



Figure 1 – Antibiotic use by procedure

References

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Antibiotic Prophylaxis in the cardiac catheter laboratory – a two year audit

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Infective endocarditis (IE) has been curable for more than fifty years, yet the diagnosis is still missed and the disease poorly treated. It has a mortality of 20%. The incidence has remained for the last 40 years at approximately 1500 cases per year in the UK. There is no Class I evidence to support antibiotic prophylaxis as a treatment which reduces the risk / incidence of IE. For patients considered high risk who are undergoing risk-associated procedures antibiotic prophylaxis should be given as recommended by international consensus opinion [1,2]. This practice should be audited regularly.

Methods

We reviewed the case notes of all adult patients undergoing a cardiac catheter procedure or electrophysiological study (EPS) with general anaesthesia / sedation, supervised by an anaesthetist, over a 2 year period (June 2002–June 2004) National and International consensus guidelines [1,2] were used to identify which patients should have been given antibiotic prophylaxis for such procedures.

Results

N = 893. 13% of EPS/Ablations received antibiotics against audit standard. 50% of patients received antibiotics for routine catheterisation against audit standard. 15% of PPM/Defibrillators are inserted without antibiotics against audit standard. 25% Device closures receive no antibiotics against audit standard. 35% of patients receiving PTCA receive antibiotics against audit standard.

Discussion

Given that the majority of the patient population studied were adults with congenital heart disease and therefore at high risk of developing endocarditis, the results of this audit have identified a prescribing practice, which deviates significantly from current accepted guidelines and is sub-optimal. Furthermore, the corollary of which is that when one considers the significant present –day problems of antimicrobial resistance in addition to the uncommon but often fatal risk of anaphylaxis, there was an equally worrying tendency to over prescribe antibiotics for procedures where endocarditis prophylaxis was not indicated. Following this audit our hospital has published new guidelines for the administration of antibiotic prophylaxis for cardiological procedures undertaken in the catheter and EP lab, in line with new National guidelines. A re-audit will be undertaken in 12 months time.

The effects of aprotinin on standard tests of coagulation

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We have assessed the effect of aprotinin on standard tests of coagulation using data obtained during a previous blood conservation trial [1].

Methods

The celite activated clotting time (ACT), activated partial thromboplastin ratio (APTR) and international normalised ratio (INR) from a total of 120 patients (60 patients in each group) were analysed. All the patients received either 'Hammersmith dose' aprotinin or equivalent volumes of normal saline (Placebo group). The coagulation tests were performed following separation from CPB and the administration of protamine and cell saved blood. The volumes of cell saved blood returned to the patients, duration of CPB, cross clamp time and the platelet count were similar between the groups.

Results

The results are summarised in table 1. P values for the difference between medians have been calculated using the Mann-Whitney test with a 2 tailed P quoted (95% CI for the difference in medians calculated according to the Hodges-Lehman method).

Table 1: Standard tests of coagulation results for each group

Test	Aprotinin group Median (IQR)	Placebo group Median (IQR)	P value for difference between the medians	95% CI for difference between the medians
ACT	144.5secs (135-152)	137secs (129-152)	0.045	0 - 12
INR	1.6 (1.5- 1.7)	1.6 (1.5 - 1.8)	0.527	-0.1- 0
APTR	1.59 (1.45-1.73)	1.14 (1.0-1.32)	< 0.0001	0.3- 0.5

Discussion. A significant increase in APTR together with a small increase in the activated clotting time was demonstrated in patients who received aprotinin. In our study this apparent 'coagulopathy' in the Aprotinin group was in the context of markedly less total blood loss (median of 460 v. 860 ml) and a lower transfusion rate (mean of 0.48 v. 2.43 units). Knowledge of this effect of aprotinin is important if decisions on transfusion of coagulation products are to be appropriate.

References

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BIS Guided Induction in Flow Restricted Heart Valve Lesions

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Bispectral Index (BIS) is a processed EEG variable, which correlates with the depth of hypnosis during anaesthesia [1]. We used this parameter to monitor the time required to achieve anaesthesia in patients having severe mitral stenosis, regurgitation or mixed lesions and aortic stenosis compared with age and weight matched controls.

Methods

45 patients were randomized to three valve groups (Gr.1, Gr.2, Gr.4) and another group of 15 prospective, age and weight matched, non-cardiac ASA 1 patients was selected for comparisons (Gr.3). The induction agent was thiopentone sodium in Gr.1, high dose Opioid in Gr.2 and Propofol in Gr.4. The control group was anaesthetized with propofol only. The premedication and monitoring until induction and intubation was same in all patients. Blood pressure changes were only treated with 15-degree head down tilt and 3-4 ml.kg⁻¹ of normal saline. The BIS, Mean blood pressure (MBP), heart rate (HR), systolic pulmonary artery pressure (PAP) and cardiac index (CI), were recorded. The readings were taken at baseline, 30 seconds, 1,2,3,5 and 7 minutes after giving full induction dose. Time to attain BIS 60 was noted. If BIS did not attain level of 60 in 7 minutes thiopentone sodium (1 mg.kg⁻¹) was given as rescue. Analysis was done with SPSS version 10. Data is presented as mean and SD. ANOVA was used to compare demographics. ANOVA (Repeated measures) was used to compare changes in BIS with time amongst groups. ANOVA was used to compare time to BIS 60 among the four groups. For Post Hoc comparisons Scheffe test was used. Bivariate Pearson Correlation was used to find out the most related factor. Chi-square was used to compare use of rescue drug. P<0.05 was taken as significant.

Results

Demographically the groups were similar. Base line BIS (p=0.05) was same in all groups. B HR, B MBP, B CI and BPAP had no significant difference in Gr.1, 2 and 4 but the control group 3 showed significant difference (p= 0.001, 0.000, 0.005, 0.000). Time to BIS 60 (seconds) was (Gr.1 159.4 (114.5); Gr.2 224.3(184.6); Gr.4 109(43.9) and in control 48.5(4.5) with a P= 0.001. Mean change in BIS with time was similar in Gr.1 and Gr.2 and it differed from control p= 0.004 and 0.000. Gr.4 showed non-significant difference with control (p= 0.06). Of all the factors BPAP and LA volume correlated with BIS 60 (Sig. 0.04, r 0.499, Sig 0.05, r 0.468). In Gr.2 and Gr.1 rescue was needed in 4 and 1 cases respectively (p = 0.03).

