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HIV OCCLUSIVE ARTERIAL AND ANEURYSMAL DISEASE: PROSPECTIVELY GATHERED DATA

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Aim: To describe the clinical presentation in patients with HIV vasculopathy (occlusive and aneurysmal disease), determine the optimal management strategy for such patients, determine the influence of CD4 count and albumin levels in predicting the post operative wound sepsis rate and the effect on graft patency, and determine the role of components of the coagulation cascade and associated organisms in the pathophysiology of HIV vasculopathy.

Methods: Prospectively gathered data for the period February 2004 to June 2006.

Results: The study included 63 patients managed at the Inkosi Albert Luthuli Central Hospital with HIV vasculopathy (41 patients with occlusive arterial disease and 22 with aneurysms).

Of the patients with aneurysms, 19 were male and 3 female with an average age of 34 yrs. Presenting symptoms depended on the anatomical location of the aneurysm. The internal carotid artery was the commonest involved. The average CD4 count was 210. 17 of the 22 patients underwent exploration with reconstruction. 12 patients had aneurysm wall biopsies submitted for histology & bacterial stains. Of these, 5 specimens were in keeping with an HIV vasculopathy.

Of the 41 patients with suspected HIV arterial occlusive disease, 34 male and 6 female patients with an average age of 41 years were assessed. CD4 count averaged 30. Serum albumin levels averaged 33. The femoro-popliteal segment was the most commonly affected. The most frequent clinical presentation was that of chronic arterial occlusive disease. 42 surgical procedures were performed on 35 patients consisting of 24 major amputations and 14 lower limb revascularisations including 1 stent and 3 upper limb revascularisations. Wound sepsis rates appear high post femoro-popliteal and distal bypass surgery with no correlation with a low CD4 count. Major amputations healed well with low septic complication rates irrespective of CD4 count level.

Conclusion: Patients with HIV associated aneurysms may be safely managed with reconstruction of the symptomatic aneurysm with low perioperative mortality. Lower limb arterial revascularisation in occlusive arterial disease is associated with poor limb salvage rates and high wound sepsis rates.

PENETRATING COLON INJURIES: AN ANALYSIS OF 104 PATIENTS

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Introduction and aim: Colon injury has been associated with a high risk of septic complications. This audit of patients with penetrating colon injuries was performed to determine the outcome in an urban trauma centre with a high incidence of penetrating trauma where primary repair for most colon injuries is practised.

Methodology: The data of all patients with a full-thickness penetrating colon injury admitted to the Trauma Centre at Groote Schuur Hospital over a four-year period (January 2003 - December 2006) was reviewed. These were reviewed for demographics, injury mechanism and perioperative management, anatomical site of the colon injury, associated intra-abdominal injuries and their management. Colonic injuries were graded as either simple or complex. Infectious complications, fistulae and mortality were noted. Injury severity was categorised using the RTS, ISS and PATI scores. Colonic injuries were generally primarily repaired. Complications were recorded.

Results: One hundred and four patients presented with penetrating colon injuries. Colon wounds were caused by gunshots in 87 (84%) and stab wounds in 17 (16%) patients. There was a mean delay of 6.6 (range 1 - 48) hours. The mean RTS was 11.2, ISS 29, 7 and mean PATI score 22.4. Colon injuries were simple and complex in 85 (82%) and 19 (18%) patients, respectively. Common complications included surgical site infection 8 (7.6%), intra-abdominal abscess 10 (9.6%) colo-cutaneous fistula 4 (3.8%) and 1 gastrocolic fistula. The overall mortality rate was 9.6% and colon injury-related mortality was one (1%). Traditional prognostic factors such as shock, massive transfusion, delay and site did not affect outcome in patients treated with primary repair.

Conclusion: Primary repair for most penetrating colon injuries is safe.

SELECTIVE NON-OPERATIVE MANAGEMENT OF ABDOMINAL GUNSHOT WOUNDS: ROLE OF ABDOMINAL COMPUTED TOMOGRAPHIC SCANNING

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Introduction and aim: Computed tomographic scanning (CT) is increasingly used in patients with abdominal gunshot wounds (AGSWs) selected for non-operative management. The aim of this study is to investigate the role of CT scanning in selecting patients for non-operative management of AGSWs.

Material and methods: Study period: April 2004 to Jan 2007 [34 months]. Laparotomy was performed for diffuse peritonitis and haemodynamic instability and those failing abdominal observation. Stable patients with no tenderness or tenderness confined to the wound or wound tract underwent serial abdominal examination. CT scanning was indicated for patients with a right upper quadrant bullet trajectory and/or localised right upper quadrant tenderness suggestive of a liver injury; and patients without an indication for laparotomy with haematuria to exclude urinary tract injuries. CT scanning to delineate bullet trajectory was left to the discretion of the attending surgeon.

Results: During the study period, 731 patients with abdominal gunshot wounds were treated. Fifteen (2%) patients in extremis died before reaching theatre. Another 522 (71%) patients met the criteria for surgery and underwent laparotomy. There were a further 38 (5.2%) deaths in this group. One hundred and ninety-four (27%) patients were selected for observation. Five patients underwent delayed laparotomy for increasing abdominal tenderness. One hundred and twenty-six (68%) patients selected for non-operative management underwent CT scanning for indications listed above. CT scanning detected 50 liver, 21 kidney and 6 splenic injuries. Overall 189 (26%) patients with abdominal gunshot wounds were successfully managed non-operatively.

Conclusions: Abdominal CT scanning should be selectively used for managing patients with AGSW for non-operative treatment.

USING A MODERN TAXONOMY OF ERROR TO ANALYSE MISSED INJURIES IN TRAUMA

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Introduction: Modern theory of human error has helped reduce the incidence of adverse events in commercial aviation. It is unclear whether these lessons are applicable to adverse events in trauma surgery. Missed injuries in a large metropolitan trauma unit were prospectively audited and analysed using a modern error taxonomy to define its applicability to trauma.

