

# RANDOMIZED, CONTROLLED COMPARISON OF VALVELESS TROCAR (AIRSEAL®) VERSUS STANDARD INSUFFLATOR WITH ULTRALOW PNEUMOPERITONEUM DURING ROBOTIC PROSTATECTOMY

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**INTRODUCTION**

Robotic surgery performed with an insufflation system using valveless trocars has been associated with more stable intrabdominal pressure (IAP) since the lack of a valve allows gas to escape with increased IAP, which may lessen the physiological effects of pneumoperitoneum. Maintenance of stable IAP despite suctioning may also allow surgery to be performed at lower pressures. We compared physiologic and operative outcomes using a valveless system (AirSeal®) versus a conventional insufflation system (CIS) during robotic prostatectomy (RP) with lymphadenectomy and impact on the ability to use an ultralow pneumoperitoneum pressure of 6mm Hg.

**METHODS**

Between March 2016 and February 2017, a prospective, randomized study of 100 RP+PLND patients was performed with 50 patients in each arm using AirSeal® versus conventional insufflation. Arterial blood gases, respiratory and hemodynamic parameters were analyzed at three different time points as well as pain scores at four time points and postoperative analgesic requirements. The subjective quality of smoke evacuation and number of scope cleanings were also measured intraoperatively as well as any need to increase pneumoperitoneum for visibility or bleeding.

Table 1: Preoperative characteristics of patients randomized to conventional versus valveless insufflation for robotic prostatectomy

	Overall	AirSeal®	CIS	p-value
Mean Age years (range)	61.5 (47-75)	61 (47-72)	62 (48-75)	0.44
Mean BMI kg/m <sup>2</sup> (range)	28.7 ( 21.5-40.7)	29.1 (22-39)	28.3 (21.5-40.7)	0.30
Mean Preoperative Hgb g/dl (range)	14.8 (12.4-17.3)	15.1 (13-17.3)	14.5 (12.4-17.1)	0.083
Mean Preoperative Creatinine mg/dl (range)	0.92 (0.59-1.96)	0.89 (0.59-1.42)	0.96 (0.59-1.96)	0.06

**RESULTS**

Mean age, BMI, and OR time were 61.5yrs, 28.7kg/m2, and 146min with no statistically significant difference between groups. All 100 procedures were completed at 6mm Hg without needing to increase pneumoperitoneum at any time. Mean blood loss was 20mL lower in the CIS group (146cc versus 126cc, p=0.03), but there were no transfusions in either group. There were no statistically-significant differences in PaCO<sub>2</sub>, PaO<sub>2</sub>, HCO<sub>3</sub>, pH, CO<sub>2</sub> elimination or Et-CO<sub>2</sub> between groups at each time point. The AirSeal® group had a lower maximum peritoneal pressure (7.9 mmHg vs 9.9 mmHg, p<0.001), but there were no differences in pain scores at all 4 time points or in analgesic requirements postoperatively despite a trend towards increased need in the CIS group (p=0.08). The rate of same-day discharge was 66% in each group. Surgeon-assessed smoke evacuation was poorer in the CIS group, and in non-obese patients (BMI<30 kg/m<sup>2</sup>) there were fewer scope cleanings needed (mean 2.1 vs 3.0, p=0.026).

Table 2: Physiologic and respiratory parameters during RALP

	Time point	AirSeal®	CIS	p-value
Mean PaCO2 mmHg(SD, range)	Baseline	39.5 (4.9, 25.3-48.0)	39.2 (5.3, 32.1-45.9 )	0.79
	60 min	41.5 (7.7, 17.4-41.2 )	41.2 (5.2, 28-51.7)	0.82
	Procedure end	45.1 (6.1, 29.5-54.8)	44.1 (5.5, 32-55.1)	0.39
Mean PaO2 mmHg (SD, range)	Baseline	361.9 (79.3, 171-508)	364.3 (81.9, 107-505)	0.88
	At 60 min	283.9 (115.4, 39.1-494)	294 (105.0, 100-473)	0.65
	Procedure end	286.5 (99.1, 146-482)	290.2 (99.4, 115-468)	0.86
HCO3 Mean (SD, range)	Baseline	24.48 (2.01, 16.5-36.9)	24.57 (1.83, 21.4-28.5)	0.82
	60 min	24.31 (2.16, 15.3-27.5)	24.22 (2.04, 17.8-29.4)	0.83
	Procedure end	24.23 (2.11, 14.8-27.3)	24.32 (1.95, 18.9-28.8)	0.83
Mean Ph (SD, range)	Baseline	7.40 (0.04, 7.3-7.49)	7.41 (0.04, 7.36-7.52)	0.43
	60 min	7.37 (0.05, 7.28-7.45)	7.38 (0.05, 7.3-7.48)	0.40
	Procedure end	7.34 (0.05, 7.23-7.45)	7.35 (0.05, 7.27-7.45)	0.15
Mean CO2 elimination mmHg (SD, range)	Baseline	3.15 (0.67, 2.0-5.0)	3.28 (0.64, 2.0-4.9)	0.42
	60 min	3.24 (0.74, 2.0-5.2)	3.28 (0.6, 1.7-4.4)	0.75
	Procedure end	3.04(1.35, 0.6-5.3 )	3.11(0.65, 0.4-7.4)	0.99
Mean Et-CO <sub>2</sub> mmHg (SD, range)	Baseline	31.47 (3.9, 24-41)	29.96 (3.1, 19-50)	0.13
	60 min	32.80 (3.6, 25-43)	30.96 (3.2, 24-39)	0.018
	Procedure end	34.77 (8.9 15-46)	34.17 (7.2, 20-50)	0.712

**CONCLUSIONS**

Valveless trocar insufflation provided more stable pressure and improved smoke evacuation allowing less scope cleanings but without identified differences in physiologic or pain parameters. Operating at ultralow pressure was uniformly possible with both insufflators although an expert bedside assistant moderating suction may have contributed to feasibility when using CIS. A randomized trial of 6mm Hg vs 15mm Hg is currently underway.