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Rate Of Cooling In Organ Preservation

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Introduction

The importance of slowing metabolism by reducing the temperature through adequate perfusion is a fundamental paradigm of organ preservation. This study aimed to measure the efficiency of cooling using different preservation solutions and to determine whether flushing an organ at a normothermic temperature prior to hypothermia had any beneficial effects on the rate of cooling.

Methods

Porcine kidneys (n = 4) were retrieved and temperature probes placed at two depths within the kidney, 20mm and 5mm. Kidneys were infused at a hydrostatic pressure of 100 cmH₂O with either 500ml UW 4°C, 500ml Soltran 4°C or 250ml AQIX® RS-I 30°C immediately followed by 250ml AQIX® RS-I 4°C. The temperature and rate of flow were recorded throughout.

Results

The rate of perfusion with UW solution was significantly lower than both Soltran and AQIX® RS-I, 5 ± 1.3 vs 12 ± 3.9 vs 13.4 ± 3.2 ml/min/100g respectively (P = 0.018). Kidneys flushed with Soltran reached 10°C at a significantly faster rate than AQIX® RS-I at depth of both 20mm and 5mm (Table 1). Overall there was no significant difference between the rate of temperature fall in the groups during the hypothermic flush at either depth (P = 0.115, 0.118, respectively).

Group	20mm	5mm
UW	16.8 ± 2.2	16 ± 3.7
AQIX	$21.5 \pm 4.0^*$	$21.8 \pm 4.4^*$
SOLTRAN	$11.5 \pm 4.9^*$	$10.8 \pm 3.6^*$

* P value <0.029; < 0.026

Table1. Duration for the kidney to reach 10°C (minutes)

Discussion

Flushing the kidney normothermically before a hypothermic flush did not increase the rate of cooling compared to traditional hypothermic solutions. Despite the viscosity of UW and slower perfusion the rate, temperature fall was equivalent to both that of Soltran and AQIX® RS-I.