Conclusions

Flow restricted heart valve lesions delay the attainment of BIS 60. During induction with high dose fentanyl BIS 60 is attained at a longer time therefore it seems not to be a good choice for induction in sick patients with flow restricted valve lesions. Induction with propofol seems to compare well with that of patients with normal hearts. Use of BIS may reduce the incidence of awareness.

Reference

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Use of Continuous Venovenous Haemofiltration for reversal of anticoagulation with Lepirudin post cardiopulmonary bypass in a patient with Heparin induced Thrombocytopenia after orthoptic heart transplantation – a case report

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A number of anticoagulation strategies have been used in patients with heparin induced thrombocytopenia syndrome (HITS) to perform cardiopulmonary bypass (CPB). They include direct thrombin inhibitors such as Hirudin, Argatroban and Bivalirudin, direct factor Xa inhibitors such as Danaproid and Heparin either as sole agents or in combination with platelet inhibitors [1]. The choice of the anticoagulant depends on the availability of the drug, monitoring facilities, availability of reversal agents, cost and personal experience.

Case report

We report the management of anticoagulation in a 55 year old woman with proven HITS who underwent allogenic cardiac transplantation. Her previous medical history included uneventful mitral valve surgery and chronic renal dysfunction with a creatinine clearance of 23 ml.min⁻¹. The management of refractory heart failure included treatment with inotropes and an intra-aortic balloon pump (IABP). She underwent heart transplantation after 5 days of maximal treatment. Lepirudin was used for anticoagulation to perform CPB. We monitored anticoagulation with the Ecarin clotting time (ECT). When the ECT remained elevated (5 g.ml⁻¹) one hour after weaning the patient from bypass we used continuous venovenous haemofiltration (CVVH) with a polyethylsulphone membrane filter (Edwards Lifesciences) to reduce plasma hirudin concentrations. The patient's chest was closed once the ECT dropped to 3 g.ml⁻¹. CVVH was continued post-operatively until the filter membrane clotted spontaneously.

Discussion

We chose to use Lepirudin as it is readily available in our institution and we have experience in using it during cardiac surgery. Its half life can be prolonged in the face of a decreased creatinine clearance as its elimination depends on renal function. Haemofiltration using high flux membranes has been used successfully in eliminating Lepirudin [2]. Polyethylsulphone membranes are high flux membranes with a pore size of 56,000 daltons. Recombinant Hirudin can be used successfully for anticoagulation in high risk patients and we recommend early use of haemofiltration with high flux filters in patients with renal impairment.

References

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Should we optimize patients' pre-operative Haemoglobin concentrations prior to elective cardiac surgery to reduce allogeneic blood product use?

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Background

We wished to identify the influence of pre-operative haemoglobin (Hb) concentration for elective cardiac surgery on allogeneic blood use. Having identified a value below which allogeneic blood use is significantly increased, we raise the question of increasing Hb concentration before surgery to reduce the need for allogeneic blood.

Methods

Data were obtained from clinical audit. Allogeneic blood use was increased when pre-operative Hb < 13g.dl⁻¹ in men and <12g.dl⁻¹ in women. Should we be treating these patients pre-operatively? Most patients had full blood count taken 3 weeks before surgery.

Results

We saw little difference in allogeneic blood use in men with a pre-operative Hb of 12g/dl and 13g/dl locally and agreed a trigger of 12g/dl in men and women. The critical pre-operative Hb concentration at which the use of surgical allogeneic blood is increased significantly locally is <12g/dl (Table 1).

Table 1

Pre-op Hb Men & women Apr- Aug 2005)	Hb ≥12g/dl	Hb <12g/dl	P
No. patients identified	240(87.9%)	33(12.1%)	
No. <u>not</u> requiring allogeneic blood	189(78.8%)	9(27.3%)	<0.001
No. requiring allogeneic blood	51(21.2%)	24(72.7%)	<0.001
Range of units transfused	1-12	1-4	
Median units transfused	2	2	

Discussion

The next stage within this study is to treat patients with anaemia of chronic disease with oral iron and Erythropoietin (EPO), to increase the pre-operative Hb to 12g/dl and observe the effect on blood product use; assess its cost effectiveness, safety and efficacy. This could potentially reduce the incidence of transfusion to < 22%. A proposal is being developed to treat patients with 3 weekly doses of 10,000iu EPO ± intravenous iron if the patients have identified iron store depletion. However the use of EPO for pre-operative optimization in cardiac surgery is currently unlicensed within the UK, unless used within an autologous pre-deposit programme. Evidence from previous study demonstrates its effect [1]; in the light of proposed shortages in the supply of blood; more studies are urgently required regarding the use and optimal dosing regimes of EPO within pre-operative cardiothoracic patients.

Reference

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Outcome of a multifaceted and interdisciplinary blood conservation strategy within Cardio-thoracic Surgery

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Background

Historically we were a high user of blood products; with no strategy. The hospital has recently appointed a Transfusion Nurse Specialist. We studied effects of a blood conservation strategy within adult Cardio-thoracic surgery.

Methods

The strategy was based upon a treatment algorithm with specific aims of:

- Identification of pre-operative anaemia
- Reducing the maximum surgical blood ordering schedule
- Reducing cardiopulmonary bypass prime (when CPB used)
- Reducing peri-operative blood loss, through the use of high dose Aprotinin and intra-operative cell salvage were appropriate
- Adhering to restrictive transfusion triggers

It was supported by an education programme to all departmental nursing and medical staff. Clinical audit monitored effects of the strategy prior to and following implementation; and analyzed using the score test. Data were gathered on all patients undergoing all categories of major thoracic and cardiac surgery.

Results

A statistically significant reduction in the use of blood products was demonstrated following implementation of the strategy (Table 1). (Cryoprecipitate use was not included within the data, as it is rarely used). The reduction in the allogeneic transfusion did not affect mortality rates; before implementation: 3.23%, after 2.09%.

