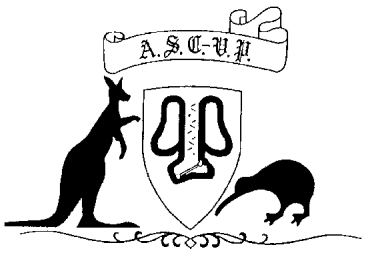

Selected Abstracts

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ELIMINATION OF CARDIOTOMY SUCTION LIMITS THROMBIN GENERATION, PLATELET ACTIVATION AND INFLAMMATION IN PATIENTS UNDERGOING CABG TREATED WITH HEPARIN-BONDED CIRCUITS

Objective: Reports evaluating the efficacy of heparin-bonded circuits (HBC) to blunt inflammation, platelet dysfunction and thrombin generation in response to cardiopulmonary bypass (CPB) have varied. We hypothesized that this variability may, in part, be related to the use of cardiotomy suction (CS), which has been demonstrated to reintroduce pro-coagulant and pro-inflammatory factors into the systemic circulation during CPB. A prospective, randomized study was undertaken to evaluate the specific effects of CS.

Methods: Thirty-six patients undergoing first-time, non-emergent, coronary artery bypass graft surgery with CPB were randomized to one of three treatment groups: I) non-heparin bonded circuits with the use of CS (n = 12), II) *Duraflo-II* HBC with CS (n = 12), or III) *Duraflo-II* HBC without CS (n = 12). Thrombin generation (PF1.2), neutrophil activation (PMN elastase, PMN-E), platelet activation (β-thromboglobulin, β-TG) and neuronal injury (neuron-specific enolase, NSE) were analyzed by ELISA assays post CPB and compared to pre bypass levels. Results are presented as mean ± SEM.

Results: Pre bypass levels of all markers were similar amongst treatment groups. However, post CPB levels were significantly and consistently highest in group I when compared with groups II and III. PF1.2 levels were 5.0 ± 0.9, 3.0 ± 0.6* and 1.5 ± 0.1* nmol/l, groups I-III, respectively. PMN-E levels were 307 ± 64, 128 ± 24* and 75 ± 14* ug/l. β-TG levels were 2,719 ± 433, 915 ± 95* and 651 ± 33* IU/ml. NSE levels were 9.8 ± 0.9, 10.5 ± 1.6 and 4.2 ± 0.5* ng/ml (*$p < 0.05$ compared to group I $p < 0.05$ compared to group II).

Conclusions: Use of cardiotomy suction results in significant increases in thrombin, neutrophil and platelet activation as well as NSE release following CPB. Limiting increases in these markers is best accomplished by eliminating cardiotomy suction and routine use of HBC whenever possible.

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EXPOSURE OF PROCOAGULANT PHOSPHOLIPIDS AT THE SURFACE OF PLATELETS IN PATIENTS UNDERGOING CARDIOPULMONARY BYPASS USING NON-COATED AND HEPARIN-COATED EXTRACORPOREAL CIRCUITS

Objective: Cardiopulmonary bypass (CPB) is associated with a generalized hemostatic defect, in which platelet dysfunction seems to play a central role. The present study was designed to elucidate whether the potential procoagulant activity of platelets, detected as annexin V binding, was altered during coronary bypass surgery, using non-coated and heparin-coated extracorporeal circuits.

Methods: Thirty patients undergoing elective coronary artery bypass grafting were prospectively randomized using either a standard untreated extracorporeal circuit (n = 15) or a heparin-treated extracorporeal circuit (n = 15). Beside measurement of the procoagulant phospholipid activity, the mediastinal blood loss after surgery, and the blood transfusion requirements were also monitored.

Results: CPB induced a decrease in the percentage of activated platelets in whole blood, manifest directly after start of CPB, which was significantly attenuated using a non-treated system. Postoperative the percentage of activated platelets recovered in both systems, reaching a point of significance 24 hours after the operation, compared to the values 2 hours after the operation. The differences among the groups for mediastinal blood loss during the first 2 and 24 hours postoperative coincided with the differences in procoagulant phospholipid activity. Furthermore, there was no statistical difference among the groups for blood transfusion requirements. The platelets in both groups showed a significantly lower ability to generate ionomycin-induced procoagulant activity after blood-material interaction when compared to the baseline values.

