



# EVALUATION OF THE RESULTS OF LONG – DISTANCE HEART TRANSPLANT AT HUE CENTRAL HOSPITAL

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## ABSTRACT



Heart transplant is the optimal treatment for end-stage heart failure patients. However, a lack of heart donors in the Central of Vietnam has been a tremendous obstacle for this method.

For this reason, long – distance heart transplant is considered as an effective solution to increase the opportunity for patients in the heart transplant waiting list in the Central of Vietnam.



# METHODOLOGY

## Pre-operative clinical assessment

Patients	Age	Sex	Height (cm)	Weight (kg)	BMI (kg/m <sup>2</sup> )	Surface area (m <sup>2</sup> )	Duration of heart disease (years)	Acquired heart disease	NYHA
1	52	Male	162	52	19.8	1.53	7	Dilated cardiomyopathy	4
2	15	Male	162	41	15.6	1.36	3	Dilated cardiomyopathy	4
3	54	Male	172	58	19.6	1.66	8	Dilated cardiomyopathy	4
4	36	Male	168	75	26.6	1.87	3	Dilated cardiomyopathy	4
5	36	Male	170	69	23.9	1.81	2	Dilated cardiomyopathy	4
6	34	Male	163	47	17.7	1.46	4	Dilated cardiomyopathy	4
7	24	Male	173	75	25.1	1.90	1	Dilated cardiomyopathy	4
8	37	Male	168	60	21.3	1.67	4	Dilated cardiomyopathy	4
9	31	Male	175	66	21.6	1.79	13	Dilated cardiomyopathy	4



# METHODOLOGY

## Pre-operative paraclinical assessment

Patients	Rythm	Rate	Wall motion	LVDd (mm)	LVDs (mm)	EF (%)	TAPSE (mm)	PAPs (mmHg)	Valves	CO (litre/min)	CI (litre/min/m <sup>2</sup> )
1	Sinus	85	Reduced	63	55	26	20	35	TR 1/4	2.7	1.7
2	Sinus	90	Reduced	68	63	16	17	35	MR 2.5/4; TR 3-3.5/4	2.0	1.4
3	Sinus	87	Reduced	98	91	14	15	50	MR 3/4; TR 2/4	1.9	1.1
4	Sinus	81	Reduced	58	48	29	18	35	MR 1.5/4; TR 1/4	2.7	1.5
5	Sinus	79	Reduced	57	51	23	17	35	MR 1/4; TR 2-2.5/4	2.1	1.6
6	Sinus	88	Reduced	65	58	25	18	35	MR 2/4; TR 1/4	2.1	1.5
7	Sinus	86	Reduced	60	45	27	17	35	MR 2/4; TR 2/4	2.8	1.5
8	Sinus	78	Reduced	57	49	29	17	25	MR 2/4; TR 1/4	2.4	1.5
9	Sinus	86	Reduced	84	72	28	16	40	MR 3/4; TR 1/4	2.5	1.4





# METHODOLOGY

## Pre-operative paraclinical assessment

Patient s	Blood type	Glucose (mmol/L)	SGOT (U/L)	SGPT (U/L)	Urea (mmol/L)	Creatinine (umol/L)	WBC (K/uL)	RBC (M/uL)	Hb (g/dL)	Hct (%)	PLT (K/uL)
1	A +	6.3	22	15	4.6	72	10.15	3.93	12.7	34.4	227
2	O +	5.3	129	43	5.4	60	6.63	4.64	13	38.6	225
3	B +	5.0	39	34	9.1	94	9.68	4.56	14.2	41.4	216
4	AB +	4.3	18	20	5.5	100	9.34	4.25	13.5	38.7	324
5	B +	5.0	28	32	8.2	128	10.1	5.62	17	51.8	261
6	AB +	5.0	23	23	6.5	104	10.7	4.25	12.3	36.3	300
7	A +	4.9	24	24	4.8	66	8.3	4.76	13.6	42.0	225
8	O +	4.7	23	7	4.3	101	6.6	4.95	14.9	45.2	246
9	AB +	4.8	41.1	38	10.31	116	6.2	5.14	15.6	48.6	197





## **METHODOLOGY**

### **Donors and Transportation of donor hearts**

- Donors are young male patients (< 50 years old), diagnosed with brain dead due to traffic accident, meet the donor selection criteria of the Ministry of Health.
- Other donor organs are transplanted at local hospitals, except for the heart which is transported to Hue city and transplanted at Hue Central Hospital.