Methods: A prospective database of all patients who experienced a missed injury/adverse event during a six-month period in a busy trauma service was maintained from July 2006. A missed injury was defined as one that escaped detection from primary assessment to operative exploration. Each missed injury was recorded and categorised. The clinical significance of the error and the level of physician responsible were documented. Errors were divided into planning or execution errors as acts of omission or commission or violations or slips and lapses.

Results: A total of 1 024 patients were treated by the trauma services over the six-month period from July to December 2006 in Pietermaritzburg. A total of twenty-nine patients (2.5%) with missed injuries were identified during this period. There were twenty-five males and four females with an average age of 29 (range 21 to 67). In eleven patients, errors were related to inadequate clinical assessment. In ten patients errors involved the misinterpretation of, or failure to respond to radiological imaging. There were eight cases in which an injury was missed during surgical exploration. Overall mortality was thirty percent (9). In five cases the death was directly attributable to the missed injury. The level of the physician making the error was consultant surgeon (4), resident in training (15), career medical officer (2), referring doctor (6).

Conclusions: Missed injuries are common and are made by all grades of staff. They increase morbidity and mortality. Understanding the pattern of these errors may help develop error reduction strategies. Current taxonomies help us understand the error process but we need to develop mechanisms to reduce the potential for error.

HAEMODIALYSIS FOR ACUTE RENAL FAILURE IN TRAUMA PATIENTS

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Introduction: Acute renal failure requiring renal replacement therapy in the ICU setting is related to high mortality. The purpose of the study is to assess whether there are any indicators of improved survival in trauma patients who undergo haemodialysis for acute renal failure.

Patients and methods: Retrospective study of 64 patients who were admitted in the Trauma ICU of a tertiary institution and underwent haemodialysis over a period of five years. This included patients with penetrating, blunt trauma and burns. Information related to pre-hospital and in-hospital resuscitation, trauma scores and physiological scores were collected. Patients in the ICU were monitored daily and detailed records were collected for the onset of complications. The majority of patients were initially dialysed with CVVHD and later on with SLED.

Results: Of the 64 patients 47 died and overall mortality was 73.4%. This was highest in the group of the burnt patients that was 84%. The survival rate in all our patients irrespective of mechanism of injury was shown to be unrelated to RTS, ISS and APACHE II as well as TRISS. The duration of haemodialysis between the three different trauma mechanism groups was not significantly different. Age is not a significant predictor of survival. Patients who had polyuria at the time of the initiation of haemodialysis had better outcome than those who were oliguric/anuric/normouric.

Conclusions: Overall acute renal failure in trauma patients still has a very low survival rate irrespective of the recent improvements in initial resuscitation and ICU care. Controversial conclusions have been presented in the few studies published on this subject. In our study, none of the parameters reported in previous publications to affect survival was proven as correct, although our number of patients was comparable to that of other studies.

Undoubtedly, the prevention of failure of other systems will improve survival by not leading to acute renal failure or by putting less strain to the patients' physiological resources. As we are still at an early stage of understanding the predictors and the behaviour of renal failure in the trauma patients there is a need for the planning multicentric prospective studies.

RE-EVALUATING THE MANAGEMENT AND OUTCOME OF COLON AND RECTAL INJURIES

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Background: Few injuries have caused as much controversy with respect to management as colon injuries have. The majority of colonic and intra-peritoneal rectal injuries can be managed by primary repair; and extraperitoneal rectal injuries require diverting colostomy. This study was undertaken to assess the outcome of current management strategies in our centre.

Patients and methods: Prospective study of all patients treated colon and rectal injuries trauma in one ward at King Edward VIII Hospital over a 7-year period (1998 - 2004). Demographic data, clinical presentation, findings at laparotomy and outcome were documented. Except under unusual circumstances all colonic and intra-peritoneal rectal injuries were primarily repaired and extra-peritoneal injuries had diverting colostomy and no repair.

Results: Of 476 patients undergoing laparotomy, 176 had injuries to the colon and rectum (37%), 11 of whom were female (M: F ratio 15:1). Mean age was 29.8 ± 10.8 years. Injury mechanisms were blunt trauma (5), firearms (119) and stabs (52). Delay before laparotomy was 11.2 ± 16.6 hours. Twenty-six patients presented in shock. The Injury Severity Score (ISS) was 12.0 ± 5.9. Fifty-eight patients needed ICU admission (ICU stay 5.3 ± 4.6 days). Management of 155 colonic injuries was primary repair (132), resection and anastomosis (13) and a combination of the two in one; damage control laparotomy (3), colostomy (2) and conservative in 4. Management of 16 rectal injuries was primary repair (7) and colostomy without repair (9); management of 5 combination injuries were primary repair (3), colostomy (1) and repair and colostomy (1). 45 patients developed complications (26%). There were no rectal injury specific complications among patients with extraperitoneal rectal injuries. 29 patients (17%) died (18 from MODS, 2 from peritonitis, 3 from hypovolaemic shock and 5 from septic shock). Mortality rate was 50% for patients with shock compared to 11% in those without shock ($p < 0.0001$). Mortality from firearms, stabs and blunt trauma was 21%, 8% and 0% respectively. Delay did not influence mortality and morbidity. Hospital stay was 9.5 ± 9.4 days.

Conclusion: Injuries to the colon and rectum occur in 37% of abdominal trauma and are associated with mortality rate of 17%. Factors which impact on morbidity include mechanism of injury, shock on presentation and number of associated organs injured. We reaffirm that primary repair is appropriate for colonic and intraperitoneal rectal injuries and that extraperitoneal rectal injuries require diverting colostomy. While primary repair is rapidly becoming the treatment of choice, there is still a role for colostomy.

ABDOMINAL INJURIES SEEN IN PATIENTS PRESENTING WITH EVISCERATIONS

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Aim: To audit the abdominal injuries seen in patients who present to a trauma unit with evisceration.

Method: A retrospective data collection of patients presenting with evisceration at the Johannesburg Hospital over a period of 26 months. The sex, revised trauma score (RTS), injury severity index (ISS), expected percentage survival (PS) based on RTS in the emergency department and ISS, clinical findings, and theatre findings were analysed.