Table 1 Blood audit

Blood product	Number units used Dec 04- Mar 05	Mean product use/case (n=465)	Number units used Apr 05- Jul 05	Mean product use/case (n=479)	P value
Red cells	622	1.34	401	0.84	<0.001
FFP	259	0.56	181	0.38	<0.001
Platelets	94	0.20	68	0.14	=0.026

Discussion

The implementation of a multifaceted and multi-disciplinary blood conservation strategy within adult cardio-thoracic surgery significantly reduces allogeneic blood product use. Our findings confirm other studies supporting the use of standardized treatment algorithms reduce the use of allogeneic blood products within adult cardio-thoracic surgery [1]. Future work will continue to explore ways to further reduce blood usage.

References

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In Vitro performance of the O₂ Sat monitor

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A working party, representing clinicians and perfusionists, has published recommendations on monitoring and alarms to be used during cardiopulmonary bypass. The continuous monitoring of arterial and venous line saturation is included in these recommendations. This study looks at a new monitor to make non-invasive measurements of saturation during cardiopulmonary bypass.

Methods

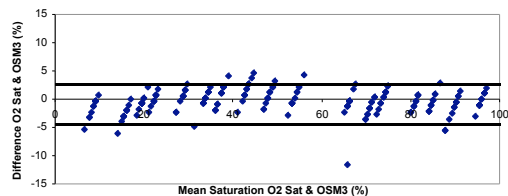
A circuit was set up to simulate an adult bypass circuit and primed with 500mls of re-suspended red cells in saline (SAGM). Flow was maintained at a steady rate of 0.5 lpm and temperature at 36.5°C. Saturations within the loop were varied from 5-95% using mixtures of oxygen and nitrogen. Six O₂ Sat monitors (Spectrum medical LLP, Cheltenham, UK) were attached to the 3/8 inch portion of the circuit according to manufacturer's instructions.

A CCO combo thermodilution / saturation catheter (Edwards Lifesciences, USA) inserted into the circuit measured blood temperature and showed a trend for the saturation measured. 0.5 ml blood samples were aspirated when stable saturation had been achieved and analysed using an OSM3 CO-oximeter (Radiometer, Copenhagen)

Results

The measurements yielded 204-paired readings. The data were analyzed using the method described by Bland & Altman.

Figure 1



Discussion

The results demonstrate that the O₂ Sat monitor is capable of measuring the saturation of blood over a wide range of saturations with clinically acceptable accuracy and precision.

The absence of any cuvette and the need for user calibration makes this an attractive monitor for use during cardiopulmonary bypass.

References

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Declaration: Dr Clutton-Brock is the clinical partner at Spectrum Medical LLP.

Postal survey of training in paediatric cardiac anaesthesia

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There are no national standards for training in paediatric cardiac anaesthesia despite the recommendations [1,2] and a survey of the profession [3]. Now, competency-based training and the European Working Time Directive have been introduced. Trainees see fewer cases, and progress through training by achieving defined competencies. We surveyed consultant paediatric cardiac anaesthetists, to establish the training they had undergone, components they consider important, and whether there should be guidelines for training in the speciality.

Methods

UK consultant paediatric cardiac anaesthetists were sent a postal questionnaire.

Results

We received 33 replies to 67 questionnaires (49% response rate). 52% (17/33) had a mixed adult / paediatric cardiac practice and the remaining 48% (16/33) did no adult cardiac anaesthesia. 27% (9/33) had no paediatric cardiac sessions in their first consultant post.

Table 1 Comparison of consultants' training with recommendations for training in paediatric cardiac anaesthesia. Median (range).

Anaesthesia / ICU	Training prior to consultant appointment (months)	Recommended training (months)
General paediatric	18 (6 – 42)	12 (6 – 12)
Paediatric cardiac	6 (1.5 – 24)	6 (4 – 12)
Paediatric ICU	6 (0 – 33)	6 (3 – 6)
Adult cardiac	6 (0 – 13) no adult cardiac now 12 (3–36) mixed practice now	6 (3 – 12)

TOE skills and overseas experience were rated as desirable or essential by 55% and 73% of respondents respectively. Experience of cardiac catheter lists, attendance at case conferences, familiarity with paediatric cardiology and experience of ECMO and ventricular assist devices were also suggested as important features of training. 73% (24/33) of respondents want the Royal College of Anaesthetists to establish guidelines on training: all wanted the Association of Cardiothoracic Anaesthetists, and 83% (20/24) want the Association of Paediatric Anaesthetists, to be involved in their design.

Discussion

There is consensus about standards for training in paediatric cardiac anaesthesia and most consultants would like to see these formalised. Although such standards would only apply to a small number of trainees, standards are nevertheless important because they provide motivation and direction for learning, facilitate judgement of the adequacy of training programs, and provide a basis for assessment.

References

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Does early circulatory failure after a Glenn operation predict early circulatory failure after a Fontan operation?

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We performed a retrospective audit of notes and PICU charts of the patients who had their first total cavopulmonary connection operation (TCPC or Fontan) at the Bristol Children's Hospital from 1999 to 2004. We wanted to establish whether early circulatory failure (ECF) after a bidirectional cavopulmonary (Glenn) connection, or other factors, predicted similar problems at the time of the TCPC.

Methods

Data was collected for 32 patients who had a TCPC as the final part of a planned, staged palliation of a system with a functionally single ventricle. Data was also collected for their previous surgical procedure, which was, in 87% (26/30) of patients, a Glenn procedure. Two patients had their Glenn procedure at another hospital. ECF after either operation was defined as a PICU stay of more than 120 hours, together with at least two of: more than 48 hours on inotropes, more than 24 hours ventilation, and renal failure requiring dialysis. This definition attempts to exclude those patients who remained on PICU for other reasons (for example sepsis, or lack of a ward bed.)

Results

Table 1 PICU data for all patients after Glenn and Fontan operations. Median (interquartile range).