## **METHODOLOGY**

### **Donors and Transportation of donor hearts**



- With the coordination between the National Organ Donation Committee, the Vietnam Airline and other airlines (Bamboo, Pacific), donor hearts are transported by civil aviation, conserved in cold temperature, from other provinces to Hue in about 1 hour.



# METHODOLOGY

## Donors and Transportation of donor hearts





## **METHODOLOGY**

### **Donors and Transportation of donor hearts**

- When the airplane carrying the donor heart has landed, we will perform thoracotomy and cardiopulmonary bypass for the recipient. Then when the donor heart has arrived at the OR, we will remove the recipient's heart. The donor heart is re-perfusion with cold cardioplegia before being transplanted. The transplantation is performed by the bicaval orthotopic cardiac transplantation technique [6].





## METHODOLOGY

### Donors and Transportation of donor hearts



- The heart was perfusion through aorta by cold cardioplegia again before transplantation



# RESULTS AND DISCUSSION

## Operation parameters

Patients	Operation time (min)	Aortic clamp time (min)	Bypass time (min)	Cold ischemic time (min)	CPB-assisted time (min)
1	430	152	247	386	84
2	340	129	212	320	63
3	310	113	168	438	44
4	260	89	175	315	50
5	295	92	243	305	142
6	340	75	160	313	75
7	360	75	210	338	100
8	270	110	160	287	30
9	270	90	155	265	65





# RESULTS AND DISCUSSION

## Operation parameters




- In our cases, there are 2 patients with cold ischemic time more than 6 hours (438 minutes and 386 minutes respectively) and 7 patients with cold ischemic time from 4 to 6 hours. Several major international researches have showed that the cold ischemic time under 8 hours has similar survival rates after 1-2 years with under 4 hours, and there is a successful case with the cold ischemic time about 13 hours. These are important foundations to carry out long – distance heart transplant.



# RESULTS AND DISCUSSION

## International researches about cold ischemic time

### Clinical outcome of donor heart with prolonged cold ischemic time: A single-center study

Fazal Shafiq MD | Yixuan Wang MD  | Geng Li MD  | Zongtao Liu MD |  
Fei Li MD | Ying Zhou MD | Li Xu MD | Xingjian Hu MD, PhD |  
Nianguo Dong MD, PhD 

**Methods:** We retrospectively analyzed outcomes of the heart transplant patients from 1 January 2015 to 31 December 2017. The recipient population was divided into four groups. Group 1: cold ischemic time greater than 8 hours; **group 2: the cold ischemic time between 6 and 8 hours**; group 3: the cold ischemic time between 4 and 6 hours; and group 4: cold ischemic time less than 4 hours. Efficacy indicators included after transplant survival, infection rate, rejection rate, and complications.

**Results:** The four groups have similar donor and recipient baseline characteristics ( $P > .05$ ). Cold ischemic time greater than 8 hours had more cardiopulmonary bypass (CPB) time ( $127.62 \pm 50.23$  minutes;  $P = .003$ ), CPB-assist time ( $86.14 \pm 36.74$  minutes;  $P = .047$ ), and higher intra-aortic balloon pump (IABP) usage rate postoperatively (47.36%;  $P = .010$ ). Cold ischemic time greater than 8 hours witnessed a relatively higher mortality rate compared with the other three groups ( $P = .115$ ,  $P = .078$ , and  $P = .114$ ) during the 2-year follow-up. Survival rates of 1 and 2 years for the four groups were 78.95%, **87.13%**, 87.32%, and 87.50% and 68.42%, **85.14%**, 85.92%, and 83.93%, respectively.