Conclusion: These observations are compatible with the notion that during CPB, irrespective of the heparin coating, platelets become modestly activated and are then rapidly removed from the circulation.

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CASE REPORTS—ALLERGIC REACTION TO HAEMACCEL? ETIOLOGY, CLINICAL IDENTIFACTION AND MANAGEMENT OF ACUTE ANAPHYLAXIS ON CARDIOPULMONARY BYPASS

Haemaccel is a common colloid solution routinely used as a priming solution for the heart-lung machine during cardiac surgery. Anaphylaxis to colloid solutions including Haemaccel, are rare. The incidence of anaphylaxis to gelatin solutions causing severe reactions such as shock, cardiac, and or respiratory arrest is 0.038% (1). Haemaccel is used in our unit as a prime constituent for the cardiopulmonary bypass circuit utilized during coronary artery bypass surgery.

Anaphylactoid reactions clinically resemble anaphylaxis, the effects being caused by the release of systemic inflammatory mediators from mast cells and basophils. The effects of release of these mediators are severe vasodilatation, an increase in capillary permeability and bronchial smooth muscle contraction all occurring within minutes of exposure to the offending allergen. The activation of the immune system results in angio-edema, bronchospasm and acute cardiovascular collapse. Acute anaphylactoid reactions must be recognized early and clinical manifestations treated prior to separation from cardiopulmonary bypass (CPB).

We present two cases of suspected anaphylactoid reactions to Haemaccel upon initiation of CPB. Both cases presented with sudden cardiovascular collapse upon initiation of bypass with mean arterial pressures falling from 60 mmHg to below 20 mmHg. Metaraminol was the first vasopressor used; however it was ineffective. Response to an intravenous inotropic infusion was immediate and effective in both patients. One patient also required nebulized salbutamol to treat excessive bronchospasm. Both patients required excessive amounts of crystalloid to treat the hypovolemia caused by the increased capillary permeability. Also noted was an increase in hemoglobin levels reflecting plasma loss through permeable capillary beds. The identification of anaphylaxis and immediate effective treatment instituted allowed the patients to be successfully weaned from CPB. In both cases the proposed procedure was carried out and the post-operative period was uneventful.

The ability to identify an acute allergic reaction occurring during CPB and to initiate appropriate management is essential. To achieve this it is important to understand the mechanism of action of the immune mediators responsible for the pathophysiological manifestation of anaphylaxis in the clinical setting.

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VALIDATION OF "AFFINITY NT" MEMBRANE OXYGENATOR ARTERIAL TEMPERATURES

Temperature control of patients during cardiopulmonary bypass entails cooling or rewarming of the arterial blood by the oxygenator's heat exchanger. However, the rates of cooling and rewarming and the maximum temperatures attained are implicated in patient morbidity. Thus accurate oxygenator arterial temperature measurements are needed. The purpose of this study was to determine the accuracy of the arterial temperature probe on the "Affinity NT" membrane oxygenator in measuring perfusate temperatures.

A dual in-vitro circuit was used. Hartman's solution was recirculated at 4 L/min through an "Affinity NT" membrane oxygenator and a second oxygenator. To simulate the patient, 10 L of water was recirculated at 4 L/min through the heat exchanger of the second oxygenator via a reservoir. A myocardial temperature probe was inserted in-line, 4 cm distal to the "Affinity NT" oxygenator arterial temperature probe site, and was considered to measure the actual temperature of the perfusate. Temperatures were simultaneously recorded from the in-line probe, arterial probe and reservoir every second. After establishing 'normothermia' (reservoir 37 ± 0.5°C), cooling began by setting the heater-cooler unit (HCU) to 20°C. Once the reservoir had reached 28°C, rewarming commenced by setting the HCU to 41°C. A trial was completed when the reservoir reached 36.9°C. Twenty-seven trials were run using random combinations of three "Affinity NT" oxygenators and three in-line probes.