	Post Glenn (n=30)	Post Fontan (n=32)	p
Ventilation (hours)	21.3 (5.1 – 26.0)	23.3 (6.8 – 48.3)	0.56
Inotropes (hours)	25.3 (19.3 – 48.0)	48.0 (45.3 – 72.5)	0.0007
PICU stay (hours)	46.8 (41.0 – 66.0)	84.8 (60.5 – 140.3)	0.009
Incidence of ECF	5 (17%)	8 (25%)	0.42

Five patients had ECF after their Glenn, of whom three (60%) went on to have ECF after their TCPC. Conversely, of the eight patients who had ECF after their TCPC, five patients (62%) had had a relatively uneventful course after their Glenn. The median age of the eight TCPC patients with ECF was 5.2 years (4.32-7.43). This was not significantly higher than the median age of the 24 patients without ECF, which was 4.35 (3.5-5.0) years (p=0.12). Four patients had a fenestrated TCPC, of whom three (75%) had ECF. Renal failure and sepsis were both more common in the TCPC series: 19% (6/32) vs 3% (1/30) and 50% (16/32) vs 40% (12/30) respectively. p>0.05 in both cases (χ^2 test).

Discussion

As 60% of the patients with ECF after their Glenn developed ECF after their Fontan, it appears that ECF after a Glenn does predict ECF after a Fontan, although the numbers are too small to achieve statistical significance. ECF after a Glenn may be a useful factor to consider, together with a patient's anatomy and haemodynamics, in deciding on their suitability for and perioperative risk of a Fontan.

The effects of Aprotinin on the Heparinase Thrombelastogram

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The thrombelastogram (TEG) gives a quantitative and dynamic analysis of the coagulation process in vitro. We have assessed the effect of aprotinin on celite activated TEG parameters with reference to data obtained during a blood conservation trial previously described [1].

Methods

Heparinase TEG data from a total of 120 patients presenting for cardiac surgery were analysed. Patients received either a standard 'Hammersmith' dose of aprotinin or equivalent volumes of saline. Following protamine and intra-operative cell salvaged (ICS) blood, TEG analysis was performed using celite activation and heparinase in standard cuvettes.

Results

The TEG results are summarised in table 1. P values for the difference between medians have been calculated using the Mann-Whitney test with a 2 tailed p quoted (95% CI for the difference in medians calculated according to the Hodges-Lehman method). Duration of CPB, cross clamp time, ICS volume and the platelet count were similar between the groups.

Table 1 Heparinase TEG results for each group – as median (IQR)

	Placebo (n=60)	Aprotinin (n=60)	P value for difference	95% CI for difference
Reaction time (min)	4.9 (4.1 – 6.0)	6.2 (5.25 – 6.8)	P< 0. 0001	0.6 to 1.7
K Time (min)	2.1 (1.8 – 2.5)	2.2 (1.8 – 2.5)	P< 0. 912	-0.3 to 0.2
Angle (degrees)	64.5 (58.3 to 69)	63 (60 to 68.5)	p< 0. 976	- 3 to 3
Maximum amplitude	55.5 mm (51.5 – 60)	58 mm (54.1 – 61)	p< 0. 048	0 to 4.5
Clot lysis in 30 min (%)	0.5 (0 – 1)	0.5 (0 – 2)	p< 0. 374	0 to 0.5

Discussion

A significant prolongation of the reaction time together with a trend in the reduction of the maximum amplitude was demonstrated in patients that received aprotinin. A similar effect upon standard TEG has been described before [2]. In our study this apparent coagulopathy in the aprotinin group was in the context of markedly less total blood loss and a lower transfusion rate. Ignorance of this effect of aprotinin might lead to inappropriate transfusion of coagulation products.

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The effects of high thoracic epidural on glycaemic control and insulin requirement after on-pump coronary artery bypass surgery.

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Introduction

Hyperglycaemia and insulin resistance are common after cardiac surgery even in patients without diabetes [1]. Glycaemic control with intensive insulin therapy has been associated with better outcome. Thoracic epidural blockade can abolish the stress response, but has not been shown to improve postoperative glycaemic control [2].

Methods

We studied retrospectively two patient groups who had undergone on-pump coronary artery bypass surgery during the calendar year 2004. 50 patients had a high thoracic epidural catheter sited immediately prior to surgery and were given a postoperative infusion of bupivacaine 0.15% with fentanyl 2 µg.ml⁻¹. 50 patients had conventional moderate dose fentanyl anaesthesia with postoperative morphine analgesia. Blood glucose concentration and insulin infusion rate were recorded every 3 hours for 24 hours postoperatively.

Results

13 patients were excluded from each group because they were either on adrenaline infusion or were diabetic.

	Epidural group	Fentanyl group
Insulin required	14(37.8%)	33(89.1%)
No insulin	23(62.1%)	4(10.8%)
Mean blood glucose (SD)[95%CI]	7.71(0.82) [7.47-7.94]	8.33(1.23) [7.98-8.68]

Blood glucose concentrations were significantly, lower in the epidural group. The number of patients requiring no insulin was significantly greater in the Epidural group with 23 patients as compared to Fentanyl group 4 patients; p=0.000007360438 (Fisher's exact test).

Conclusion

High thoracic epidural helps to provide better glycaemic control postoperatively in cardiac surgical with most patients requiring no insulin and avoiding the risk of hypoglycaemia, which is a feature in patients managed by aggressive insulin regimes. Larger studies are needed to determine if this beneficial effect leads to lower morbidity.

References:

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during surgery may cause epicardial damage, which may be reflected by ST segment changes. Furthermore, OPCABG involves blowing carbon dioxide onto the coronary vessels to remove blood from the operative field. This may result in surface drying and promote epicardial damage resulting in widespread ECG ST segment changes.

Conclusion

Patients undergoing OPCABG have a high incidence of multi-lead, non-specific ST segment elevation. The most likely mechanism is epicardial damage as a result of surface drying and manipulation.

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Post-operative ECG ST segment elevation in on-pump versus off-pump Coronary Artery Bypass Graft surgery.

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We compared non-specific ECG abnormalities (ST segment elevation) in patients who had undergone coronary artery bypass grafting surgery (CABG). We compared ECGs on day 1 post CABG of those patients done on cardiopulmonary bypass (ONCABG) and those done off pump (OPCABG). We had observed that patients who had undergone OPCABG seemed to have a higher incidence of multi-lead, non-specific ST segment elevation on ECG than those done using CPB (ONCABG).