## RESULTS AND DISCUSSION

### International researches about cold ischemic time



ELSEVIER

### Successful Heart Transplantation After 13 Hours of Donor Heart Ischemia With the Use of HTK Solution: A Case Report

J. Wei, C.Y. Chang, Y.C. Chuang, S.H. Su, K.C. Lee, D.Y. Tung, S.L. Lee, and W.C. Lee

to the type B recipient. Since the type O donor heart seemed to be wasted, we performed HTx for the boy. Though preserved for 12 hours in cold cardioplegia, the donor heart was implanted with biatrial anastomosis that took 1 hour. The total IT of this donor heart was 13 hours. The recipient recovered and was discharged 3 months later.

Conclusions. The IT of 13 hours for this donor heart is believed to be a world record. Our experience demonstrates that preservation time of donor heart may exceed 6 hours.



# RESULTS AND DISCUSSION

## Post-op echocardiography

Patients	Wall motion	EF (%)	Right ventricle	TAPSE (mm)	PASP (mmHg)	Heart valves
1	Good	60	Undilated	18	25	TR ¼
2	Good	61	Undilated	19	25	TR ¼
3	Good	62	Undilated	19	35	TR ¼
4	Good	65	Undilated	18	30	MR ¼
5	Good	60	Undilated	19	30	TR 1.5/4
6	Good	50	Undilated	18	30	MR ¼, TR 1.5/4
7	Good	51	Undilated	17	30	MR 2/4, AR ¼ , TR ¼
8	Good	65	Undilated	17	30	MR 2/4 , TR 1.5/4
9	Good	60	Undilated	14	40	MR 2/4, TR 2/4



# RESULTS AND DISCUSSION Discharged echocardiography

Patients	Wall motion	Left ventricle	EF (%)	Right ventricle	TAPSE (mm)	PASP (mmHg)	Heart valves
1	Synchronized	Undilated	64	Undilated	19	30	TR ¼
2	Synchronized	Undilated	63	Undilated	18	30	TR ¼
3	Synchronized	Undilated	63	Undilated	18	30	TR ¼
4	Synchronized	Undilated	62	Undilated	19	30	TR ¼
5	Synchronized	Undilated	65	Undilated	18	30	TR ¼
6	Synchronized	Undilated	63	Undilated	19	30	MR ¼, TR ¼
7	Synchronized	Undilated	65	Undilated	19	25	MR ¼, TR 1.5/4
8	Synchronized	Undilated	62	Undilated	20	30	MR ¼, TR ¼
9	Synchronized	Undilated	63	Undilated	17	40	TR 1.5/4



## RESULTS AND DISCUSSION: Post-op hemodynamic and after 5 days

Patients	Rythm	Rate (beat/min)	MAP (mmHg)	Right atrial pressure	PAPs (mmHg)	Wedged PAPs (mmHg)	CO (litre/min)	CI (litre/min/m <sup>2</sup> )
1	Sinus	130	123/67 (82)	5	31/15 (19)	13	4.8	3.1
2	Sinus	95	125/62 (79)	5	27/15 (20)	8	8.5	6.4
3	Sinus	105	137/64 (88)	9	38/13 (21)	8	4.1	2.3
5	Sinus	110	117/75 (85)	10	28/18(23)	9	5.4	3.0
4	Sinus	100	128/68 (87)	8	30/14(20)	9	5.2	3.0
6	Sinus	120	140/82 (98)	4	25/13(17)	10	8.7	5.4
7	Sinus	120	120/70 (87)	4	26/15(19)	8	5.7	3.0
8	Sinus	110	118/69 (85)	5	28/15(18)	9	6.3	3.7
9	Sinus	105	116/68 (84)	5	29/16(21)	10	5.4	3.0