During early cooling (cooling until the reservoir was 34°C), the oxygenator arterial temperature over-read by 0.57 ± 0.68°C (mean ± SD; $p < .0001$). Late cooling (further cooling until the reservoir was 28°C) was associated with a reduction of this discrepancy to 0.02 ± 0.15°C (p = ns). The oxygenator arterial temperature under-read by 0.72 ± 0.58°C ($p < .0001$) during early rewarming (warming until the reservoir was 31°C), with this difference being reduced to 0.52 ± 0.48°C ($p < .0001$) during late rewarming (further heating until the reservoir reached 36.9°C).

The "Affinity NT" oxygenator arterial temperature probe may over-read the arterial perfusate temperature while cooling and under-read the arterial perfusate temperature when rewarming. These discrepancies are exacerbated during the early phases of cooling and rewarming. The perfusionist should be aware of the temperature probe characteristics of the oxygenator being used in order to safely perfuse the patient.

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PLATELET GEL IN THE TREATMENT OF CHRONIC ULCERS

Background: There is a great therapeutic potential of the clinical use of growth factors in the treatment of chronic non-healing wounds. Previous studies have suggested that topically applied platelet-derived growth factors promote wound healing by stimulating angiogenesis, fibroblast proliferation and collagen synthesis. We therefore examined whether platelet-derived growth factors could facilitate healing of chronic ulcers, and report our preliminary results.

Objective: We sought to investigate the indication and advantages of the use of Platelet Gel in the treatment of Chronic Ulcer.

Methods: 14 patients were enrolled in a prospective, randomized controlled clinical trial. Inclusion criteria were: 1) insulin dependent diabetic mellitus type II; 2) diabetic foot ulcers present for at least 8 weeks; 3) percutaneous partial oxygen tension on the wound environment > 40 mm Hg; 4) grade IV diabetic foot ulcer according to Wagner Classification; 5) be able to attend Diabetes Ambulatory Foot Clinic once a week. After initial surgical debridement of all ulcers, group A patients (n = 4; control group) were treated with hydrogel while group B patients (n = 10) were treated with Autologous Platelet Gel (APG). Wound healing was graded by measuring the ulcer's length, width, and depth at weekly intervals for 4 weeks and is expressed as % wound healing (with 100% equalling complete wound closure).

Results: At the end of the study (4 weeks) one patient was excluded from group A (deceased) There is no statistic difference in infection at day one between the control group and group B ($p = 0.145$). The Mann-Whitney U analysis suggested a statistic difference in healing of the % length ($p = 0.041$), % width ($p = 0.013$) and % depth ($p = 0.032$) of the wounds between week 0 and week 4.

Conclusion: Our preliminary results indicate that autologous platelet gel enhances diabetic foot ulcer healing.

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HEPARIN MANAGEMENT IN CARDIOPULMONARY BYPASS: IS IT TIME FOR REVIEW

Over the last twenty years the extracorporeal circuit has undergone major changes in the quality of its surfaces and blood handling capability. Despite the current research into the benefits of biocompatible surfaces, protocols for heparin management remain unchanged by the perfusion community with systemic dosages of heparin remaining 300–400 U/I per Kg. Appropriate heparin management is still an area of our profession that has yet to be clearly defined. It may well be possible to offer surgeons cardiopulmonary bypass using what is referred to as an off-pump dose of heparin, perhaps eliminating another reason why off-pump may be perceived a better alternative. The literature is divided on the subject of heparin management and the adverse effects that may occur with its overuse. Heparin has been noted to have a variable response, half-life and have a possibility of crossover to the extravascular compartments due to the effects of hemodilution and systemic temperature changes. Heparin rebound is another issue being often blamed as a cause for post-operative bleeding. The literature is unclear on the causes of heparin rebound and is often reported not to be heparin dose related.

This presentation also reviews thirty-two consecutive patients who had undergone complex aortic repair from 1996 to 2003 at the Royal North Shore Hospital. All patients had complex aortic surgery that entailed CPB and deep hypothermic arrest. The patients were divided into two groups: Group 1 used heparin-coated circuits (Carmeda) combined with low-heparin management with heparin being administered @ 100 IU/Kg to maintain an ACT of 250–300 seconds; Group 2 used standard circuits and heparin management of 400 IU/Kg to maintain an ACT >480. Patients were retrospectively matched for surgery, total bypass times, deep hypothermic circulatory arrest. The same surgeon and perfusionist managed all these patients.