Methods

In a single centre study, all patients who had undergone CABG surgery for a six week period had their 12-lead ECG analysed for ST segment changes on day 1 after operation. There were a total of 77 patients, 38 who underwent OPCABG and 39 who underwent ONCABG. The ECGs were analysed for ST segment elevation (by Marquette monitor) and clinically by 2 anaesthetists at 0800 on the morning following surgery. The anaesthetists analysing the ECG were blinded as to whether the patient had their surgery on or off pump. Patients either did or did not have multi-lead (five or more) non-specific ST segment elevation.

Results

Patients with ST segment elevation who underwent ONCABG and those who underwent OPCABG were compared with those with no ST segment elevation using a chi squared test. Those who had their CABG off pump had more ST segment elevation (55.3% 21/38) compared with those who had their CABG on pump (12.8% 5/39) $P < 0.001$.

Table 1.

	ST elevation	No ST elevation	Total
On pump	5	34	39
Off pump	21	17	38
Total	26	51	77

Discussion

Patients who underwent OPCABG had more multi-lead, non-specific ST segment elevation than those who underwent ONCABG. This ST elevation was not associated with any adverse outcomes. We do not know the reasons or mechanisms for this significant increase in ST segment elevation in OPCABG surgery, but can only speculate. ST segment elevation occurs with transmural injuries or with epicardial damage. The widespread, non-specific changes observed make transmural ischaemic unlikely and studies [1] have shown that OPCABG surgery results in significantly less cumulative release of serum troponin I than ONCABG surgery. Czerny et al.[2] showed significantly reduced completeness of revascularization for off-pump versus on-pump reporting that twenty-six of 40 (65%) patients undergoing CABG without CPB underwent complete revascularization whereas in the group of patients operated on with CPB, 34 of 40 patients (85%) received complete revascularization. Again, the widespread, non-specific changes observed make regional ischaemia unlikely.

Epicardial damage would seem to be the most likely mechanism. Lifting and manipulating the heart for access to coronary vessels

Effect of positive end expiratory pressure on the respiratory profile during one-lung ventilation for thoracotomy

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Application of PEEP during one lung ventilation OLV may increase physiological shunt from the dependant lung to the non-dependant lung, affecting oxygenation adversely. There is conflicting evidence for this [1, 2]. We hypothesised that the use of PEEP may increase lung compliance, reduce physiological deadspace and improve intraoperative and postoperative oxygenation.

Methods

This was a randomised controlled trial which measured effects of 4 PEEP pressures (2.5, 5, 8, 10 cmH₂O) on the dependant lung on dynamic compliance, physiological deadspace and oxygenation during OLV. Respiratory parameters were measured using a mainstream infrared capnograph and fixed orifice pneumotachograph (CO₂SMO Plus Respiratory Profile Monitor Novamatrix Medical Systems, Wallingford, CT, USA) and computer software capable of both on-line and off line analysis. Patients undergoing elective open thoracotomy for lung resection were studied (n=42). There were 10 patients PEEP 2.5 group, 11 patients PEEP 5 group, 11 patients PEEP 8 group and 10 patients in PEEP 10 group. Baseline ventilator settings whilst on two lung ventilation was pressure controlled ventilation PCV with PEEP 5cm H₂O, Inspiratory Expiratory ratio 1:2, tidal volume 10ml/kg, respiratory rate to maintain the Et CO₂ at 5.0kPa and FiO₂ 0.5. Patient was turned lateral position and one lung ventilation was commence with ventilator setting as follows, PCV with randomized PEEP level, inspiratory expiratory ratio 1:2, tidal volume ≤ 10ml/Kg, respiratory rate to maintain Et CO₂ at 5.0kPa and FiO₂ 1.0 were used. Arterial blood gases was taken every 20 min whilst on OLV and once in recovery period.

Results

There were no differences between groups for age, weight, FEV₁ to FVC ratio, duration of surgery and OLV. During PEEP on OLV, dynamic lung compliance was not different between groups at 5 min (p=0.28), 20 min (p=0.50), 40 min (p=0.84) or 60 min (p=0.79). The physiological deadspace to tidal volume ratio was not different between groups at 20 min (p=0.90), 40 min (p=0.99) or 60 min (p=0.92). The intraoperative oxygenation was not significantly different between groups at 20 min (p=0.14), 40 min (p=0.49) or 60 min (p=0.45). Mean postoperative oxygenation values were better in the PEEP 5, 8 and 10 cm H₂O group in comparison to the PEEP 2.5cm H₂O but this was not statistically significant (p= 0.97).

Discussion

Routine application PEEP to the ventilated lung during one lung ventilation during open thoracotomy does not improve lung compliance, physiological dead space or intraoperative and postoperative oxygenation.

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Survey on Anaesthetic Specialist Training for Oesophagectomy

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A survey was conducted on Specialist Registrars in the West Midlands Region to find out the status on anaesthetic training for oesophagectomy.

Methods

Trainees were asked questions ranging from the number of procedures relating to oesophagectomy to rating their own ability to perform procedures. Likert scale (1-5) was used to rate trainee's own abilities with 1=poor, 3=average to 5= excellent.

Results

A. There was an overall response rate of 71%.

B. As table 1 demonstrates 69% of trainees were exposed to very limited one lung ventilation (≤ 5 /year) 31% of trainees had no experience.

C. Eighty-three percent (60/72) and 97% (70/72) of trainees rated themselves 3-5 in the capability of preoperative assessing patient's fitness for oesophagectomy and confidence in the correct placement of a thoracic epidural respectively. In the confidence with the principles of one-lung ventilation 76% (55/72) rated themselves 3-4. Seventy-three percent (53/72) rated themselves 3-4 in the degree of comfortable in dealing with the problems of one-lung ventilation.

Number of one lung ventilations in the last year	Range	0	1-5	6-10	>10
	Number trainees	22	28	11	11
Number of thoracic epidurals in the last year	Range	0	1-5	6-10	>10
	Number trainees	2	28	18	24
Oesophagectomies anaesthetized with direct supervision	Range	0	1-2	3-5	>5
	Number trainees	30	25	10	7
Oesophagectomies anaesthetized with indirect supervision	Range	0	1-2	3-5	>5
	Number trainees	59	10	2	1

Discussion

Elective oesophagectomy carries a risk of 40% morbidity and 10% hospital mortality [1]. Only 42% of trainees surveyed have accompanied consultants for an oesophagectomy and 18% of trainees had an opportunity to anaesthetise such cases without direct supervision. Nevertheless, half these trainees surveyed would like to obtain more training in this field of anaesthesia. We have identified a deficiency in anaesthetic training for oesophagectomy. We propose that oesophagectomy requires thoracic training module to ensure that trainees get a better exposure to the problems of one lung ventilation.