Results: Seventy-five patients were recruited. Sixty-seven (92%) were male, and only 6 (8%) were female. Average ISS of 12.01 and PS of 92.75%. Only 36 patients (48%) showed obvious evidence of peritonitis in the casualty department. All patients were taken to theatre for exploratory laparotomy. Nineteen patients (25.3%) of the cases required just repair of the abdominal wall and reduction of the protruding omentum. The remaining 56 patients (74.7%) had visceral injury that required intervention. Hollow viscus injury was noted in 46 patients (61.4%). 13 of these patients with hollow viscus injury had an associated solid organ and/or vascular injury. Isolated liver injury was noted in 4 patients (9.3%).

Conclusion: The majority of the patient presenting to the emergency department with evisceration have significant intra-abdominal visceral injuries that require surgical intervention.

CIVILIAN EXTRAPERITONEAL RECTAL GUNSHOT WOUNDS: SURGICAL MANAGEMENT MADE SIMPLER

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Introduction and aim: Rectal injuries are associated with significant morbidity. Controversy persists regarding routine presacral drainage, distal rectal washout (DRW), and primary repair of extraperitoneal rectal injuries. This retrospective review was performed to determine the outcome of rectal injuries in an urban trauma centre with a high incidence of penetrating trauma where a non-aggressive surgical approach to these injuries is practised.

Methods: The records of all patients with a full-thickness penetrating rectal injury admitted to the Trauma Centre at Groote Schuur Hospital over a four-year period (January 2002 - December 2005) were reviewed. These were reviewed for demographics, injury mechanism and perioperative management, anatomical site of the rectal injury, associated intra-abdominal injuries and their management. Infectious complications and mortality were noted. Intraperitoneal rectal injuries were primarily repaired, with or without faecal diversion. Extraperitoneal rectal injuries were generally left untouched and a diverting colostomy done. Presacral drainage and DRW were not routinely performed.

Results: Ninety-two patients with 118 rectal injuries [intraperitoneal (7), extraperitoneal (59), combined (26)] were identified. Only two extraperitoneal rectal injuries were repaired. None had presacral drainage. Eighty-six sigmoid loop colostomies were done. Two (2.2%) fistulas, one rectocutaneous and one rectovesical, were recorded. There were 9 (9.9%) infectious complications: surgical site infection (4), buttock abscess (1), buttock necrosis (1), pubic ramus osteitis (1), septic arthritis (2). No perirectal sepsis occurred.

Conclusion: Extraperitoneal rectal injuries due to low-velocity trauma can be safely managed by faecal diversion without repair, DRW and presacral drainage with minimal morbidity.

MEASUREMENT OF FINE MOTOR CO-ORDINATION IN SURGEONS

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Introduction: During the years of training, a surgeon repeatedly performs tasks including knot tying, proper handling of instruments, suturing and even laparoscopic skills. Repetition eventually leads to the almost automatic execution of the task with little attention needed to perform the task efficiently. At this stage a high level of fine motor control is attained and the skilled tasks are executed with economy of both motion and movement. Thus one would expect with more experience of the surgeon, the more efficiently a simple tasks can be performed. The digitiser tablet is used to measure subject fine motor co-ordination by determining the variation from an existing pattern while tracing over the pattern. The study is part of an ongoing assessment of ways of determining surgical skill in a non-patient based laboratory setting.

Objective: To determine whether there are differences in fine motor co-ordination, as assessed by a digitiser tablet, between individuals differing in surgical experience.

Materials and methods: Twenty eight subjects, controls (non-clinical; n=8), medical officers (n=5), surgical registrars (n=8) and consultants (n=5) participated in the study. Subject demographics and surgical experience was recorded. Fine motor co-ordination was assessed using an A GENIUS, 5.5"X 4" digitiser-tablet with a pressure sensitive cordless pen, controlled by Windows based software on a Pentium 4 computer. Subjects traced on the tablet with the pen, looking at the computer monitor, while tracing pre-existing vertical and horizontal lines and an ellipse. Time taken to perform each task was recorded with a stopwatch. The deviation from the existing lines were divided by the median and recorded as narrow (\leq median deviation) or wide ($>$ median deviation). Deviation from the elliptical pattern was determined by weight of the paper re-calculated to determine area of deviation. Data was recorded in EXCEL and analysed in SAS V9.1.

Results: Control subjects and medical officers generally had marked variation around the required rectangle lines, whereas the registrars and consultants

Group	Dominant hand		Non-dominant hand	
Rectangle deviation from template				
Controls (n/total)	Narrow	Wide	Narrow	Wide
Controls (n/total)	2/8	6/8	3/8	5/8
Medical officers (n/total)	1/5	4/5	2/5	3/5
Registrars (n/total)	6/10	4/10	7/10	3/10
Consultants (n/total)	5/5	0/5	3/5	2/5
Ellipses median difference from template (cm²)				
Controls (n=8)				
Medical officers (n=5)	2.69 cm²		6.73 cm²	
Registrars (n=8)	2.69 cm²		2.11 cm²	
Consultants (n=5)	2.06 cm²		3.42 cm²	
	1.61 cm²		1.67 cm²	

showed little variation. Similarly, when tracing over an ellipse, consultants traced with little deviation from the given ellipse in contrast to controls. The differences for medical officers and registrars fell between the other two groups.

Conclusions: These preliminary data suggest the tablet may be useful in determining fine motor control and seems to correlate with surgical skill. The results need to be confirmed in further study subjects.

NEUROANATOMY OF THE PEDUNCULATED SUPERNUMERY DIGIT

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Aim of study: Supernumerary digits (SD) are seen in two forms: (a) *SD with a wide pedicle*; this type is surgically removed at 3-6 months of age under general anaesthesia, and (b) *SD with a narrow pedicle* (pedunculated digit); which is normally tied off without sedation or local anaesthesia shortly after birth. Patients invariably appear to be in pain during this procedure. This suggests innervation of the digit.

This anatomical study was carried out to assess this innervation.

Method: 6 SDs with narrow pedicles were obtained after removing them under local or general anaesthesia. SDs were fixed in formalin, mounted in paraffin and microtomed in cross section. The sections were subjected to (Linder's) silver nerve staining technique.