Patients	Rythm	Rate (beat/min)	MAP (mmHg)	Right atrial pressure	PAPs (mmHg)	Wedged PAPs (mmHg)	CO (litre/min)	CI (litre/min/m <sup>2</sup> )
1	Sinus	110	124/82 (96)	6	26/17(20)	12	4.6	3.0
2	Sinus	95	125/62 (79)	5	27/15(20)	8	7.4	5.3
3	Sinus	105	137/64 (88)	9	32/14(21)	8	6.8	4.0
5	Sinus	110	117/75 (85)	10	28/18(23)	9	4.3	2.3
4	Sinus	100	128/68 (87)	8	30/14(20)	9	5.2	4.2
6	Sinus	120	140/82 (98)	4	23/12(15)	10	6.9	4.3
7	Sinus	120	120/70 (87)	4	25/15(19)	8	5.9	3.1
8	Sinus	74	137/74 (93)	6	24/12(16)	8	6.7	3.9
9	Sinus	120	108/63 (80)	10	27/15(20)	10	5.5	3.1





## RESULTS AND DISCUSSION: Post-op paraclinical assessment

Patient	Lactate (mmol/L)	pH	Troponin T (ng/ml)	SGOT (U/L)	SGPT (U/L)	Urea (mmol/L)	Creatinine (umol/L)	WBC (K/uL)	RBC (M/uL)	Hb (g/dL)	Hct (%)
1	11.0	7.28	5.29	171	36	9.7	130.0	18.5	3.5	11.1	32.7
2	7.2	7.36	2.86	439	206	5.5	96.0	23.0	3.5	10.3	30.3
3	10.2	7.17	4.31	131	35	9.3	154.0	18.8	3.7	11.5	33.7
4	12.9	7.25	4.26	131	23	7.9	185.0	17.8	3.5	10.7	33.0
5	9.1	7.20	7.75	90	33	9.6	168.0	13.4	4.5	13.0	41.0
6	1.3	7.42	1.13	64	20	6.4	122.0	12.2	3.1	8.7	26.9
7	10.5	7.39	>10.0	226	41	5.2	110.0	16.8	3.5	9.9	31.4
8	3.1	7.32	0.23	79	15	5.3	108.9	8.5	4.0	12.5	36.5
9	7.9	7.20	1.61	71	27	11.6	175.0	10.8	3.5	11.0	33.4





# RESULTS AND DISCUSSION: Discharge paraclinical assessment

Patient	Lactate (mmol/L)	pH	Troponin T (ng/ml)	SGOT (U/L)	SGPT (U/L)	Urea (mmol/L)	Creatinine (umol/L)	WBC (K/uL)	RBC (M/uL)	Hb (g/dL)	Hct (%)
1	1.0	7.4	0.137	7.2	71	58.0	103.0	8.55	3.2	10.1	29.9
2	1.2	7.4	0.065	8.2	98	38.0	29.0	9.8	3.7	10.7	32.0
3	1.1	7.4	0.073	13.8	133	37.0	40.0	8.8	3.5	10.7	33.8
4	1.8	7.4	0.091	7.5	95	20.0	36.0	11.0	2.7	8.1	25.1
5	1.1	7.4	0.082	6.9	103	28.0	48.0	16.9	3.3	9.6	27.6
6	1.1	7.4	0.059	4.6	87	29.0	82.0	22.1	3.6	10.1	31.0
7	1.1	7.4	0.049	7.1	80	38.0	66.0	8.6	3.1	8.9	27.2
8	1.7	7.4	0.095	7.5	69	65.0	94.0	15.0	3.9	11.9	34.9
9	1.3	7.4	0.299	11.7	109	51.1	86.4	9.3	3.3	9.5	29.6



