Review of 113 Anaesthetics for Patients Undergoing Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy (HIPEC)

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Background

Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are the treatment of choice for selected patients with peritoneal carcinomatosis, which was previously a lethal condition with dismal survival rate. CRS aims to remove macroscopic disease while HIPEC works synergistically by removing microscopic tumour load at 42-43C.

Methods

We reviewed all CRS and HIPEC procedures performed in Singapore General Hospital/ National Cancer Centre from January 1997 to December 2012, with a focus on perioperative events and anaesthetic implications.

Results

In total, 111 patients underwent 113 procedures. Mean age of patients was 51.7 ± 11.6. Postoperatively, 78.8% of patients required intensive care. Median length of ICU stay was 2 days. 75.2% (85) required post-operative ventilator support, of which 69.4% (59) and 12.9% (11) were extubated on the first and second postoperative days. Patients with lower PCI scores (7 vs 17) were more likely to be extubated immediately post-operation (P<0.05). Patients with a longer HIPEC duration (63 vs 58 minutes) were more likely to have post-operative coagulopathy. Median duration to discharge from hospital was 14 days. Patients who required longer hospitalization (>14 days) had longer durations of surgery (603 vs 498 minutes) than those who had shorter hospitalization stay (P<0.05).

Table 1. Demographics of patients undergoing CRS and HIPEC (n=113)

Variable	Number (%)
ASA status	
I	62 (54.9%)
II	45 (39.8%)
III	6 (5.3%)
Primary Tumour	
Ovarian	43 (38.1%)
Colorectal	35 (31.0%)
Appendix Mucinous Adenocarcinoma	12 (10.6%)
Pseudomyxoma peritonei	11 (9.7%)
Mesothelioma	8 (7.1%)
Primary peritoneal carcinoma	3 (2.7%)
Gastric carcinoma	1 (0.9%)
Gender	
Male	18 (15.9%)
Female	95 (84.1%)
Ischaemic heart disease	
Yes	3 (2.7%)
No	110 (97.3%)

Conclusion

The combination of CRS and HIPEC is a major complex procedure with significant morbidity and many anaesthetic considerations. Many patients who present for surgery are relatively young and without significant comorbidity, but the extensive procedure will result in multisystem derangements that include the cardiorespiratory system, fluid and acid base balance as well as body temperature. Our study has highlighted some of the perioperative concerns associated with CRS and HIPEC. The development of an optimal anaesthetic technique in conjunction with evidence-based medicine may improve outcomes in this group of patients.

References

1. Teo M. Peritoneal-based malignancies and their treatment. Ann Acad Med Singapore 2010; 39: 54-7
2. Bryant J. Systematic review of the Sugarbaker procedure for pseudomyxoma perionei. Br J. Surg 2005; 92: 153-8

Table 2. Intraoperative variables

Intraoperative Variable	Mean ± Standard deviation
Surgery duration	9 Hr 10 min ± 2 hr 56 min
Peritoneal Cancer Index Score	14.3 ± 8.9
Estimated Blood loss (ml)	1481 ± 1064
Hourly Urine output (ml/kg/hr)	1.6 ± 1.0
Crystalloid administered (ml)	5852 ± 2912
Total IV and blood products administered (ml)	8498 ± 3941
Intravenous morphine administered (mg/kg)	0.4 ± 0.2
Blood product/colloid administered	
Blood (ml) (n=87; 77.0%)	1089 ± 722
FFP (ml) (n=21; 18.6%)	604 ± 243
Platelet (ml) (n=7; 6.2%)	476 ± 279
Cryoprecipitate (ml) (n=1; 0.9%)	150
Total colloids (ml) (n= 88; 77.9%)	1790 ± 1309
Temperature	
At the start	35.6 ± 0.6
Minimum Intraop Temperature	35.0 ± 0.7
Maximum Intraop Temperature	37.4 ± 0.8
Temperature at end of surgery	36.8 ± 0.9
Temperature difference (end of surgery to start)	1.2 ± 1.0
Peak airway pressure (cmH2O)	
Minimum	17.4 ± 2.8
Maximum	25.8 ± 5.1
Change	8.4 ± 4.4
Final pH	7.33 ± 0.07
Final Base excess	-5.33 ± 2.89

Table 3. Other perioperative events (n=113)

Variable	Number (%)
Intraoperative Hourly Urine output	
< 0.5ml/kg/hour	3 (3.3%)
> 0.5ml/kg/hour	88 (96.7%)
Temperature at end of surgery	
< 36.0	12 (12.6%)
36.0–37.4	62 (65.3%)
> 37.4	21 (22.1%)
Postoperative discharge disposition	
Intensive care unit	89 (78.8%)
Intermediate care unit	18 (15.9%)
High dependency area	5 (4.4%)
Postoperative extubation	
Immediately post surgery	28 (24.8%)
First postoperative day	59 (52.2%)
Second postoperative day	11 (9.7%)
≥Third postoperative day	15 (13.3%)
Death during same admission	
Yes	2 (1.8%)
No	111 (98.2%)
Number of chest tubes inserted	
0	37 (32.7%)
1	23 (20.4%)
2	53 (46.9%)
Postoperative coagulopathy	
Elevated prothrombin time	79 (79.0%)
Elevated activated prothrombin time	44 (44.0%)
Postoperative renal impairment	6 (5.6%)