

# NHS BLOOD AND TRANSPLANT

## CARDIOTHORACIC ADVISORY GROUP – HEART

### SUPER-URGENT HEART TRANSPLANT OUTCOMES

#### INTRODUCTION

1. The primary indication for super-urgent heart listing is short-term ventricular assist device (ST VAD) or veno-arterial extra-corporeal membrane oxygenation (VA-ECMO) support. This paper compares the number of patients transplanted, demographic characteristics, median waiting time and post-transplant survival between the two support types. The time period analysed was super-urgent transplants performed 1 September 2017 to 31 March 2022.

#### DATA AND METHODS

2. All adult (age $\geq$ 16) super-urgent heart-only first transplants performed between 1 September 2017 and 31 March 2022 were extracted from the UK Transplant Registry. Two retransplants, four recipients on IABP only, and one recipient not on support (CTAG approved) at time of transplant were excluded from the analysis.
3. Patients were categorised by the type of support they were on at time of transplant. This information was taken from the cardiothoracic transplant record form. Data for any recipients who were not recorded as having either ST VAD or ECMO support on the transplant record form was taken from the VAD database. This data was then sent to each heart transplant centre and subsequently verified to ensure accuracy of the data.
4. Two groupings of support at time of transplant were used for this analysis; those recipients on ST VAD support only, and those recipients on VA-ECMO with or without another type of support.
5. Demographic characteristics were compared between support types using the chi-squared test for categorical variables and Wilcoxon's rank-sum for continuous variables. Median time to transplant and patient survival post-transplant were analysed using the Kaplan-Meier method where support types were compared using the log-rank test.

#### RESULTS

6. There were 118 adult heart-only super-urgent first transplants in the time period, of which four recipients on IABP only and one recipient who had CTAG approval for SU listing not on support were excluded, leaving 113 transplants for analysis. A breakdown of these transplants by type of support and centre is shown in **Table 1**. In total, 90 (80%) patients were on a ST VAD only at time of transplant and 23 (20%) were on ECMO with or without ST VAD.

Centre	ECMO+/-ST VAD		ST VAD		Total
	N	%	N	%	N
Birmingham	3	11	25	89	28
Glasgow	5	56	4	44	9
Harefield	7	37	12	63	19
Manchester	0	0	16	100	16
Newcastle	6	55	5	45	11
Papworth	2	7	28	93	30
<b>Total</b>	<b>23</b>	<b>20</b>	<b>90</b>	<b>80</b>	<b>113</b>

7. **Table 2** shows patient demographics of ECMO+/-ST VAD transplants compared with ST VAD only transplants. There was evidence that the ST VAD only group had higher rates of previous heart surgery and higher bilirubin levels at time of registration.

