



Does The Modification Of Histidine–Tryptophan–Ketoglutarate Cardioplegia Influence Hemodilution And Transfusion Requirements in Patients Undergoing Minimally Invasive Cardiac Surgery? *A Preliminary Study*



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Introduction

- New cardioplegic formulations with and without the presence of blood extend ischemic time but use high-volume, crystalloid-based solutions that may cause hemodilution hindering the clinical advantages
- This study aims to compare different strategies of histidine–tryptophan–ketoglutarate (HTK) solution compared to del Nido (DNC) and 4:1 blood (BC) in minimally invasive cardiac surgery (MICS) up to 60 min ischemic time to discuss the safety level of myocardial protection and rationale for addition of blood component

Patients & Methods

- Following ethics approval, during a two-year period, 44 patients undergoing MICS with an expectation of cross-clamp time< 60 min received 1:4 blood HTK (M-HTK) cardioplegia
- Data was retrospectively compared with propensity score matched patients (N=40 each) receiving different cardioplegic solutions up to 60 min ischemic time:
 - ✓ Conventional HTK
 - ✓ DNC
 - ✓ BC
- Patients received single calculated dose (BC group in every 20 min) under controlled pressure within the predefined duration (15 mL/kg via 80 to 100 mm Hg pressure)
- Inclusion criteria were patients aged 50 to 79 years, providing informed consent, scheduled for MICS with x-clamp time expected to be <60 min
- Exclusion criteria were patients with ischemic time >60 min, receiving early and additional doses, severe hemodynamic instability, renal failure, previous cardiac surgery, conversion to sternotomy and significant neurological dysfunction
- Blood samples were collected at the following time intervals: after induction of anesthesia before CPB (T1), after cessation of CPB (T2), ICU on the first postoperative day at 8 am (T3)
- Primary endpoints were the hematocrit levels at T2 and the perioperative rate of transfusion

Results

- In the M-HTK group, two patients were converted to full sternotomy (one patient needed earlier redosing-heart started beating/fibrillation) and two ischemic time > 60 min were all excluded
- Perioperative outcome is summarized in Table