Continuous variables summarized as mean ± SD, medians in parentheses.

A total of 53 patients including those presented have undergone surgery using this extra-corporeal technique and heparin protocol. The safety of low heparin management and heparin-coated circuits combination is well established in the literature. Our experience also suggests that "low heparin" management combined with heparin circuits may indeed be beneficial to patient outcome by reducing post-operative blood loss and homologous blood and/or products usage.

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ARTERIAL LINE FILTERS, (BUT WHAT IS AN ARTERIAL LINE FILTER?)

In recent years the use of arterial line filtration has become a standard of practice to protect the patient from particulate and air emboli during CPB. As a result, a variety of different devices have become available and are often seen as generic products i.e., "*its just a filter*". However, significant differences exist between the designs of current arterial line filters that can affect their performance and efficiency. This scientific review will examine the types of filters available, their mode of operation and capabilities and limitations and will examine the following areas.

There are currently 4 generations of arterial line filters available:

- 1st generation axial flow
- 2nd Generation tangential flow
- 3rd generation tangential flow autoventing.
- 4th generation tangential flow autoventing, leukocyte reduction.

These devices use some, or all of the following filtration and design principles to remove emboli:

1. Screen filtration and bubble point pressure.
2. Flow dynamics (i.e., tangential flow and port configuration) and buoyancy of air emboli.
3. Coalescing media
4. Vent-lines or auto-venting membranes
5. Leukocyte depth filtration media.

Recent clinical studies have shown that some filters may be 60% more efficient at removing emboli than other types. Some other studies have raised questions about whether the use of open vent-lines on filters may actually lead to regeneration of micro-bubbles by a "fountain effect". Demand for minimized perfusion circuits has also lead to the recent development of very low priming volume (<100 mL) adult arterial line filters.

Manufacturers and perfusionists must also consider ease of use, priming volume, hemolysis and platelet loss, visual clarity (as an aid to confirm priming), surface coatings as well as materials of construction. There is also the difficulty of testing filters with reproducible micro- air emboli challenges and in measuring the number and size range of micro-air emboli removed using current detection methods.

Hence, there are many variables that effect how air and emboli are removed by arterial line filters and these should be considered when choosing one to provide optimized emboli protection for patients undergoing CPB.

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EXTENDED HOURS OF WORK AND OCCUPATIONAL HEALTH AND SAFETY

Occupational health and safety laws within Australia operate within a framework that includes a principal Act and subordinate legislation in the form of regulations, advisory standards and Codes of Practice. The laws are based upon the UK's "Robens style" approach that includes a mix of prescriptive requirements and mechanisms for consultation and cooperation between the employer and employees.

The employer's duties within the legal framework are a codification of the common law general duty of care. These duties relate to the safety of premises, plant and systems of work. The extent of the duty extends to what is "practicable". The issue of what is "practicable" involves a consideration of the risk and severity of injury/harm to health, the means of reducing the risk and the "forseeablility" or "state of knowledge" about the risk.

There is a growing body of knowledge concerning the risks associated with working extended hours. These arise through the effects of fatigue (lack of sleep) and the body's circadian rhythms (working when the body wants to sleep). Research has shown a significant increase in the risk of accidents with extended working hours and working between the hours of 11 pm and 7 am.

Where complex tasks are performed, the effects may be subtle. Fatigue has also been shown to effect mood and skills such as the ability to comprehend complex situations without distraction.

Where highly motivated employees are involved, performance on complex tasks may not be affected, but errors may increase with routine monotonous tasks.

SUGGESTED READING:

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INCREASED EFFICIENCY IN THE TREATMENT OF PULMONARY ALVEOLAR PROTIENOSIS VIA PERFUSION RELATED ADVANCEMENTS IN WHOLE LUNG LAVAGE THERAPY

Pulmonary Alveolar Proteinosis is a rare disease of currently unknown aetiology and affects about 15 people within the UK and a small number within Australia. Although research has commenced into the cause and effect of this disease, there is still much work to be done to compile an accurate assessment and diagnosis regime for its effective detection and early treatment.