Main results: The narrowest part of the pedicle contains central blood vessels and one or two large myelinated nerve bundles. These digital nerves, almost immediately, divide resulting in four myelinated nerve fibers more distally in the pedicle. Small nerve fibres branch off at regular intervals. The main nerve bundles then fan out within the digit and to the nail. Narrow-pediced SDs have a neuroanatomy very similar to normal digits.

Conclusion: There is increasing evidence of abnormal pain perception in infants who have been exposed to surgical procedures without adequate analgesia during infancy.

It is recommended that before removal, local anaesthesia is injected (or applied topically) to the base of an SD. A tie can then be applied to the pedicle and the SD excised distal to it. The procedure should preferably be done by a paediatric surgeon.

AN AUDIT OF THE QUALITY OF OPERATIVE NOTES AT A GENERAL SURGERY UNIT

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Operation notes are often referred to in medico-legal cases. Incomplete and illegible notes are a common source of weakness in a surgeon's defence. Operative notes are also referred to by colleagues and nursing staff, who are sometimes expected to make difficult decisions about postoperative patient care, particularly after hours. Furthermore, improving the accuracy and standardizing the form of presentation of operative notes facilitates efficient audit. This in turn improves the quality of patient care.

An audit of 100 sets of operation notes was carried out in a regional general surgery unit. Predetermined criteria were used to evaluate the accuracy of these notes. Notes for procedures described as urgent or emergency fulfilled more criteria than those for elective procedures or burns.

Direct comparisons were made between operative notes written by trainees and consultants. It was determined that consultants were more likely to accurately describe the incision, findings and actions of the procedure, but less likely to include accurate information about the suture used for closure, the dressing used, or the postoperative instructions. The consultants included diagrams of the procedure in their operative notes more frequently.

A series of operation pro formas for specific operation types (with diagrams and headings) were integrated into the current anaesthetic card. The introduction of the pro formas improved the standard of operative note-keeping with respect to many of the criteria identified.

RAPID CORRECTION OF METABOLIC ALKALOSIS WITH INTRAVENOUS Cimetidine IN INFANTS WITH HYPERTROPHIC PYLORIC STENOSIS

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Introduction: The definitive treatment of hypertrophic pyloric stenosis (HPS) is pyloromyotomy as described by Ramstedt. In most instances, there is a metabolic alkalosis, requiring intravenous fluid resuscitation to lower pH. If pH is above 7.65 at admission, this could take as long as 5 days. Alkalosis is due to excessive vomiting of hydrochloric acid (HCl) and therefore it is possible that serum pH can be normalised faster if a H2 blocker such as cimetidine is used to reduce HCl production. This study is to assess the usage of this drug.

Material: Over a 15-month period, 5 children (aged 5 - 8 weeks) with HPS, with arterial blood pH over 7.65, were treated with standard resuscitation protocols. Three cases remained alkalotic (pH >7.5) after 4 - 5 days of fluid management and these infants were given intra-venous cimetidine at 50 mg twice daily for 24 hours. The remaining 2 cases, with an initial pH of 7.7, were given cimetidine immediately after admission.

Results: In all cases, pH reduced to less than 7.5 after 2 - 3 doses of cimetidine, thus allowing for safe surgery within hours of pH correction.

The patients were commenced on oral feeds the next day and were discharged at the 2nd postoperative day.

Conclusion: In this small series of patients with HPS, it appears that metabolic alkalosis can be stabilised rapidly with the usage of intra-venous cimetidine. Pyloromyotomy can be performed earlier, saving hospital costs and allowing earlier discharge.

PRESENTATIONS OF THE SURGICAL RESEARCH SOCIETY OF SOUTHERN AFRICA (1997 - 2006)

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The inaugural meeting of the SRS took place in Johannesburg in 1972. Two previous studies have analysed the papers presented to the Society over the first and second decades. During the second decade there were a total of 594 papers presented, of which 15 - 35% were regarded as basic science (non-clinical).

The aim of the present study was to analyse the papers presented at the SRS meetings over the last decade.

The abstracts of all the papers presented to the SRS between 1997 and 2006 were reviewed. The following information was recorded: Institution, subspecialty, type of research.

During this 10-year period, a total of 552 papers were presented, with an apparent slight increase in recent years (55, 41, 39, 57, 59, 45, 63, 62, 60 and 71). The proportion of basic science presentations has remained steady over the decade at between 20% and 35%. The most prolific institutions have been the Universities of Cape Town (34%), Witwatersrand (19%) and KwaZulu-Natal (17%). The distribution of subspecialties has changed in recent years, with trauma (13%), transplantation (12.5%) and vascular (10%) being the most popular.

There has been a minimal decline in the total number of papers presented at the SRS over the last decade, and the proportion of basic science papers remains unchanged.

PAIN PERCEPTION IN NEONATES: OBSERVATION DURING CIRCUMCISION

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Introduction: Pain perception in neonates is a controversial subject, with the old fashioned statement of 'newborns do not feel pain' roundly discarded. The retrospective study was performed to assess the perception of pain during neonatal circumcision.

Material: Over a 6-month period (Nov 2006 - April 2007), 68 neonatal circumcisions performed by the author were retrospectively analysed. A ring block with 1% lignocaine at 20 mg/kg was used. As a further 'soothing' method, formula/expressed breast milk was fed to the child liberally during the procedure (and if no milk was available 10% glucose/water solution was used). A sutureless circumcision was performed with size 12 or 13 Gomco clamp, with an iodine gauze wrapped on the wound at the end of the procedure. All parents were present during the procedure, and all were contacted for the purpose of the study telephonically and questioned in detail about the baby's reaction during the procedures.

Results: Age at the time of the procedure ranged from 1 day to 38 days (median 12 days). All babies were calm when brought to surgery. They cried during the injection of ring block, irrespective of soothing fluid given. During the procedure, only boys over 7 days old continued to show signs of irritation and discomfort, i.e. crying not in keeping with the child's usual response to nappy change, hunger, etc. (as noted by the parents). Newborns less than 7 days old were either calm or slept throughout the procedure.

