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Glucose Monitoring on CPB

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Serum glucose levels rise during cardiopulmonary bypass (CPB). This appears to be regardless of temperature during CPB. The cause of this rise is multifactorial but there are two prime areas of cause;

1. increased transformation of glycogen to glucose as a response to stress
2. decreased insulin secretion secondary to surgery, anesthesia and hypothermia.

It has been shown in many publications that hyperglycemia can cause increased cerebral injury when the brain is ischemic, increased propensity for wound infection, increased propensity for renal dysfunction post-operatively, and other complications. Many units don't routinely monitor blood sugar levels (BSL) during CPB and many more only on known diabetic patients.

METHODS

We retrospectively analyzed 2095 consecutive CPB cases performed during 2003–4. We reviewed at gender, age, diabetic status, requirement for insulin, highest, lowest and mean BSL recorded at four time points (post-heparin pre-CPB, 5', 30' and 60' into CPB), and percentage of cases with a BSL > 8.0 mmol/l.

RESULTS

In over 8000 tests, no patient recorded a BSL < 3.0 mmol/l, i.e., hypoglycemia. The lowest BSL recorded was 3.9 mmol/l.

Pre-CPB 19% of non-diabetic patients recorded a BSL > 8.0 mmol/l. Twenty-seven percent of diabetic patients had a BSL > 8.0 mmol/l at this point.

At CPB+5' this fell to 17% and 24% respectively, most likely due to dilution with the pump prime. All age group's BSL either fell or remained at pre-CPB levels except the <50 year-old group where the BSL almost doubled from 21% to 39% and 25%–40% respectively.

At CPB+30' 45% of all non-diabetic patients recorded a BSL > 8.0 mmol/l (48% for diabetics).

At CPB+60' 72% of all non-diabetic patients recorded a BSL > 8.0 mmol/l, the percentages were higher for the diabetic patients (82%). This was despite insulin treatment in many of these patients.

Further, this rise in BSL was seen across all age groups and both genders. Interestingly the highest rise in BSL was seen in the under 50 years of age group at all time points and in both diabetics and non-diabetics.

CONCLUSION

This retrospective audit has demonstrated the difficulty in effective control of blood glucose and the need to monitor BSL carefully in all patients during CPB.

Review on the Usage of Mannitol During Cardiopulmonary Bypass

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INTRODUCTION

Mannitol is an inert, undissociated six-carbon polyhydric alcohol. It is an osmotic diuretic. Mannitol is used during cardiac surgery as it improves renal blood flow, minimizes extra vascular fluid shifts and reduces positive fluid balance.

METHODS

A retrospective analysis was performed on the usage of mannitol during cardiopulmonary bypass. Mannitol was not used as a constituent of the prime, however was administered during cardiopulmonary bypass, at the discretion of the perfusionist, to augment diuresis and to minimize fluid movement to the extra vascular space. Data was collected from sixty-five consecutive patients who underwent routine cardiopulmonary bypass procedures. The patients were divided into two groups. Group A did not receive any mannitol during the surgery; Group B received 0.25 g/kg body weight mannitol during surgery. The parameters analyzed were age, pre operative hemoglobin, weight, renal function, intra operative hemoglobin, bypass time, urine output, volume added during bypass and the fluid balance. Statistical analysis was performed with SPSS for windows V 13.

RESULTS

32 patients (group A) did not receive any mannitol. 33 patients (group B) received mannitol. The demographics show that the two groups were similar in all respects except for the bypass time ($p < 0.05$), which was significantly longer in group B (88.1 vs. 109.8 mins).

	Group A (no Mann)	Group B (Mann)	p Value
Age	64.9 (±12.5)	69.4 (±12)	0.14
Hb (pre-op)	134 (±18.4)	137.8 (±17.4)	0.40
Weight	79.5 (±14.4)	78.6 (±14.6)	0.79
Urea	7.23 (±2.9)	9.2 (±12.1)	0.36
Creatinine	89.4 (±31.8)	91.8 (±28.8)	0.76
Fluid balance	3131.3 (±840.0)	3341.9 (±1064.4)	0.38
Bypass time	88.09 (±23.2)	109.8 (±41.9)	0.01
Urine output	725 (±467.3)	806.7 (±516)	0.51
Hb (bypass)	76.1 (±15.3)	77.7 (±12.1)	0.63