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Impact of 'ALERT' style teaching on incidence and outcome of ward arrests in a cardiothoracic hospital

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Prevention of cardiac arrest is better than cure. The ALERT (Acute Life-threatening Events – Recognition & Treatment) Course may help identify patients at risk of cardiac arrest [1]. There are few data on CPR outcomes in cardiothoracic wards and the value of ALERT style teaching has not previously been reported in this setting.

Methods

ALERT style training was introduced for Papworth nursing staff in late 2002. The audit was undertaken in two stages: 1. Prospective audit of all ward arrest ('2222') calls was undertaken over two 24-month periods before (April 2000-02) and after (April 2003-05) introduction of ALERT training. 2. Retrospective review of CPR audit forms, medical & nursing records by two senior anaesthetists and a ward sister to confirm: 1. Cardiac or respiratory arrest requiring BLS or ALS. 2. Physiological status of patient before arrest. 3. Presence or absence of nursing concern before arrest. 4. Appropriateness of medical response & resuscitation

Results

	2000-02	2003-05
Patients with confirmed arrest	102	93
Percentage VF/ VT arrests	26.5%	25.8%
Survival to discharge VF/VT arrests	51.8%	54.1%
Survival to discharge non VF/VT arrests	28.0%	27.5%
Nursing concern prior to arrest	54 of 102	46 of 90
	52.9%	51.1%
Appropriate nursing concern	53 of 54	45 of 46
Suboptimal medical response	24 of 53	16 of 45
	45.3%	35.5%
ICU delay or premature discharge	14	10
Should have considered 'DNAR'	6	1
Miscellaneous	4	5
Inappropriate lack of nursing concern or failure to seek medical advice	5 of 48	1 of 44
	10.4%	2.3%
*Total in-hospital deaths	378	356

*Angioplasty & cardiac surgical activity increased by 91% & 6% respectively between audit periods. Thoracic surgical activity & medical admissions reduced by 5.7% & 4.1% respectively. All 102 notes available for 2000-02. 90 of 93 available 2003-05.

Discussion

Despite increasing hospital activity, the numbers of patients with confirmed arrests and total in-hospital deaths fell during the audit period. ALERT training may improve detection of impending arrest by nurses. Failure to consider DNAR by medical staff has improved though delays instituting ICU referral remain a cause for concern.

Reference

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Anonymous Incident Monitoring Study in a Cardiac Surgical Intensive Care Unit; A pilot project

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Critical care units are well known to be complex patient management environments in which critical incidents occur frequently [1]. The Northern Ireland Incident Monitoring Study is a prospective audit study designed to analyse adverse events in intensive care units in the province. This pilot project was undertaken in the regional cardiac surgical intensive care unit.

Methods

The design of this project is based on the previous experience of the Australian Incident Monitoring Study in Intensive Care Units [2]. The study was undertaken in a 12 bedded ICU/6 bedded HDU cardiac surgical unit as a pilot scheme over 5 months (April 2005-August 2005). A database, specifically designed for the anonymous collection of incident data, relative to an intensive care environment was installed in the unit. The database was designed to be user friendly, to maintain patient and staff anonymity and to prevent access to the data by anyone other than the local coordinators at a later date. Staff education, in the form of small group tutorials, was undertaken over a four week period. An incident was defined as “any event that led to, or could have led to, patient harm if it had been allowed to proceed. It may, or may not, have been preventable and it may, or may not, have involved error.” Details were requested on various aspects of the incident and contributing factors, as well as outcome. The system complemented the formal hospital incident report system.

Results

21 incidents in total were reported over the 5-month pilot project period. The majority of incidents (43%) involved unit management issues, followed by drugs (24%), airway (19%), procedures & lines (9%) and environment (5%). Medical staff caused 44% of incidents and nursing staff 34%. Most incidents were detected by nursing staff (48%). Incidents were detected in <1 hour in 62% of cases. Regarding outcomes, 62% resulted in either no, or a minor, physiological change in the patients condition. During the pilot project there were 4 incidents reported through the existing hospital report system.

Discussion

The anonymous incident reporting scheme has been well adopted by staff. As a result of this project change has been implemented to reduce further adverse events and a decision to continue using the database has been made. The system gives staff a more direct feedback regarding incidents and staff members appear to be more comfortable using an anonymous system, reflected by the increased numbers reported.

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Monitoring of cardiac patients during transfer from theatre to cardiac ITU

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Monitoring the haemodynamic and ventilatory parameters during transfer of post cardiac surgical patients from theatre to cardiac ITU is routine practice in many cardiac centres. However there may be differences between centres on the number of parameters monitored during transfer. Loss of continuity of monitoring and changes in ventilatory pattern even for a short period of time are detrimental to patients, especially when they are moved after cardiac surgery, and any undetected haemodynamic changes during this period can lead to irreversible damage to myocardium before these are recognized and acted on after arrival in cardiac ITU. We sought to establish the current practice of monitoring during transfer of post cardiac surgery patients from theatre to cardiac ITU. Should full monitoring be made mandatory during transfer?

A questionnaire was designed and sent to all ACTA members who are practicing cardiac anaesthetists.

Results

A total of 145 anaesthetists responded to our questionnaire. 92% use some form of monitoring during transfer of patients to cardiac ITU. The majority of respondents use ECG and invasive blood pressure as their parameters of choice. Pulse oximetry is used by 77% and 48% of persons are using CVP monitoring. 77% of respondents use manual IPPV for transfer. Portable ventilators are only used by 23% of anaesthetists. Only 2.7% of anaesthetists monitor ETCO₂. In some cases (7.5%) no monitoring was used with reasoning quoted as a stable patient at the time of transfer, close proximity of CITU to theatre and time taken to transfer was very short. The travelling distance between theatre & cardiac ITU was more than 50 meters for 30% of respondents. 90% of those who were surveyed felt strongly that full monitoring should be used during transfer in all patients even if it is for a short distance.

