Femoral Venous Cannulation For Minimally Invasive Surgery: Three Years Experience With Wall-less, Self-expandable Cannula

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BACKGROUND
The target of an optimal minimally invasive setting is to minimize surgical trauma: trans-femoral venous cannulation with virtually wall-less, self-expandable cannula offers an excellent drainage and surgical exposure.
In this study, almost three years of prospective experience with this device are reported: intraoperative performance of the wall-less cannula was compared to a standard drainage settings with dual-stage cannula.

METHODS From January 2018 to October 2020, were prospectively enrolled 108 patients underwent minimally invasive surgery for mitral disease. Trans-femoral venous cannulation with standard dual stage venous cannulas (3/8" 23Fr distal/25FR proximal, 72.5mm) (Group 1), while wall-less cannula (3/8" 24Fr 630-730mm) was used in 54 randomized patients (Group 2) was used in 54 other patients (Group 2). Baseline characteristics are reported in Table 1. Our approach provide for femoral vessels surgical cutdown and cannulation with Seldinger technique. The venous cannulas were then fed over the wire and adequately positioned under echocardiographic control. As marker of quality of cardiopulmonary bypass, five intraoperative hemogasanalysis sample, preoperative and postoperative blood tests (in first, third and fifth postoperative days) were collected and compared between two groups.

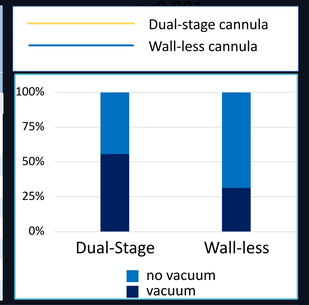
RESULTS Mean target flows were 3.51±0.38 L/min and 3.83±0.38 L/min for Group 1 and Group 2 respectively (p=0.000). Mean achieved flows were 4.43±0.49L/min and 4.81±0.55L/min (p=0.001), corresponding to 126% of the target in both groups (Table 2). Rate of vacuum assist, in case of poor drainage was 55.6% in Group 1, versus 31.5% in Group 2 (logistic regression p<0.000 OR=0.066 [IC 0.019;0.224]). Intraoperative hemogasanalysis demonstrates no significative differences in terms of hematocrit, lactate and mixed venous oxygen saturation (p>0.05). During postoperative days transaminase, total bilirubin, creatinkinase didn't differ. Mean cardiopulmonary bypass time was 194±44 and 191±42 minutes, while mean crossclamp time was 125±30 and 128±30 minutes respectively in Group 1 and Group 2. In all cases, virtually wall-less cannula provides an excellent exposure, collapsing right sections immediately after starting cardiopulmonary bypass.