Conclusion: It appears that perception of pain can be suppressed completely in newborns undergoing circumcision, with local anaesthesia and oral feeds. Surprisingly, this is only effective up to 7 days of age, suggestive of alterations in either neuroanatomy/neurophysiology of the foreskin or central pain perception in this specific age range. Further studies are planned to investigate this matter.



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SEQUENTIAL CHANGES IN COAGULATION AFTER RENAL TRANSPLANTATION - A THROMBOELASTOGRAM STUDY

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Chronic renal failure (CRF) is associated with complex alterations in coagulation. The changes in coagulation which occur after renal transplantation have been studied only to a limited extent. The thromboelastogram (TEG) provides a global assessment of whole blood clotting. In this study, sequential changes in coagulation after renal transplantation were investigated using the TEG in 8 patients. The controls included normal healthy controls ($n = 6$), and patients on haemodialysis ($n = 5$), on peritoneal dialysis ($n = 6$) and long-term after transplantation ($n = 7$). The TEG parameters measured included the R-time, K-time, alpha angle and the maximum amplitude (MA).

The TEG parameters pre-transplantation demonstrated a hypercoagulable state. There was a trend towards normal coagulation immediately post-transplantation (days 2 - 4) and a return to hypercoagulability thereafter, compared to the normal controls. There was no difference in the TEG parameters between the patients long-term after transplantation and the normal controls. The dialysis patients were also hypercoagulable.

EARLY SURGICAL RESULTS OF A LIVER TRANSPLANT PROGRAMME IN JOHANNESBURG

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Aim: To review the early results of a newly established liver transplant programme and identify problem areas.

Method: A liver transplant program was begun in August 2004. The aim was to perform at least 20 transplants annually and provide a service to the whole community. Patient pathology, donor utilization, recipient operations and outcomes were analyzed in the period to May 2007.

Results: A total of 38 liver transplants were performed. Ages ranged from 1 to 67y, 4 were paediatric recipients, 2 indigent, 21 male, 29 white, 4 black, 2 mixed-race, 3 Asians. The mean MELD score was 23 (8 - 40) and waiting time 5 months (3 days - 22 months). Patients with higher Meld scores were transplanted earlier. There was a disproportionate representation of blood group-A recipients (14/39). PSC (12), autoimmune hepatitis (6) and alcohol (8) accounted for the majority of transplants. Mean operative time was 5 h 45 min, cold ischaemic time 5h30 min (3°45' - 10'), mean blood loss was 1850 ml (300 - 10 000 ml). Nine suitable livers were not used due to logistic problems. Ten chronic and 6 acute liver failure patients died while waiting. Complications included re-operation for bleeding (3), biliary tract complications (4 early, 5 late strictures), abdominal sepsis (2) and wound sepsis (5). There were no primary non-functions and no hepatic artery thromboses requiring re-transplantation. Three transplanted patients died. Mean follow up time was 14 months. The initial waiting list of 5 has grown to 35 in this time period while the number of donors has remained low.

Conclusion: Comparable outcomes with established units have been achieved. Logistic and financial constraints remain a difficulty in transplanting indigent and paediatric patients and result in underutilisation of suitable livers. More wait list deaths can be expected unless more donors and suitable livers are utilised.

THE EFFECT OF LIVER REGENERATION ON CYCLOSPORINE PHARMACOKINETICS

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In liver transplantation, the liver can be injured as a result of ischaemia, reperfusion, rejection and infection. The transplanted liver responds by undergoing liver regeneration. We know that cyclosporine is metabolised via the cytochrome P450 system and that cytochrome P450 is down-regulated during liver regeneration. In this study we investigated the effect of liver regeneration on cyclosporine pharmacokinetics.

Male Long Evans rats weighing 250 - 300 gm were randomly assigned to either 2/3 partial hepatectomy (PH) or sham operation (SH). Cyclosporine (5 mg/kg) was administered orally at 0, 24 and 96 hours postoperatively. Blood samples were taken at 0, 2, 4, 6, 12 and 24 hours after each dose of cyclosporine and the following pharmacokinetic parameters calculated: Co, Cmax, Tmax, AUC and T1/2.

The pharmacokinetic profile at 96 hours postoperatively showed higher AUC in the PH group (5 963 vs 4 001), higher Cmax in the PH group (360 vs 263), and higher Co in the PH group (235 vs 173). The pharmacokinetic profile immediately after PH or SH showed higher AUC in the PH group (4 754 vs 3 350), and a higher Co in the PH group (88 vs 72). After PH, the AUC, Cmax and Co were all lower in the pharmacokinetic studies done at 0 hours compared to 96 hours (4 754 vs 5 963, 172 vs 360, and 88 vs 235, respectively). There was minimal change in pharmacokinetic parameters after SH at 0 and 96 hours postoperatively.

In conclusion, liver regeneration results in impaired metabolism of cyclosporine, presumably as a result of its effect on cytochrome P450. This would impact on cyclosporine monitoring in patients with compromised liver grafts.

ORGAN DONOR REFERRALS TO GROOTE SCHUUR HOSPITAL BETWEEN 1996 AND 2005

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The most significant factor limiting transplantation is the critical shortage of organs available for transplantation. Several strategies have been introduced to increase the number of donor referrals. In this study we reviewed all the patients referred as potential organ donors to our Unit.

All patients referred to the Transplant Unit at Groote Schuur Hospital as potential organ donors between 1996 and 2005 were included in the study. The hospital records of these patients and the transplant co-ordinator files were retrospectively reviewed, and the demographics, cause of death, time of referral, use of inotropes, referring centre, and outcomes recorded.

During the 10-year study period, 824 potential organ donors were referred to our Unit. The male to female ratio was 3:1, and included 321 black patients, 318 mixed race patients and 154 white patients. The average age of the patients was 26.15 years (range 1 day to 73 years). The majority of the referrals (453; 54%) were from Groote Schuur Hospital; the remaining referrals came from Red Cross Children's Hospital (98; 12%) other hospitals in the Western Cape (103; 13%), and hospitals in the Eastern Cape (170; 21%). The number of referrals has decreased over the course of the 10 year period, from 113 in 1996 to 59 in 2004. There has also been an increase in the number of black patients referred as potential donors. Thirty-nine per cent of the patients were blood group 0, 38% were group A, and 18% were group B. The majority of deaths were related to trauma (640), with 171 deaths due to medical causes. Only 38% of the referrals were eventually used as organ donors.