Conclusion

It is evident from the results of this survey that the majority of respondents are in favour of monitoring during transfer of post cardiac surgical patients from theatre to cardiac ITU but there is a lack of consistency in type of monitoring being used. There is a need for guidelines on minimum standard of monitoring during transfer of such patients.

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3 Laser Doppler perfusion imaging: New technique for determination
of perfusion and reperfusion of splanchnic organs and tumor tissue
David L. Liu, Katarina Svanberg, Ingrid Wang, Stefan Andersson-
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479

4 Laser Doppler, speckle and related techniques for blood perfusion
mapping and imaging
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5 Effect of thoracic epidural anaesthesia on colonic blood flow
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British Journal of Anaesthesia, 2002, Vol. 89, No.3 446-451

Effect of thoracic epidural on gastric tube blood flow following oesophagectomy

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Surgical resection of oesophagus is associated with 5 – 10 % risk of oesophagogastric anastomotic leak [1]. Gastric mobilization for oesophageal reconstruction reduces blood flow to the anastomotic site [2]. Further reduction by hypotension can lead to ischemia, necrosis and anastomotic leak. Thoracic epidural provides good perioperative analgesia, but may cause hypotension. The aim of the study was to measure the effect of thoracic epidural induced hypotension and phenylephrine on gastric tube blood flow.

Methods

In this prospective pilot study 11 patients undergoing oesophagogastric resection with gastric tube reconstruction, a thoracic epidural catheter was inserted at the level of T4-6. Laser Doppler probes [3] were attached on the distal end of the stomach to measure gastric serosal red cell flux [4]. Baseline haemodynamic and laser Doppler measurements were done. Following this, 0.1 ml / kg of 0.25% L-Bupivacaine was injected epidurally. When systolic arterial pressure fell to about 80 mm Hg or 20% from baseline, these measurements were repeated. Phenylephrine i.v. was used to return the mean arterial blood pressure [5] to baseline and measurements repeated. Statistical analysis was by multiple regression analysis.

Results

Gastric blood flow correlated with change in systolic arterial pressure. With thoracic epidural block, there was a significant fall in the systemic arterial blood pressure and gastric tube blood flow. Phenylephrine infusion i.v. restored the arterial blood pressure and gastric tube blood flow. No patient had anastomotic leak.

Conclusion

It is usually believed that thoracic epidural induced sympathetic blockade causes splanchnic vasodilatation. But systemic hypotension caused by thoracic epidural actually reduces the gastric tube blood flow. Phenylephrine, by counteracting the hypotension causes increase in the blood flow to the gastric tube and has the potential to reduce the incidence of gastric tube necrosis. The systolic arterial pressure is now strictly maintained using Phenylephrine infusion to optimize the anastomotic blood flow. Further studies are planned to optimize the gastric tube blood flow using the laser Doppler blood flow monitoring in early postoperative period and evaluate its impact on reduction in gastric tube ischemia and anastomotic leak.

References:

1 Scanning laser Doppler flowmetry and intraluminal recirculating gas tonometry in the assessment of gastric and jejunal perfusion during oesophageal resection

Mr N. H. Boyle, A. Pearce, D. Hunter, W. J. Owen, R. C. Mason
British Journal of Surgery: Volume 85, Issue 10 , Pages 1407 – 1411

2 Intraoperative scanning laser doppler flowmetry in the assessment of gastric tube perfusion during esophageal resection

A blood transfusion index for cardiac surgery

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Although blood transfusion may be indicated during cardiac surgery, there is greater awareness of an associated increase in morbidity and mortality [1]. Avoiding transfusion may therefore be beneficial. Preoperative identification of patients at a higher risk of transfusion would be helpful in assisting with pre-operative optimisation of haemoglobin levels.

Methods

We derived a transfusion index (TI) on the basis of a retrospective analysis of 800 patients who had undergone cardiac surgery. Descriptive data, including pre and post operative haemoglobin, age, weight, height, BSA and units transfused were recorded. Patients who had had valve surgery, re-opening for bleeding, emergency surgery or over-transfused (post Hb > pre Hb) were excluded, leaving 323 for analysis. A further 50 patients were selected to test the index.

Results

We found that $TI = (\text{pre-op Hb} \times \text{Weight} / \text{Age})$, with a cut-off value of 20, appeared to be a viable formula (figure 1). On testing in the 50 patients, we found a negative predictive value of 87.5%, with a 94.7% sensitivity and a 22.6% specificity for requiring transfusion. Patients with $TI > 20$ had a 12% incidence; $TI = 15-19.9$ a 22% incidence; and $TI = 10-14.9$ a 34% incidence of having a blood transfusion.

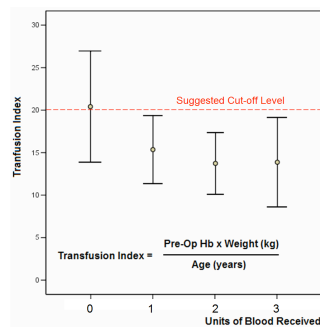


Figure 1 The distribution (mean, SD) of the Transfusion Index (TI) of 323 patients according to the number of units of blood transfused.

Discussion

This index requires further evaluation on a bigger scale or including patients undergoing valve surgery. It appears to indicate that patients with $TI = 10-15$ were 3 times more likely to require transfusion compared to those with $TI > 20$. Using the TI preoperatively may help to improve consent or indicate patients who need pre-operative optimisation to reduce the need for transfusion.

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The use of renal dose dopamine in cardiac surgery intensive care units in the UK

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Several studies have shown that renal dose dopamine (RDD) does not improve renal function in critically ill patients [1]. This is also true for patients following cardiac surgery [2]. Despite this, personal experience tells us that RDD is still frequently used. This study aimed to clarify the use of RDD in cardiac intensive care units (CICUs) in the UK.

Methods

A telephone survey was performed on all CICUs in the UK. A brief structured questionnaire concerning dopamine usage was administered. The senior nurse in charge answered the questions. The data was confirmed by contacting the cardiac surgery pharmacists at each hospital via email. The definition of renal dose dopamine was 'low-dose dopamine used to treat renal dysfunction in a patient with satisfactory haemodynamics'.