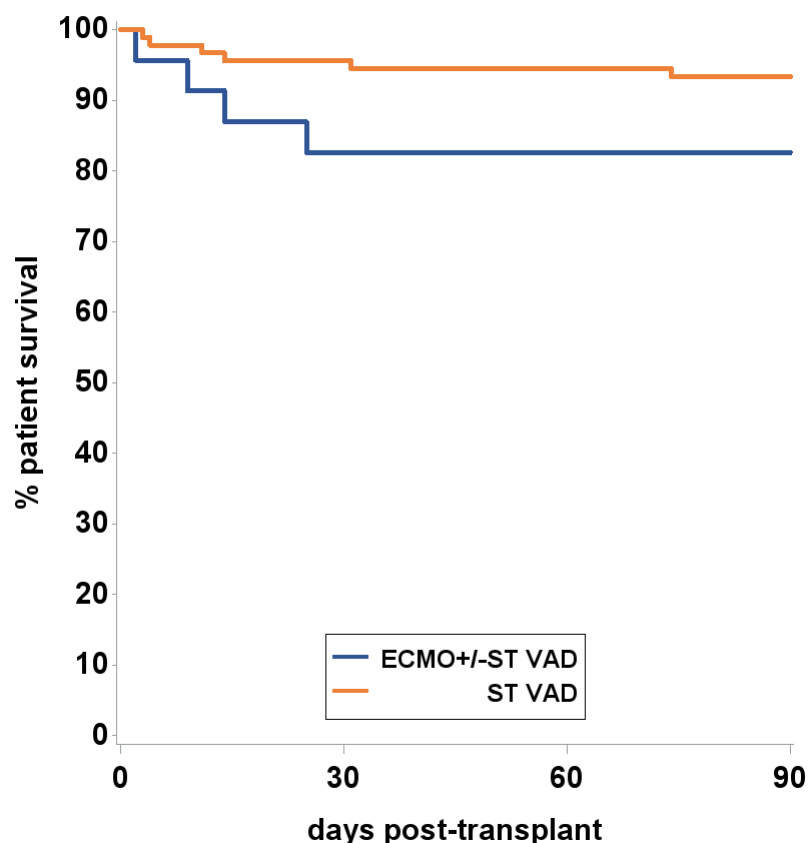
Patient demographics	ECMO+/-ST VAD (N=23)		ST VAD (N=90)		p-value
	N	%	N	%	
<b>Sex</b>					
Male	16	70	72	80	0.28
Female	7	30	18	20	
<b>Primary disease</b>					
Coronary heart disease	2	9	15	17	0.55
Cardiomyopathy	19	83	70	78	
Congenital heart disease	0	0	1	1	
Other/not reported	2	9	4	4	
<b>Previous open-heart surgery at registration</b>					
No	13	57	37	41	<b>0.031</b>
Yes	4	17	46	51	
Not reported	6	26	7	8	
<b>Age (years), median (IQR)</b>	37 (26 – 48)		43 (27 – 52)		0.61
<b>Creatinine at transplant (umol/l), median (IQR)</b>	74 (55 – 88)		72 (54 – 94)		0.78
<b>Bilirubin at registration (umol/l), median (IQR)</b>	14 (11 – 22)		20 (13 – 33)		<b>0.057</b>

8. Median waiting time from super-urgent registration to transplant across the two groups is shown in **Table 3**. There was a significant difference in median waiting time between the two groups ( $p=0.048$ ), with those patients receiving ECMO waiting less time than those on ST VAD only.

Support type	Number of transplants	Waiting time (days)	
		Median	95% CI
ECMO+/-ST VAD	23	8	(2 – 17)
ST VAD	90	11	(6 – 23)

9. Patient survival to 30 days and 90 days post-transplant was analysed for all 23 ECMO+/-ST VAD and 90 ST VAD patients. The 90-day survival curves are presented in **Figure 1**. The survival rates are presented in **Table 4**. There was evidence of a significant difference in 30-day survival between the two groups ( $p=0.030$ ), with ST VAD only patients having higher unadjusted survival. At 90 days, this difference was borderline statistically significant ( $p=0.097$ ).

**Figure 1** Unadjusted 90-day patient survival for ECMO+/-ST VAD versus ST VAD super-urgent transplants



**Table 4 Unadjusted 30-day and 90-day patient survival rates for ECMO+/-ST VAD versus ST VAD super-urgent transplants between 1 September 2017 and 31 March 2022**

Patient survival	Number at day one	Died	Survival rate	95% CI
<b>30-day (p=0.030)</b>				
ECMO+/-ST VAD	23	4	82.6	(60.0 – 93.1)
ST VAD	90	4	95.6	(88.6 – 98.3)
<b>90-day (p=0.097)</b>				
ECMO+/-ST VAD	23	4	82.6	(60.0 – 93.1)
ST VAD	90	6	93.3	(85.8 – 96.9)

## SUMMARY

10. This analysis shows that patients on VA-ECMO support at time of super-urgent heart transplant have significantly worse short term survival outcomes than those patients on ST VAD only.

**Lewis Simmonds**  
**Statistics and Clinical Research**

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