Thus, in summary, the number of referrals of potential donors to the Transplant Unit is decreasing and only 38% of the referrals were eventually used as donors.

THE EFFECT OF LIVER REGENERATION ON RAPAMYCIN PHARMACOKINETICS

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In liver transplantation, the donor liver is susceptible to many forms of injury, including ischaemia, reperfusion, rejection and infection. The liver responds to injury by undergoing liver regeneration. Several of the new immunosuppressive agents are known to modify the regenerative response. In this study we investigated the effect of liver regeneration on the pharmacokinetic (PK) profile of rapamycin (RAPA).

Male Long Evans rats weighing 250 - 300 gm were randomly assigned to either two-thirds partial hepatectomy (PH) or sham operation (SH). Single bolus doses of RAPA were administered orally at 0, 24 and 96 hours postoperatively. Blood samples were taken at 0, 1, 2, 4, 6, 12 and 24 hours after the dose of RAPA and used to measure RAPA levels. These were used to calculate the following PK parameters: AUC, Co, Cmax, and T1/2.

The PK profiles (AUC, Cmax and Co) at 24 hours after PH and SH were the same (63 vs 64; 5.3 vs 4.5; and 1.5 vs 1.8, respectively). The PK parameters (AUC, Cmax and Co) at 96 hours in the PH and SH groups were also similar (186 vs 149; 7.6 vs 8.2; and 5.7 vs 4.3, respectively). The PK parameters were higher at 96 hours after PH compared with 24 hours (186 vs 63; 7.6 vs 5.3, 5.7 vs 5.7, respectively).

In conclusion, RAPA pharmacokinetics were not modified by the regenerative response.

FACTORS WHICH INFLUENCE THE SUCCESSFUL RETRIEVAL OF ORGANS FROM POTENTIAL DONORS

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Although organ transplantation has achieved remarkable success, the critical shortage of organs for transplantation remains a major limiting factor.

Unfortunately many of the potential donors referred to transplant units do not result in successful organ donation. In this study we reviewed the factors which could influence organ donation.

All referrals of potential donors to the Transplant Unit at Groote Schuur Hospital between 1996 and 2005 were included in the study. The patient files and transplant co-ordinator records were retrospectively reviewed and factors which could influence organ donation noted.

There were 824 potential donor referrals to our Unit between 1996 and 2005. The male to female ratio was 3:1, and the mean age was 26.15 years. The races of the patients were as follows: 321 black, 318 mixed race and 154 white.

Only 38% of the 824 potential referrals resulted in successful organ donors. The success rate has remained more or less the same over the 10-year period. The reasons why the referrals were not used included refusal of consent (26%), the donor not being suitable (21%), cardiac arrest of the donor (6%), and no family available (3%). The consent rates were highest in the white patients, and lower in the black patients (33%). The consent rate was not influenced by the age or gender of the donor.

The consent rate was higher when the cause of death was suicide.

The very high overall refusal rate in potential organ donors remains an ongoing problem, with the lowest success rates in black patients.

TACROLIMUS PHARMACOKINETICS IS IMPAIRED IN LIVER REGENERATION**Lutske Lodewijk, Anwar Mall, Wendy Spearman, Enid Shepherd, Delawir Kahn***Surgery, University of Cape Town*

Ischaemia, reperfusion, rejection, infection and drug toxicity are all potential causes of injury to the graft in liver transplantation. This injury results in a regenerative response in the liver graft. Tacrolimus is metabolised via the cytochrome P450 system, and liver regeneration is associated with down-regulation of cytochrome P450. We therefore investigated the effect of liver regeneration on the pharmacokinetics (PK) of tacrolimus.

Male Long Evans rats weighing 250 - 300 gm were randomly assigned to either 66% partial hepatectomy (PH) or sham operation (SH). Tacrolimus (0.2 mg/kg) was administered orally at 0, 24 and 96 hours postoperatively. Blood samples were taken at 0, 1, 2, 4, 6, 12 and 24 hours and the Tacrolimus PK profiles calculated. The following PK parameters were calculated: AUC, Cmax, Co, and t1/2.

PK studies undertaken immediately after PH and SH, showed higher AUC, Cmax and Co in the PH group (188 vs 129; 20 vs 11; and 10 vs 2.9, respectively). Similarly the PK studies undertaken at 96 hours after PH and SH, showed higher AUC, Cmax and Co in the PH group (169 vs 94; 18 vs 7; and 4.3 vs 2.3, respectively. In the animals subjected to PH, the AUC, Cmax, and Co were higher at 0 hours compared to 96 hours postoperatively (188 vs 169; 20 vs 18 and 10 vs 4.3, respectively).

In conclusion, the PK parameters were higher in the PH group compared to the SH animals. The impaired metabolism of Tacrolimus in the PH group was probably related to the down-regulation of cytochrome P450 associated with liver regeneration. This has important implications in patients transplanted with marginal livers.

FNA IN THYROID DISEASE – SHOULD IT ONLY BE PERFORMED BY A DEDICATED TEAM?**Osman E. O., Mikey C. J.***Department of Surgery, Pretoria Academic Hospital, University of Pretoria*

Background: Thyroid nodules are commonly encountered in general surgery practice. There is always a need to identify the subset of malignant lesions among the high numbers of these predominantly benign conditions. Fine needle aspiration cytology (FNA) has become an important diagnostic aid in the management of thyroid nodules as reported in the literature. Shortcomings are that the FNA is operator/interpreter dependant with different rates of sensitivity and specificity. In this presentation we assess the role of FNA when performed randomly by circulating registrars and not reported on by a dedicated cytology pathologist.

Methods: The records of patients who had FNA (in the period from January 1995 to April 2005) were reviewed. The subgroup of patients who underwent FNA followed by thyroidectomy were further analysed and their results correlated with their histologic outcomes.