Results

The survey included all forty CICUs, and the email response by pharmacists was 25% complete. The mean number of ITU and HDU beds was 10.6 ± 5.6 (Mean \pm SD) and 7.4 ± 2.3 respectively with a mean of 82 ± 24 CICU admissions per month. There was a mean of 5.7 ± 1.5 surgeons and 7.3 ± 2.8 cardiac anaesthetists in these units. Dopamine is used in 90% of CICUs. Dopamine is used as the first line inotrope in 13% of units. RDD is used in 82% of CICUs. Of the CICUs that use RDD, 9% consider RDD to be 2.5 μ g/kg/min, 36% 3.0 μ g/kg/min, 9% 4.0 μ g/kg/min, 3% 4.5 μ g/kg/min and 43% 5 μ g/kg/min or more. Responses from the pharmacists confirmed that these data were accurate.

Discussion

RDD is frequently used in UK CICUs (82%) to treat renal dysfunction in post-operative patients with satisfactory haemodynamics. RDD can depress respiratory drive, predispose to arrhythmias, contribute to myocardial/gut ischaemia, and can potentially be detrimental to renal function. It seems to be used so frequently because it can improve urine output. However, it has no beneficial effect on renal function, renal replacement therapy rates and mortality. We feel, therefore, that its use in the cardiac surgical setting is not evidence based and should be discouraged.

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Survey of Analgesic Regimens in Adult Cardiac Surgery in the United Kingdom and Ireland 2005

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Methods

A questionnaire aimed at surveying current practice regarding analgesia was posted to the current membership list of the Association of Cardiothoracic Anaesthetists. Areas of interest included the use of regional anaesthetic techniques and the use of remifentanyl.

Results

We received 195 of 436 questionnaires sent. Of these, 28 were not completed as the correspondent did not undertake adult cardiac cases. Therefore the response rate was 167/408 (41.2%). Of these 78% always or frequently based their intra-operative analgesia on fentanyl. 23% used remifentanyl at least frequently, with morphine being used by 35% on the same basis. Epidurals were used by 12% either frequently or always, with overall 31% having indicated they have used epidural analgesia. Intrathecal analgesia was used by 6% on a frequently or occasionally basis. Of those who use epidurals, 46% inserted the epidural with the patient awake in theatre (always or frequently) with only 3% undertaking the procedure with the patient asleep. 17% insert the epidural post-operatively on occasions. Of those who use epidurals, 5% always use epidural analgesia in patients who will be anticoagulated post-operatively compared with 31% who use them in this situation on a frequent or occasionally basis and 64% who use them seldom or never. Of those who had a bloody tap, 67% proceeded with the case. Of those who delayed the case, in 50% the delay was 24 hours, with 7% delaying for one hour, 14% for 48 hours and 7% for one week. For immediate post-operative analgesia by infusion, morphine is the most popular with 75% of respondents using it at least frequently. Post-operative analgesia in the ICU/HDU is given by morphine infusion by 61% of respondents on a frequent or always basis while a morphine PCA is used by 36% either frequently or always. Co-codamol is given frequently or always by 32%, tramadol by 49% on a frequent or occasional basis and oxycodone is given by only 3% on an always or frequently basis. Regular paracetamol is given by 91% of respondents either always or frequently. NSAID's are given by 63% on a frequent or occasional basis. On discharge to the ward the mainstays of analgesia are Paracetamol, co-codamol, tramadol and NSAID's.

Discussion

The results of the survey show that while the primary mode of analgesia for the majority of respondents is opioid based, there are 31% of respondents who have experience in using regional techniques in adult cardiac surgical patients, with varying degrees of regularity.

Acknowledgement

Many thanks to the clerical staff in the Anaesthetic Office, Royal Victoria Hospital for their help.

Heparin / Protamine Complex inhibits monocyte derived dendritic cell differentiation in vitro

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Dendritic cells (DC) uniquely activate primary immune responses. Thus they are an important defence against septic shock. Monocytes stimulated in vitro with the cytokines GM-CSF and IL-4 will differentiate to DC. Heparin and protamine are administered during cardiac surgery. We have investigated the hypothesis that the heparin/protamine (H/P) complex inhibits monocyte-derived DC differentiation in vitro

Methods

Monocytes were separated from blood from consented healthy donors. A portion of the cells were stained with the antibodies detailed below, and analysed by flow cytometry. The remaining cells were cultured with GM-CSF and IL-4 with and without Heparin, Protamine (2.5 IU/ml each) or H/P complex, for 6 days at 37°C. The cells were harvested, washed and stained with FITC or PE conjugated anti CD14, anti CD16, anti CD1a and anti HLA-DR before analysis by flow cytometry.

Results

In the presence of GM-CSF and IL-4, as monocytes differentiate into immature DC they upregulate CD1a and HLA-DR on the cell surface. In the presence of the H/P complex this change did not occur and the expression of these markers remained similar to the expression on uncultured (day 0) monocytes.

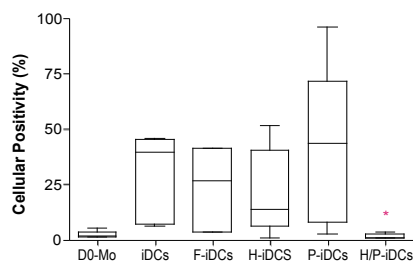


Figure 1. Changes in CD1a expression after 6 days culture with GM-CSF and IL-4 in the presence and absence of heparin (H-iDC's), protamine (P-iDC's), and heparin-protamine complex (H/P-iDC's). Effect of fentanyl is shown for comparison (F-iDC's). DO-Mo indicates monocytes before culture and iDC's indicate cells differentiated to immature DC's without the presence of any anaesthetic agent. *p=0.01

Discussion

The successful differentiation of monocytes to immature dendritic cells in vitro is signalled by the upregulation of expression of CD1a and HLA-DR. Failure to upregulate expression of these markers indicates that differentiation to DC has been inhibited and the resulting cells have retained the phenotypic characteristics of blood monocytes. The effect of this in vivo remains to be determined.