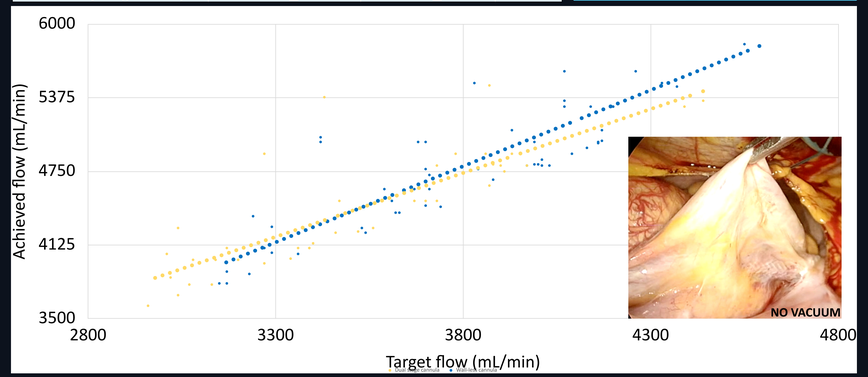
Table 1

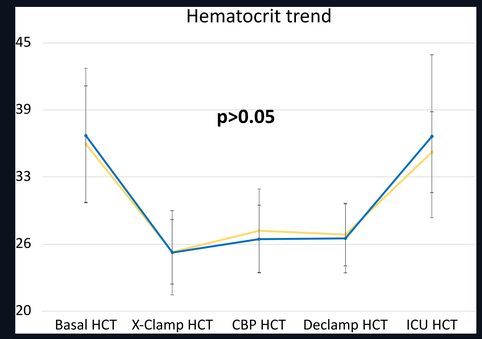
	Dual-stage cannula (n=54)		Wall-less cannula (n=54)		
	n	*%*	*n*	*%*	*p-value*
Age, years	60 ± 13		59 ± 13		0.668
Gender, male	22	40.7	41	75.9	**0.000**
BMI, kg/m2	23.4 ± 3.6		25.3 ± 3.5		**0.008**
BSA, m2	1.7 ± 0.2		1.9 ± 0.2		**0.000**
Hypertension	23	42.6	25	46.3	0.630
Diabetes mellitus	0	-	1	1.9	0.495
Dyslipidemia	18	33.3	25	46.3	0.141
Smoking history	13	24.1	16	29.6	0.475
Coronary artery disease	3	5.6	3	5.6	0.652
Atrial fibrillation	9	16.7	6	11.1	0.426
Echocardiogram					
EF, %	65 ± 5		65 ± 5		0.678
Mitral regurgitation grade					0.712
0	2	3.7	1	1.9	
1+	1	1.9	0	-	
2+	1	1.9	1	1.9	
3+/4+	50	92.6	52	96.3	
Mitral stenosis	1	1.9	0	-	0.500
Tricuspid regurgitation					**0.010**
0	28	51.9	43	79.6	
1+	16	29.6	8	14.8	
2+	7	12.9	3	5.6	
3+/4+	3	5.6	0	-	
Diuretic therapy					0.138
no therapy	30	55.6	34	63.0	
<50mg/die	16	29.6	18	33.3	
≥50 mg/die	8	14.8	2	3.7	
Laboratory					
Hemoglobine, g/dl	13.7 ± 1.4		14.2 ± 1.5		0.147
Hematocrit, %	40.7 ± 3.8		41.8 ± 4.5		0.174
Platelet, U/μL	221.5 ± 61.4		210.2 ± 59.5		0.374
Creatinine, mg/dl	0.8 ± 0.2		1.0 ± 0.4		**0.001**
Bilirubine, mg/dl	0.9 ± .6		1.0 ± 0.6		0.502
AST, U/L	32.1 ± 25.8		21.7 ± 9.2		**0.025**
ALT, U/L	25.2 ± 13.7		18.7 ± 8.8		**0.014**

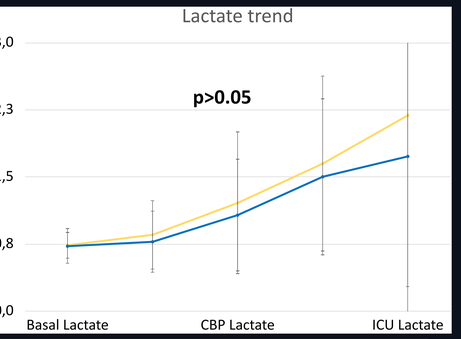
Table 2

	Dual-stage cannula (n=54)		Wall-less cannula (n=54)		
	n	*%*	*n*	*%*	*p-value*
Surgery					
MV repair	43	79.6	50	92.6	0.439
MV replacement	8	14.8	3	5.6	
Fibroelastoma	1	1.9	1	1.8	
TV repair/replacement	2	3.7	0	-	
X-lamp time, min	125 ± 30		128 ± 30		0.603
CPB time, min	194 ± 44		191 ± 42		0.763
Target flow, mL/min	3512 ± 378		3829 ± 377		**0.000**
Achieved flow, mL/min	4428 ± 492		4817 ± 555		**0.001**
Achieved /Target flow, %	126 ± 9		126 ± 8		0.976









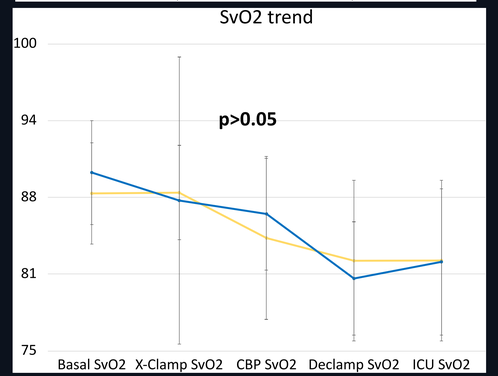


Table 3

	Dual-stage cannula (n=54)		Wall-less cannula (n=54)		
	n	*%*	*n*	*%*	*p-value*
Hematocrit G1	33.4 ± 3.7		33.5 ± 3.4		0.874
Hematocrit G3	31.2 ± 3.3		31.7 ± 3.8		0.629
Hematocrit G5	32.4 ± 3.5		33.4 ± 4.8		0.343
Creatinine G1	0.8 ± 0.2		1.0 ± 0.5		**0.050**
Creatinine G3	0.7 ± 0.2		0.8 ± 0.5		0.150
Creatinine G5	0.6 ± 0.2		0.8 ± 0.4		**0.010**
Total bilirubin G1	1.7 ± 1.5		1.6 ± 1.1		0.915
Total bilirubin G3	1.4 ± 1.2		1.2 ± 0.7		0.445
Total bilirubin G5	1.0 ± 0.5		1.0 ± 0.6		0.877
ALT G1	34.8 ± 26.3		51.5 ± 106.9		0.407
ALT G3	26.9 ± 14.8		30.9 ± 32.9		0.545
ALT G5	42.8 ± 37.7		44.5 ± 38.0		0.858
CK-MB 1	1947 ± 1286		2306 ± 1230		0.258
CK-MB 2	2579 ± 2808		2372 ± 1359		0.716
CK-MB 3	2440 ± 2890		2114 ± 1617		0.580

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CONCLUSIONS Wall-less cannula ensure higher flow, in most cases without vacuum assistance. Surgical set up resulted easier and quicker with excellent visibilty, reducing operative times. No advantages in terms of quality of cardiopulmonary bypass and enzymatic peaks were demonstrated.