Currently the only effective form of treatment is via massive whole lung lavage. The previous method of administration consisted of filling an open topped glass reservoir with buffered saline to an ambient temperature of 36.5–37.5 degrees Celsius, while a glass thermometer measured the temperature. The lung was then isolated and washed in a tidal fashion in and out through a closed circuit until all the abnormally built up surfactant material had been removed. This process proved both laborious and prone to errors, as it required large quantities of pre heated saline and long procedure times.

The involvement of the perfusion department in the administration of this form of treatment has resulted in the development of a simple but effective circuit comprising a heat exchanger / roller pump and temperature thermistor that is incorporated into the existing circuit. The effect of this has been to drastically increase the speed and efficiency of the procedure, thus effectively allowing a bilateral procedure to now be done in the time that it once took to perform a single lung lavage. The introduction of this new circuit has also decreased theatre time and reduced the workload upon staff. These and other advantages, as well as an in-depth assessment of the new delivery system will be addressed within the presentation.

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TOTAL ENDOSCOPIC MITRAL VALVE REPAIR WITH AN ENDO CPB SYSTEM

Objective: To document the feasibility, safety and effectiveness of performing mitral valve repair by a totally endoscopic approach using an endo CPB.

Methods: Between February 1, 1997 and April1, 2003, 337 patients underwent totally endoscopic mitral valve repair at our institution. The mean age was 61.6 ± 13.6 years and 63.5% were male. The use of endovascular cannulae and catheters, integrated in a modified heart-lung machine (endo CPB) allows the surgeon to perform an operation through a "working port". The heart-lung machine contains two centrifugal pumps for arterial blood flow and for kinetic-assisted venous drainage (KVAD). Statistical analysis included Kaplan-Meier and Cox regression methods.

Results: Associated atrial procedures were performed in 13.7% (n = 46) of the patients. Mean endo aortic clamp time was 89.5 ± 24.4min (24-180) and mean CPB time was 128.1 ± 32.8min (54-252). Eight patients required intra-operative conversion to sternotomy. Thoracoscopic reevaluation for suspected bleeding (n = 26) was part of our aggressive postoperative management. One patient required sternotomy for control of bleeding. Hospital mortality included 2 patients (0.6%) and 1 patient was technology related. There were one early and six late reoperations, four of which were due to endocarditis.Ninety two % of the patients were highly satisfied with either no or mild postoperative pain and 96.9% felt they had an esthetically pleasing scar.

Conclusions: Totally endoscopic mitral valve repair with endo CPB can be done safely with excellent results and a high degree of patient satisfaction. It is now our exclusive approach for isolated atrioventicular valve disease.

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AN INVESTIGATION INTO THE VARIATIONS OF STORED HOMOLOGOUS PACKED RED CELLS SUPPLIED BY THE BLOOD BANK FOR USE IN PAEDIATRIC CARDIAC SURGERY

Background: To perform open-heart surgery in a paediatric setting the Heart Lung Machine prime requires in most cases the addition of homologous Packed Red Cells (PRC). The Bloodbank at The Children's Hospital at Westmead was informed that the Australian Red Cross Blood Service was changing (by 25.08.2003) the PRC supplied from a buffy coat containing (BCC) to a Buffy Coat Poor (BCP) product. During centrifugal sequestration of donor whole blood, the buffy coat forms as a thin yellow-white layer of leucocytes on top of the red cells, containing some platelets. To gain more platelets from a unit of whole blood the buffy coat and unfortunately some younger red cells are removed to salvage the platelets. This means the end products are a unit of Buffy Coat (/Leucocyte) Poor Packed Red Cells and a greater yield of plasma and platelets. As the change took place it was noticed that BCP units had a markedly lower volume. Further investigation showed a large degree of variability in the components of BCC units and BCP units, to such an extent that it made prime calculations inaccurate.

Aim of the study: To identify differences in volume, hematocrit, potassium, glucose, lactate, and colloid osmotic pressure (COP) between Packed Red Cells containing the buffy coat (BCC) and Buffy Coat Poor (BCP) units.

Method: The volume of 80 consecutive homologous packed red cell units was measured by weight. After proper mixing, a 3ml sample was drawn from each bag. A portion of the sample was tested using a Radiometer ABL 625 blood gas/ electrolyte-metabolite analyser. The remaining sample was centrifuged for 10 minutes at 5000 rpm, the plasma separated and the COP analysed using a Gonotec Osmomat 050 RS.