Results: Out of 1650 patients with FNA reports 261 underwent thyroidectomy for different clinical indications. In 83(31.8%) cases a diagnosis was offered. In 178 cases (68.8%) no specific diagnosis was offered. 58 cases (22.2%) reported as benign of whom 3 (5.10%) were found to be malignant on histology. 22 were considered suspicious for malignancy. 8 were histologically proven malignant on histology. There were 27 malignant lesions (10.3%). Of these 27 malignant cases the diagnosis was suggested in 11 cases (40.7%).

Conclusion: For FNA to be reliable as a diagnostic aid in the decision making process in the management of nodular lesions of the thyroid, both the collection and the interpretation of the specimen should be handled preferably by a dedicated FNA team.

ROLE OF FINE NEEDLE ASPIRATION IN THE PREOPERATIVE EVALUATION OF SALIVARY GLAND TUMOURS**D. Mbaya, M. C. M Modiba, I. Mandiwana****Department of General Surgery, Dr George Mukhari Hospital; Department of Anatomical Pathology*, Medunsa Campus, University of Limpopo*

Background: This study seeks to evaluate the efficacy of FNA in salivary gland tumours.

Material and methods: A retrospective study was done on patients who had salivary gland tumours and had fine needle aspiration performed. The study focused on a 7-year period (May 1999 to March 2007). Only those patients who had FNA followed by tissue biopsy with a histological diagnosis were included. A total of 36 patients were included comprising of 14 males and 22 females with a median age of 48 years. FNA was done at the outpatient department and the specimen was fixed with either 95% ethanol or a cytological fixative on a slide and then taken to the laboratory where it was stained with Harris haematoxylin, Orcein Green (OG 6) and Eosin Alcohol (EA 50) stains and evaluated under a microscope at 10X and 40X magnification. Preoperative cytology results and postoperative histology results were collected compared and analysed.

Results: Twenty seven (75%) were parotid swellings and 9 (25%) were submandibular gland swellings. Of the 27 patients with parotid tumours, 26 underwent superficial parotidectomy and 1 had a total parotidectomy. All the patients with submandibular tumours had submandibular gland excision. Benign versus malignant cytology results were 32 (83.8%) : 6 (16.2%) as opposed to 26 (70.3%) : 11 (29.7%) histological results. Of the 1 malignant histology reports, 7 were parotid and 4 mandibular. FNA was able to detect

malignancy in 5 out of 11 histologically malignant cases. The specificity was 96%, diagnostic accuracy was 86% with a sensitivity of 96% for benign disease. The 6 histologically malignant cases missed on cytology were acinic cell carcinoma (2), ductal carcinoma, low grade mucoepidermoid carcinoma (2) and adenocarcinoma. Those that were correctly diagnosed were clear cell carcinoma, malignant melanoma, mucoepidermoid carcinoma (2) and squamous cell carcinoma.

Conclusion: FNA is an acceptable investigative tool for benign salivary gland tumours. It should, however, not be used as evidence to justify radiation or extensive surgery.

ANTI-HIV-1 ACTIVITY OF SALIVARY MUC5B AND MUC7 MUCINS FROM HIV PATIENTS WITH DIFFERENT CD4 COUNTS**Habtom H. Habte¹, Corena de Beer³, Zoe Lotz¹, Marilyn Tyler¹, Paul Roux², Delawir Kahn¹, Anwar S. Mall¹***¹Department of Surgery, ²Paediatric Medicine, University of Cape Town, ³Medical Virology, Stellenbosch University, Tygerberg, W Cape*

Objective: We have shown that MUC5B and MUC7 mucins from saliva of HIV negative individuals inhibit HIV-1 activity by 100% in an *in vitro* assay (Habte *et al*, *Virol J* 2006;3:99). In this study we investigated whether MUC5B and MUC7 from saliva of HIV patients or with full-blown AIDS had a similar inhibitory activity against the virus.

Methods: Saliva was collected from HIV patients from the Clinic for Infectious Diseases at Groote Schuur Hospital, in Cape Town. Samples were grouped according to the CD4 counts of the patients, <200, 200 - 400 and >400. For the inhibition assay MUC5B and MUC7 (0.9 mg in 500 µl) were mixed with 4 ml of the HIV-1 supernatant fluid and incubated for 60 min at 37°C. As controls, heat inactivated HIV-1 and HIV-1 plus media were used. After filtration of the mixture through 0.45 µm cellulose acetate filter, both the unfiltered and filtered samples were incubated with the human T lymphoblastoid cell line (CEM SS cells) at 37°C at a concentration of 0.5×10^6 cells/ml for 30 min, 1 h and 3 h. Cells were then washed three times with PBS to remove free virus, and cultured. Supernatant fluid was harvested on day 4 and viral replication was measured by a qualitative p24 antigen assay.

Results: It was shown that irrespective of their CD4 counts both MUC5B and MUC7 from HIV patients, unlike the MUC5B and MUC7 from HIV negative individuals, did not inhibit HIV-1 infection. The mucins from HIV-negative and positive individuals had different mobilities on agarose gel electrophoresis.

Conclusions: The reason for the inability of mucins from infected individuals to inhibit the virus is not known. It is likely that there is an alteration of the glycosylation pattern, and therefore of charge of mucin, in HIV positive patients. The ability to inhibit the virus by aggregation by sugar chains is thus lost. Evidence for this hypothesis was shown by the varying mobility on an agarose gel of MUC5B and especially MUC7 from normals and HIV patients of different CD4 counts. An altered glycosylation pattern could explain the increase in opportunistic infections of the mouth by organisms such as *Candida albicans* in HIV patients.

