (6.16)	19.11 (5.12)	0.789
pH	7.39 (0.07)	7.35 (0.05)	0.046

**Table 2** presents blood gas values by gender for systemic and intracranial blood.

**Table 3.** Comparison by CTA Score of Systemic and Intracranial Blood Gases

	0 CTA (n = 17)	1+ CTA (n = 41)	p-value
<b>Systemic</b>			
pO <sub>2</sub>	211.35 (64.08)	255.22 (93.98)	0.084
pCO <sub>2</sub>	39.43 (5.19)	37.66 (4.48)	0.196
Bicarbonate	22.38 (2.62)	22.12 (3.47)	0.787
pH	7.36 (0.04)	7.38 (0.06)	0.407
<b>Intracranial</b>			
pO <sub>2</sub>	182.25 (48.83)	215.69 (66.44)	0.077
pCO <sub>2</sub>	33.2 (9.83)	31.29 (8.87)	0.492
Bicarbonate	18.91 (5.97)	18.39 (5.61)	0.766
pH	7.36 (0.04)	7.37 (0.07)	0.426

**Table 3** presents blood gas values by collateral circulation levels.

## Discussion and Conclusion

- This study provides rare insight into the stroke microenvironment in humans.
- Changes in blood gas values occur across the thrombus in large vessel occlusions.
- Blood gas values differ between men and women in acute ischemic stroke, suggesting acid-base changes may be affected by sex differences in stroke.<sup>5</sup>
- Vascular collateralization does not appear to significantly affect blood gas changes across the thrombus as one may initially expect.

## References

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