Results: Of the 80 units examined 43 were BCC and 35 were BCP. The measured parameters are listed in table below as the mean and range.

Conclusion: Buffy Coat Poor Blood is a more consistent product, with a higher hematocrit over a smaller range but its overall quality is lower than that of the BCC Packed Red Cell we used to get before. The leucocyte reduced properties of BCP units are irrelevant to our practice as all Packed Red Cells added are leucocyte filtered on addition to the circuit prime.

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MINIMIZING THE CARDIOPULMONARY BYPASS CIRCUIT: A PERFUSIONIST'S PERSPECTIVE OF THE BENEFITS AND RISKS ASSOCIATED WITH THE MINI-CIRCUIT

Since the first successful clinical use of cardiopulmonary bypass (CPB) in 1953 by John Gibbon, there has been a concern about the need for and use of homologous blood in cardiac surgery. The knowledge we now have of AIDS, hepatitis, and the inflammatory responses associated with CPB and transfusion has served as a catalyst for all involved finding ways to minimize transfusions.

In 1967 Dr. Arthur Beall and Dr. Denton Cooley reported their results of performing open-heart surgery without blood transfusion. Prior to this report the use of blood as the priming agent of the CPB circuit was the norm. Since this report there has been in excess of 300 papers published examining the effects of hemodilution and ways to minimize and avoid blood transfusion in cardiac surgery. As perfusionists we are all aware of the risks associated with hemodilution as well as the risks associated with transfusion of blood products.

In 2001 DeFoe and colleagues from the Northern New England Cardiovascular Disease Study Group reported the effect of hematocrit on outcomes. After adjustment for preoperative differences in patient and disease characteristics, the lowest hematocrit during cardiopulmonary bypass was significantly associated with increased risk of in-hospital mortality, intra- or postoperative placement of an intraaortic balloon pump and return to cardiopulmonary bypass after attempted separation. Smaller patients and those with a lower preoperative hematocrit are at higher risk of having a low hematocrit during cardiopulmonary bypass.

Today we are being offered the next step in attempting to reduce the hemodilutional effects associated with CPB–the 'mini circuit.' The various manufacturers of CPB equipment have either introduced such a circuit or are in the process of developing one.

As with all new technology, one must carefully weigh the benefits it seems to offer over the current equipment and techniques and ascertain any potential risks. The goal of this presentation is to provoke the thought process of the perfusionist, surgeon, and anesthesiologist. As we experience shifting paradigms in cardiac surgery one must make certain that sound decisions are made when changing techniques or equipment. This presentation will examine the benefits, risks, indications, and limitations of this new generation of CPB circuits and to describe and critique the various 'mini circuits' being introduced to the perfusion community.

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BEST PRACTICE FOR CARDIOPULMONARY BYPASS IN THE HIGH-RISK ELDERLY PATIENT

The management of cardiopulmonary bypass (CPB) has empirically resulting in a largely consistent approach to adult perfusion on the one hand and pediatric perfusion on the other. Perfusion techniques used specifically for neonates differ from those used for older children. Very little has been written or prospectively researched on best practice for CPB in the high-risk elderly patient, despite the challenge this patient cohort presents compared to the general adult population and the rapidly increasing number of such patients undergoing cardiac surgery. The second edition of Cardiopulmonary Bypass–Principles and Practice edited by Gravlee, Davis, Karusz and Butler published in 2000 devotes only three paragraphs to CPB for elderly patients.

The aging population is a global phenomenon. In both New Zealand and Australia the population greater than 65 years is predicted to double by 2025. The most common cause of death in both countries is cardiovascular disease and the number of patients over the age of 80 presenting for open-heart surgery is rapidly increasing. Patients of advanced age undergoing cardiac surgery suffer higher morbidity and mortality require longer hospital stays compared younger patients Increasing age in cardiac patients has been associated with pulmonary morbidity, renal dysfunction and, in particular, impaired neurological outcome and neurocognitive deficit. Cognitive function following cardiac surgery is predictive of long-term quality of life. All of these factors have important socio-economic implications in an international environment of health funding restraints. This year marks the 50th anniversary of the first successful clinical use of the heart lung machine by John Gibbon. Many advances in CPB have resulted from research into improving outcome in the very young, such as the development of modified ultrafiltration to reduce post bypass whole body edema in the neonate. In the outcome literature of elderly cardiac surgical patients, authors and editors have paid little attention to the detail of the conduct of CPB. What constitutes best perfusion practice for 'the high-risk elderly patient' is yet to be established.

