

Introduction

The use of hypothermic perfusion machines in kidney transplantation has now become common practice, and there is growing clinical interest in the interpretation of perfusion parameters and their predictive value for post-transplant kidney function. Between April 2023 and April 2025, 20 renal transplantations were performed at Treviso Hospital using the PerLife®System (Aferetica®, Bologna, Italy) oxygenated hypothermic perfusion machine for organ perfusion. This pilot study aimed to assess clinical outcomes and identify perfusion predictive parameters for renal function.

Materials and Methods

Of the 20 kidney transplants performed, 17 were conducted using grafts from donors after circulatory death (DCD), while the remaining 3 involved grafts from donors after brain death (DBD). For each transplant performed, renal function at 30 days post-transplant was recorded using the estimated glomerular filtration rate (eGFR) formula. The following variables were assessed:

- Machine perfusion time (minutes)
- Delta resistance (difference between initial and final resistance index, mmHg/mL/min)
- Final flow (flow rate recorded at the end of perfusion, mL/min)

Statistical analysis was conducted using a multiple linear regression model to evaluate the impact of these variables on renal function at one-month post-transplant. Additionally, receiver operating characteristic (ROC) curves were used to estimate optimal cut-off values for the significant variables.

Results

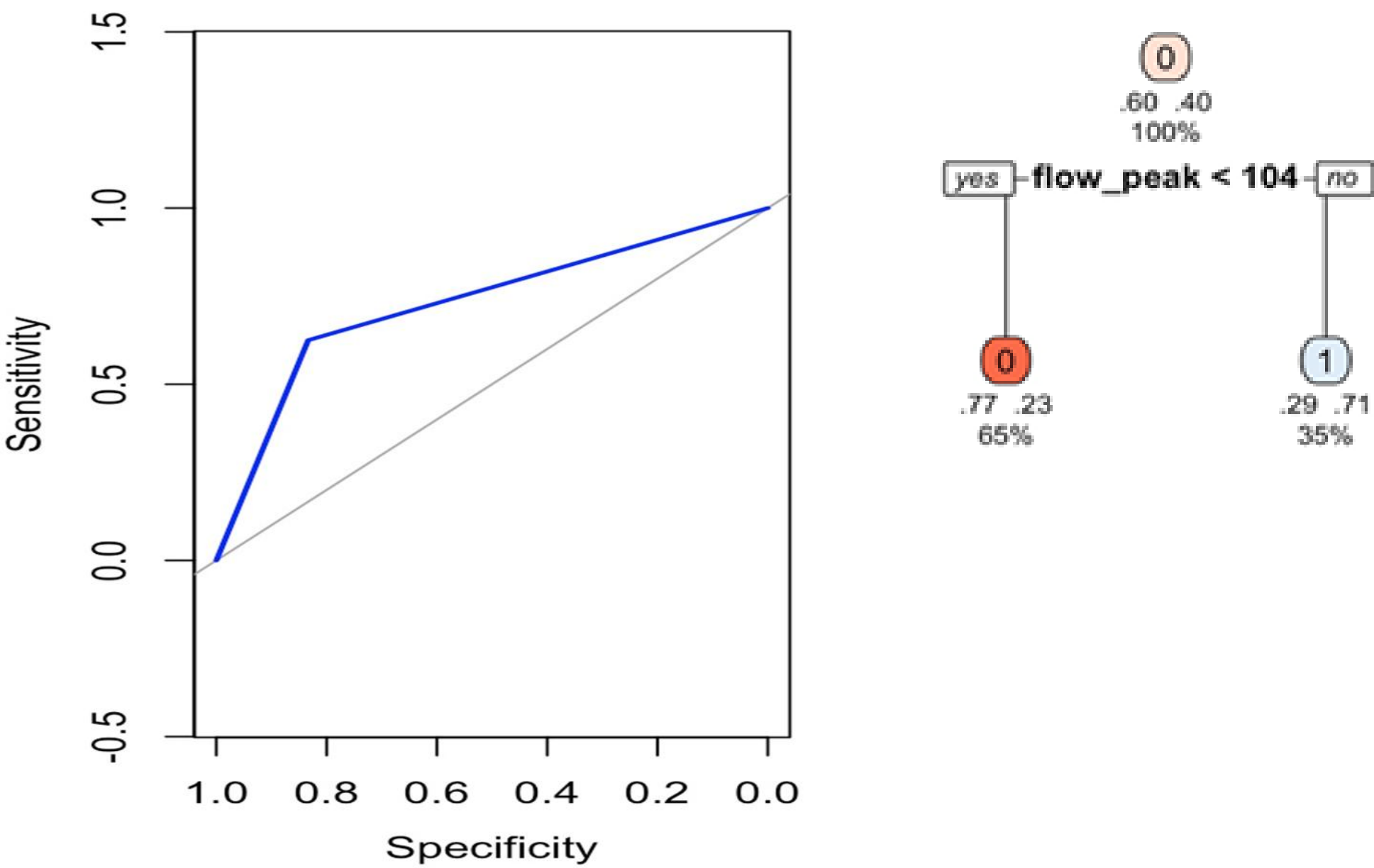
- Organs were perfused for an average of 339 minutes. Mean final resistance index was 0.18 mmHg/mL/min, with a mean delta resistance of 0.1 mmHg/mL/min. The mean final flow was 110.1 mL/min. Average eGFR at 30 days post-transplant was 53.45 mL/min/1.73m².

	perfusion time (minutes)	initial resistance	final resistance	delta resistance	final flow	30 days post- TX eGFR
Mean	339,6	0,28	0,18	0,10	110,1	53,45
Standard Deviation	292,14	0,17	0,06	0,11	37,73	26,19
Median	240,5	0,23	0,17	0,05	100,5	46

- The multiple linear regression model analyzing the variables “Delta Resistance” and “Final Flow” in relation to renal function one-month post-transplant revealed that both variables are significantly correlated with post-transplant renal function.

	Coef.	Standard Error	t_value	p_value
delta resistance	+508,62	149,29	3,41	0,01
final flow	+1,29	0,28	4,58	0,00

- A decision tree was constructed for the variable “Final Flow,” which allowed the identification of a cut-off value. It was found that 77% of patients who received a kidney with a final perfusion flow below 104 mL/min had an eGFR < 50 mL/min/1.73 m² at one-month post-transplant, whereas 71% of patients who received a kidney with a final flow above 104 mL/min had an eGFR > 50 mL/min/1.73 m². The identified cut-off of 103 mL/min demonstrated an AUC of 0.729, with a specificity of 0.83 and a sensitivity of 0.625.



Conclusions

Kidney transplantation following hypothermic oxygenated machine perfusion using the PerLife system (Aferetica®, Bologna, Italy) is safe. Parameters such as Delta Resistance and Final Perfusion Flow may be considered potential predictors of post-transplant outcomes.

References

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