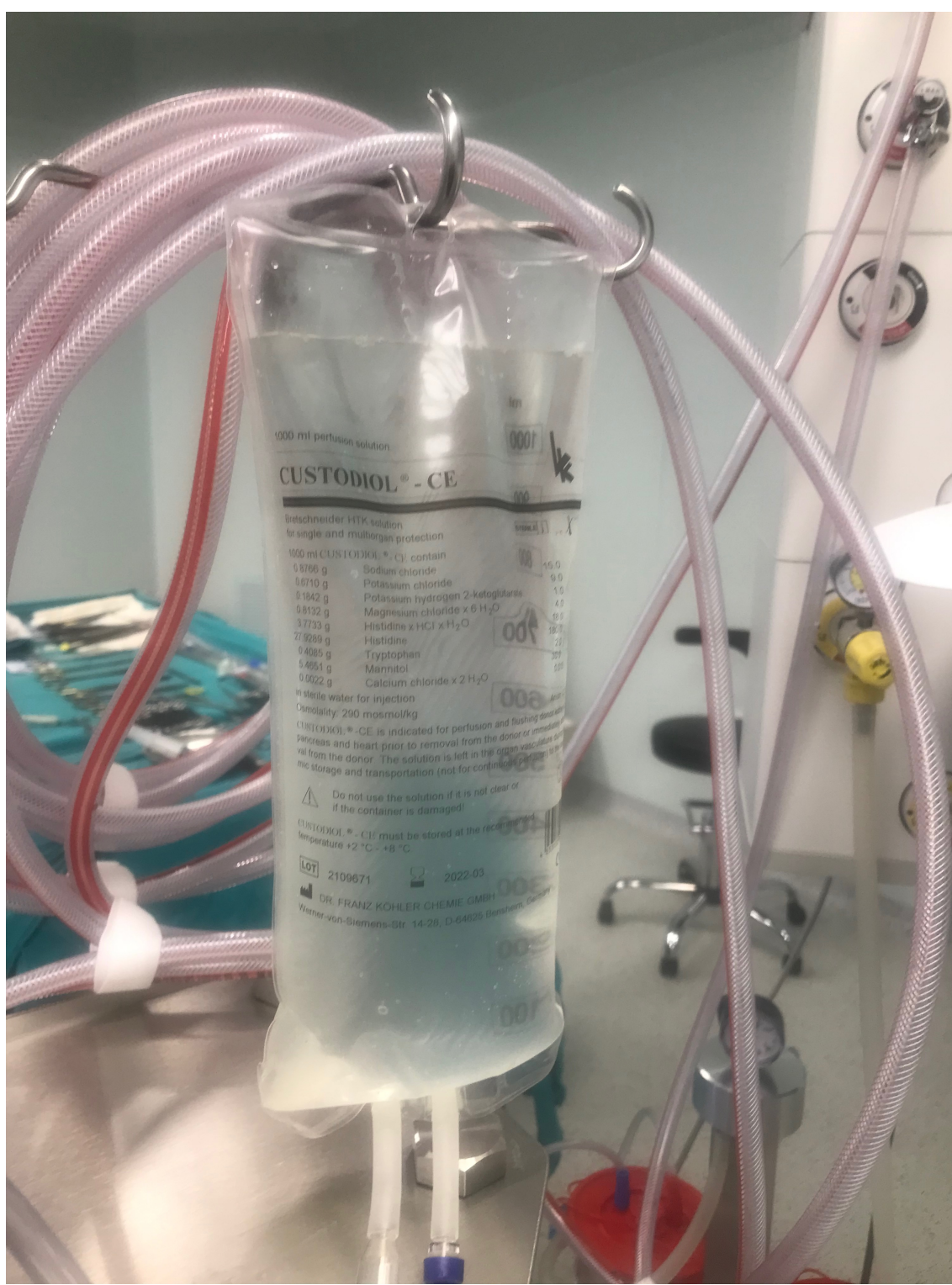


Table: Perioperative follow-up

	Group 1 (M-HTK) (N=39)	Group 2 (HTK) (N=40)	Group 3 (DNC) (N=40)	Group 4 (BC) (N=40)	P
Age (y)	71±5	67±6	74±6	70±6	>0.05
Preoperative STS Score (%)	7.4±2	7±2	6.7±2	6.9±2	>0.05
Aortic cross clamp (min)	88±5	86±5	84±4	88±5	>0.05
Hematocrit at T2 (%)	29±4	23±5*	26±5	28±5	=0.04 vs Groups 1 & 4
Hemorrhage (mL/24 h)	400±50	500±50	450±50	400±50	>0.05
RBC Transfusion	1.1±0.5	1.4±0.5	1.4±0.5	1.2±0.5	>0.05
FFP Transfusion	2.2±0.7	2.4±0.7	2.5±0.8	2.4±0.7	>0.05
Troponin-I (ng/mL)- (T2)	4.5±1.5*	5.4±2.5	9.6±2.5	8.6±2.5	=0.045 vs Group 3
Respiratory Support (h)	9±3	12.1±3	12.5±3	11.3±3	>0.05
Cardioplegia Volume (mL)	1250±100	1300±100	1280±100	2850±120*	0.01
ICU Stay (days)	1.2±0.5	1.4±0.5	1.7±0.5	1.6±0.5	>0.05
Hospital Stay (days)	6±1	6.2±1	6.9±1	6.4±1	>0.05

M-HTK (modified histidine–tryptophan–ketoglutarate solution), DNC (del Nido cardioplegia) BC (4:1 blood cardioplegia), RBC (red blood cell), FFP(fresh frozen plasma)

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Conclusion

- M-HTK provided safe and acceptable myocardial protection in a preliminary study with limited population
- Potential concerns represented by hemodilution and increased transfusion were well controlled
- Further studies with larger patient population are warranted

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