



Near-infrared Spectroscopy Assessment Of A Novel Arterial Cannula For Peripheral Cardiopulmonary Bypass In Minimally Invasive Cardiac Surgery

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BACKGROUND

Peripheral cannulation for cardiopulmonary bypass or extracorporeal membrane oxygenation is generally safe but has been associated with limb ischemia, which can have devastating consequences. Reduced perfusion to the cannulated limb occurs in up to 30% of minimally invasive cases, with 5% being clinically significant, and 1% requiring surgical intervention.

Ischemia mitigation techniques including graft cannulation and distal limb perfusion cannulas aim to decrease this risk, but are technical and time costly, with other associated risks.

Bidirectional flow cannulas may negate the need for adjunct ischemia prevention methods by allowing flow to cannulated limb.

OBJECTIVE

This proof-of-concept, first in humans, trial analyzed regional oximetry assessed with near-infrared spectroscopy (NIRS) in patients undergoing minimally invasive valve surgery using a novel 18F femoral arterial cannula designed to provide retrograde flow down the ipsilateral lower limb.

METHODS

- Single center, prospective cohort
- 10 patients undergoing minimally invasive mitral valve repair +/- tricuspid valve repair
- December 2025-February 2026

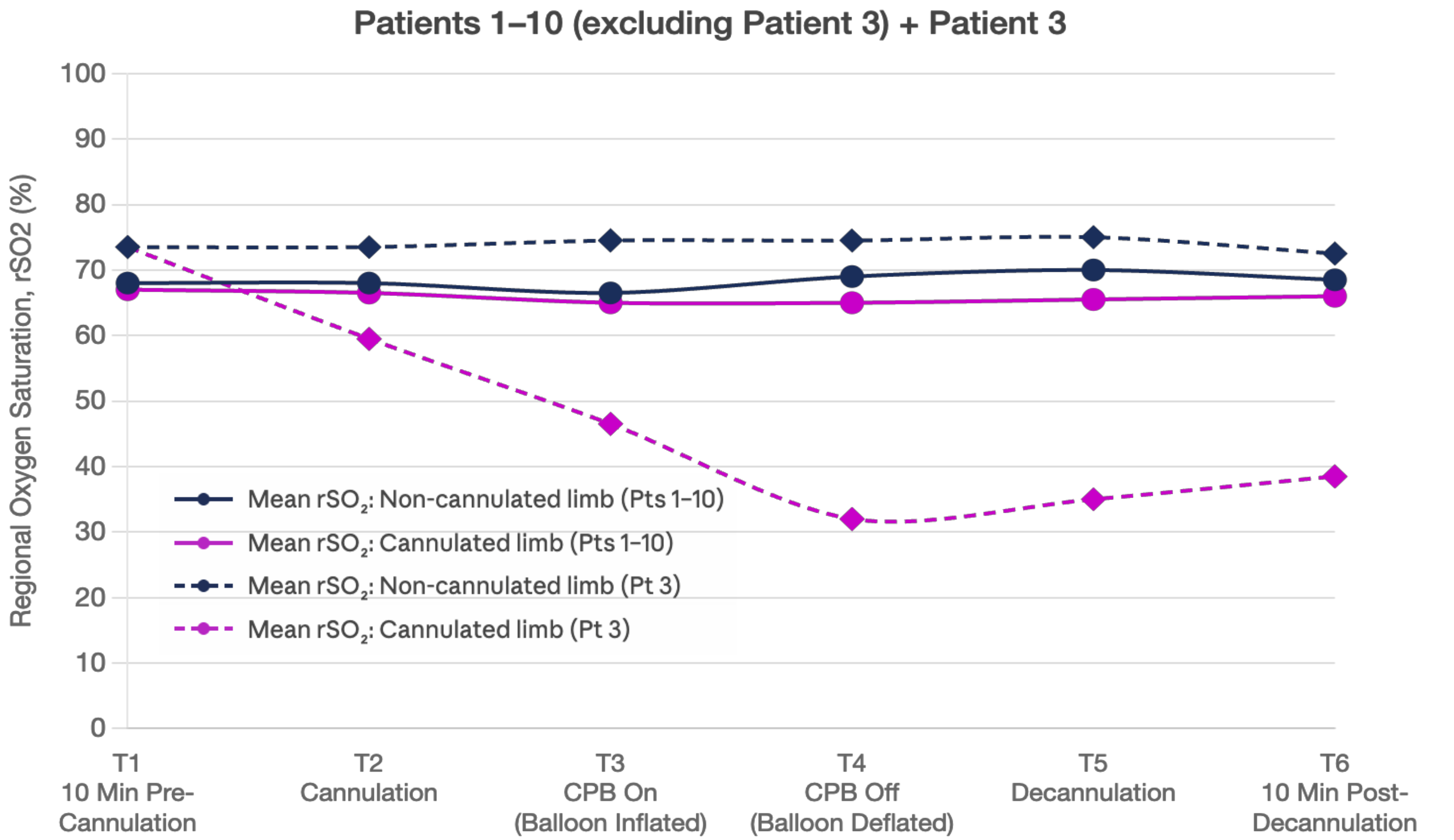
RESULTS

Patient Characteristics	N = 10
Male	8 (80%)
Age (years)	63.3 ± 8.7
Height (cm)	172.6 ± 11.5
Weight (kg)	81.8 ± 15.0
Body surface area (m²)	1.95 ± 0.14
Minimum diameter femoral artery (mm)	8.5 ± 1.3
Right femoral artery calcification	4 (40%)
Medical History	
Hypertension	7 (70%)
Left ventricular dysfunction	1 (10%)
Atrial fibrillation or arrhythmias	2 (20%)
Peripheral vascular disease	0 (0%)
Prior stroke or transient ischemic attack	1 (10%)
Diabetes mellitus	1 (10%)
Chronic kidney disease	1 (10%)
Chronic obstructive pulmonary disease	1 (10%)
Current Smoking	2 (20%)

ID	Mean rSO2 Non-Cannulated Limb (%)	Mean rSO2 Cannulated Limb (%)	Difference (%)
01	62.3 ± 2.4	54.5 ± 6.5	7.8
02	57.7 ± 2.4	63.9 ± 1.5	-6.2
03	75.2 ± 0.8	36.6 ± 4.6	38.6
04	64.3 ± 2.5	57.5 ± 5.0	6.8
05	67.2 ± 1.5	71.8 ± 2.2	-4.6
06	61.9 ± 1.9	60.1 ± 1.9	1.8
07	64.2 ± 2.0	60.0 ± 3.0	4.2
08	64.7 ± 3.2	58.5 ± 3.5	6.2
09	71.7 ± 2.8	69.8 ± 2.3	1.9
10	65.3 ± 2.2	54.1 ± 11.1	11.2

One patient had rupture of cannula balloon due to atherosclerotic disease, with reduction in limb perfusion according to NIRS

Periprocedural Data	
CPB Time (mins)	127.9 ± 31.3
Cross Clamp Time (mins)	95.8 ± 27.4
Mean Line Pressure	267 mmHg
Mean Flow Rate	4.8 L/min
Median Lactate	1.2 mmol/L



CONCLUSIONS

- Novel bidirectional cannula provided safe and adequate flow during minimally invasive surgery
- NIRS perfusion data suggests maintenance of limb perfusion with use of this novel device
- No associated complications

FUTURE STEPS

- Comparison cohort with standard unidirectional flow cannula