The objective of this paper is to propose a framework for perfusion strategies for the high-risk elderly patient from our current understanding of cardiopulmonary bypass. We report recent outcome trends from Green Lane Hospital in this patient cohort. This paper should stimulate discussion for a consensus on perfusion strategies for the elderly and encourage further research into perfusion variables as they relate to the outcome of patients of advanced age.

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LEUCOCYTE REDUCED BLOOD CARDIOPLEGIA FILTRATION: A NEW DESIGN

Despite the increased use of blood cardioplegia strategies during CPB, a significant number of patients, especially high risk, suffer myocardial dysfunction due to reperfusion injury.[1,2] Atrial fibrillation is reported to occur in 20–30% of patients postoperatively.[3]

An increasing body of clinical evidence suggests that leucocyte depletion of blood cardioplegia during cardiac surgery can attenuate the leukocyte mediated ischaemia-reperfusion injury seen especially in high risk and paediatric patients.[1–3] Recent studies have reported a 72% reduction in atrial fibrillation with the combined use of leucocyte filters and aprotinin,[3] reduced ventricular-fibrillation and inotropic support with leucocyte filters alone[1,2] and significant reductions in markers of myocardial damage i.e. Tropinin T, CPK-MB[1, 2] etc.

In 1995 Pall Medical introduced a blood cardioplegia leukocyte reduction filter (BC1) that has been demonstrated to reduce leukocyte mediated reperfusion injury.[1] However, the relatively large internal volume of this filter (220 mL) compared to modern blood cardioplegia systems presented many perfusionists with practical issues when employing this device.

In response to comments from the perfusion community and with experience gained in developing new arterial line filters, we have designed an effective blood cardioplegia filter with a prime volume as low as 95 mL.

In this presentation we will review the latest clinical data on leucocyte-reduction of blood cardioplegia and detail the performance characteristics of this new blood cardioplegia filter.

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Pall Medical UK

LONGITUDINAL ASSESSMENT OF COGNITIVE DECLINE AFTER CORONARY ARTERY GRAFTING: WHAT REALLY HAPPENS AFTER FIVE YEARS?

Longitudinal studies investigating the incidence of neuropsychological deficits five years following surgery have been limited, however recent studies have suggested a pattern of late decline. These studies have failed to include a control group, and are thus unable to account for the confounding influence of aging.

With institutional approval 110 patients recruited into prospective studies in 1996 and 1997, were invited to participate in a follow-up study. Each patient was asked whether they would perform a fourth test battery, on average 5 years after their surgery. Seventy of 110 patients consented and were re-examined. The incidence of neuropsychological deficits was calculated using Reliable Change (RC) indices derived from a sample of 36 non-surgical controls, examined over identical time intervals. The standard deviation (SD) method of analysis was used as a comparison.

Subjects consenting to participate did not differ on demographical, clinical or outcome measures from those declining to participate. Subjects participating performed significantly better on their initial neuropsychological assessment. The incidence of deficits (RC) on TMT B and Digit Symbol decreased significantly from 7 days to 6 months, decreasing further at 5-year follow-up. The incidence of deficits on TMT A increased significantly from 7 days to 6 months, then decreased significantly at 5 years, while the incidence of deficits on CVLT short delay free recall increased significantly from 7 days to 5 years. The percentage of patients displaying a deficit on $\geq$2 measures was 37% at 7 days, 31% at 6 months, and 27% at 5 years. Using the SD method the incidence rates were 67% at 7 days, 34% at 6 months, and 67% at 5 years.

Generalized linear model analysis identified older age, ischaemic heart disease status, length of hospital stay and cognitive decline at 6 months as significant predictors of late decline.

The incidence of late deficits following surgery does not increase when age-related changes in neuropsychological performance are taken into account, highlighting the importance of study design and analysis when assessing the long-term impact of cardiac surgery on neuropsychological performance.

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