# RESULTS AND DISCUSSION: Post-op period and complications

Patient s	Mechanical ventilated duration (days)	Chest tube removal (days)	Post-op hospitalized duration (days)	Pleural effusion	Pericardial effusion	Renal failure	Other complication
1	4	7	26	Yes (bilateral pleural drainage)	Small. Medication treatment. (S-med)	Yes	No
2	4	3	43	No	Very large. Pericardial drainage.	Yes	Subacute subarachnoid hemorrhage. Medication treatment.
3	1	8	32	Yes- Med	S- Med	Yes	No
4	1	4	21	No	No	No	No
5	1	3	18	No	No	Yes	No
6	1	4	14	No	S-Med	Yes	No
7	1	4	19	No	S-Med	No	No
8	1	4	11	No	S-Med	No	No
9	1	5	22	No	S-med	Yes	Acute right heart failure

## RESULTS AND DISCUSSION: Revisiting results

Patient	Revisiting time (month)	Wall motion	LVDd (mm)	LVDs (mm)	EF (%)	TAPSE (mm)	PAP (mmHg)	Heart valves
1	64	Synchronized (sync)	45	30	62	22	25	Soft, TR ¼
2	63	Sync	45	29	65	20	30	TR ¼
3	56	Sync	40	27	63	20	25	TR ¼
4	49	Sync	45	29	63	20	30	TR ¼
5	49	Sync	43	27	63	20	25	TR ¼
6	33	Sync	45	26	65	18	30	TR 1.5/4
7	20	Sync	48	32	60	23	25	TR ¼
8	X	X	X	X	X	X	X	X
9	3	Sync	48	32	60	20	55	TR 2/4



# RESULTS AND DISCUSSION: Revisiting results

Patient	Revisiting time (month)	Immunosuppression drugs	Drug dosage	Side effects
1	64	3 types	Reduce	Insignificant
2	63	3 types	Reduce	Insignificant
3	56	3 types	Reduce	Insignificant
4	49	3 types	Reduce	Insignificant
5	49	3 types	Reduce	Insignificant
6	33	3 types	Reduce	Insignificant
7	20	3 types	Reduce	Insignificant
8	X	X	X	Death
9	3	3 types	Reduce	Insignificant



# RESULTS AND DISCUSSION: Revisiting results

Patient	Revisiting time (month)	SGOT	SGPT	Urea	Creatinine	WBC	RBC	Hgb	Hct
1	64	16.9	7.6	6.4	95.0	9.2	4.5	14.0	42.2
2	63	23.1	23.8	5.1	66.0	6.4	4.8	15.2	46.0
3	56	25.0	24.0	5.5	105.0	9.7	4.9	14.6	44.7
5	49	25.1	31.5	6.2	101.7	6.6	4.9	14.3	43.0
4	49	16.8	13.6	6.7	96.0	9.2	5.0	15.6	46.8
6	33	17.7	18.2	8.1	105.0	11.2	5.5	15.3	46.1
7	20	4.4	90.0	21.1	17.5	6.0	5.4	15.2	47.0
8	X	X	X	X	X	X	X	X	X
9	3	26.8	28.9	7.4	93.0	7.3	3.8	11.9	35.7





# RESULTS AND DISCUSSION

## Revisiting results

- With a distance 700 – 1000 km from Hanoi to Hue (1 hour flight time), it is important to minimize the cold ischemic time to preserve the function of donor heart and the quality of life for the recipient. This is still the biggest challenge for us.



# RESULTS AND DISCUSSION

## Revisiting results

- It is necessary to minimize dead time, calculate the time of heart removal to be fit with the flight time to Hue or Danang, move to the airport as soon as possible, strictly cooperate with airlines to simplify the procedure. Also, we need to move fast and safely from the airport to Hue Central Hospital, at the same time the transplant team must carry out the operation so that when the heart arrives, it is transplanted to the recipient in time.





# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The heart is about to be taken to the airplane



# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The donor heart has arrived at Hue





# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The heart is carried to the OR and re-perfusion by cold cardioplegia before transplantation



# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The transplantation team at Hue Central Hospital

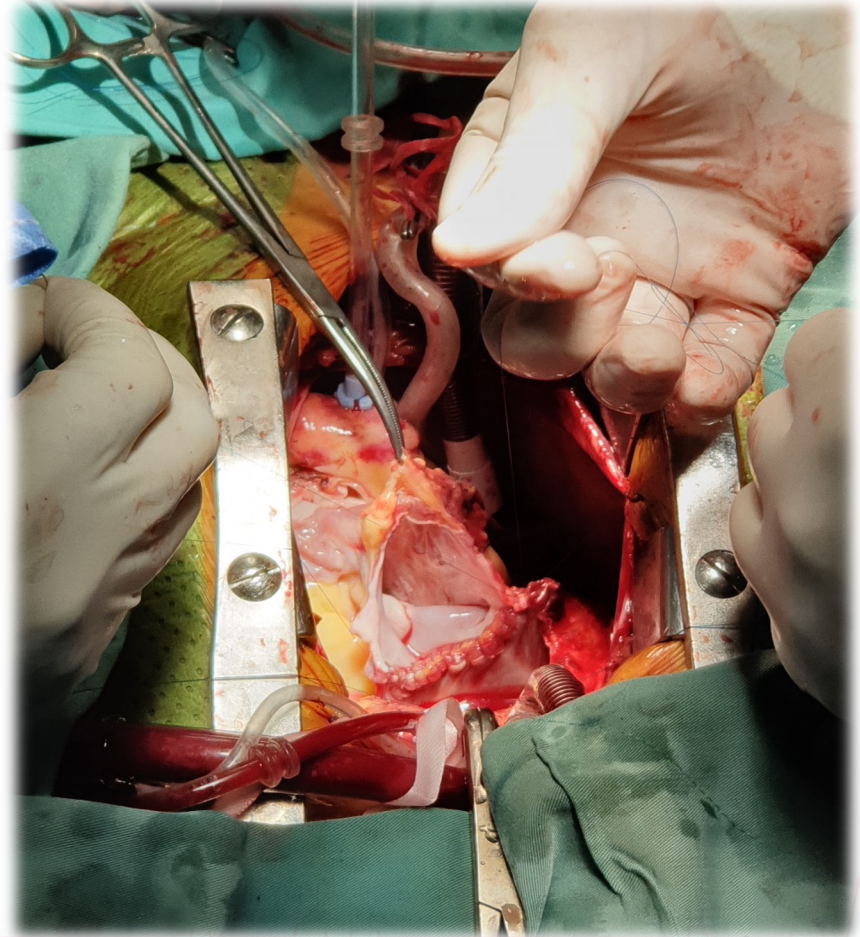




# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The transplantation is performed by the bicaval orthotopic cardiac transplantation technique





# MEMORABLE IMAGES

## A journey of long – distance heart transplant

- The transplantation team at Hue Central Hospital





# MEMORABLE IMAGES

## A journey of long – distance heart transplant





# MEMORABLE IMAGES

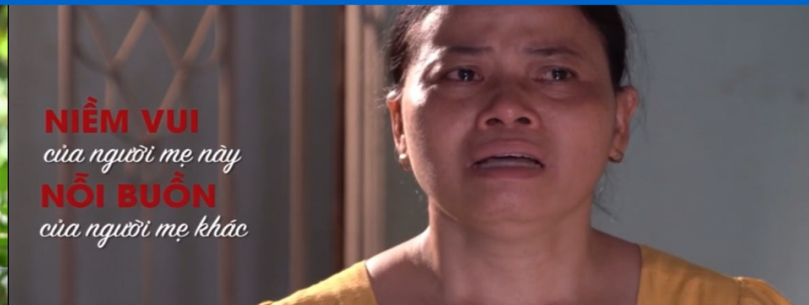
## A journey of long – distance heart transplant



### CUỘC SỐNG HỒI SINH TỪ NHỮNG TRÁI TIM XUYÊN VIỆT



**THỜI SỰ** GS.TS. PHẠM NHƯ HIỆP  
Giám đốc Bệnh viện Trung ương Huế



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*của người mẹ này*  
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