PLASMA ARGinine CONCENTRATIONS ARE RELATED TO PROLINE CONCENTRATIONS IN BLACK SOUTH AFRICAN SUBJECTS**G.P. Candy, A. D. Cromarty², M. Nel, C. Naidoo, T. Nunkoo³, E. Libhaber³, M. R. Essop³***¹Departments of Surgery and Cardiology³, Chris Hani-Baragwanath Hospital and University of the Witwatersrand, Johannesburg, and ²Immunology², University of Pretoria*

Introduction: The semi-essential amino acid arginine:

- is synthesised by the kidney and is used in protein synthesis, including the cross-linking of collagen;
- is the precursor to the vasodilator nitric oxide, which is also a neurotransmitter and is essential in the defence against infectious diseases (e.g. malaria);
- plays a significant role in burn victims (in nitrogen metabolism), although its benefit in wound healing *per se* is less clear;
- inhibits platelet aggregation and decreases PAI-I and fibrinogen concentrations;
- prevents salt sensitive hypertension in the rat model;
- supplementation improves outcome in heart failure and decreases blood pressure in hypertension.

Orotic acid concentrations, a marker of arginine deficiency, are elevated in cardio-vascular diseases (including hypertension and stroke), diabetes and in some cancers.

Factors regulating arginine concentrations in humans have not been fully elucidated. We examined the relationships between plasma arginine concentrations and other amino acids in subjects without and with hypertension. Patients with hypertension are convenient to study as changes in arginine should reflect as non-invasively measured blood pressure changes.

Aim: To determine relationship between plasma arginine concentrations with other amino acids in black African patients with hypertension.

Methods: Consecutive subjects being screened for hypertension at the clinic at CH-Baragwanath Hospital were requested to take part in the study and provide a blood and urine sample after an overnight fast. In consenting subjects, ambulatory 24-hour blood pressures (ABPM) were measured and amino acid profiles in blood and urine determined by HPLC-MS. Hypertension was defined in subjects with a mean daytime ABPM >89 mmHg.

Results: Plasma arginine concentrations were increased in hypertension and correlated directly with proline concentrations ($r^2=0.91$; $p<0.05$). Weaker

associations with amino acids using the γ -transporter, and the branch chain amino acids, were noted.

Discussion: The finding of elevated plasma arginine concentrations in hypertension is consistent with two published reports in the literature. The novel finding of the correlation between plasma arginine and proline, a precursor of arginine, suggest that arginine is being synthesised from proline. The results suggest that arginine synthesis may be up-regulated, as reflected by the increased plasma concentrations. However, the arginine is not available for nitric oxide synthesis in these patients with hypertension. Further studies using non-radioactive isotopes would confirm the conversion of proline to arginine.

A POLYCLONAL ANTIBODY TO A 55 - 65 kDa GASTRIC MUCIN FRAGMENT IN GASTRIC ADENOCARCINOMA AND ULCERATION: A CLINICAL MARKER FOR GASTRIC DISEASE?

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Introduction: Gastric cancer is a fatal disease prevalent in the Western Cape region of South Africa. There has been an increasing interest in mucins in the detection and management (treatment) of carcinomas (Devine and McKenzie 1992) and also in particular in their role as diagnostic and therapeutic agents (Graham *et al.* 1996). Tumour markers useful in diagnosing gastric carcinoma at an early stage have not been identified. Hakkinen *et al.* (1991) described a structure associated with gastric mucins in carcinoma that could be useful as a clinical marker. Our laboratory identified a mucin fragment of Mr=55 - 65 kDa in crude mucus scrapings and purified mucin from stomachs of patients with ulceration and carcinoma (Mall *et al.* 1999).

Aim: To determine whether this factor can be used as a marker for premalignant disease of the stomach.

Methods: Gastric mucins were extracted and purified from crude mucus scrapings obtained from gastrectomy specimens resected for carcinoma and peptic ulceration. Mucins were separated by SDS-PAGE and the 55 - 65 kDa glycoprotein (band) was retrieved from the gel by electro-elution methods and injected into a rabbit using the optimized naked bacteria method for antibody production (Bellstedt, DU *et al.* 1987). Antibody specificity against the band (55 - 65 kDa), albumin and other mucins was then determined by Western blotting.

Results: We have successfully isolated the 55 - 65 kDa mucin fragment by gel electrophoresis from the mucus of patients with carcinoma and ulceration and raised a polyclonal antibody against it in a rabbit. This antibody will be used to determine the level of expression of this fragment in intestinal metaplasia, low and high grade dysplasia, ulceration and carcinoma of the stomach by immunohistochemical methods.

Summary: This antibody could be used as a screening technique in a high risk group for gastric cancer in the Western Cape.

ARGININE UPTAKE AND NITRIC OXIDE PRODUCTION IN AN ENDOTHELIAL CELL LINE

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Introduction: Nitric oxide (NO) plays a major role in arterial vasodilation. Vasodilation in subjects with normal blood pressures is proportional to the concentration of arginine, the precursor of NO. Indeed, markers of arginine deficiency are elevated in stroke and hypertension. In addition, the well known cardiovascular risk factor, homocysteine reduces NO production. However, the factors which determine arginine uptake and the impact of extracellular arginine and homocysteine concentrations on NO production by endothelial cells have not been determined.

Aims: To determine factors which determine arginine uptake (arginine and homocysteine concentrations) and consequently NO production in an endothelial cell line.

Methods: 400 000 endothelial cells (ECV₃₀₄) were grown to confluence in 6 well culture plates for both arginine transport and NO production studies. The cells were washed with buffer and growth medium replaced with arginine-free medium and incubated for 24 hours. The medium was removed and the cells incubated with saline buffer containing ³H-arginine with/without unlabelled homocysteine. The reaction was stopped at specific time periods and ³H-arginine uptake by the cells determined using a β -scintillation counter. The NO specific fluorescent probe DAF-2/DA was used to measure NO production in the supernatant.

Results: Uptake of ³H-arginine into the cells was rapid and followed Michaelis-Menten kinetics. The K_m (arginine concentration at 1/2 maximal uptake) was 9.5 μ M arginine/L. Homocysteine competitively inhibited arginine uptake. NO production only commenced at arginine concentrations >50 μ M arginine/L and was maximal at 200 μ M arginine/L. The kinetics showed 'inhibition' of NO production at low arginine concentrations.

Conclusions: a) Homocysteine inhibited arginine uptake by endothelial cells b) NO production was inhibited at low arginine concentrations. These data may have implications in cardiovascular disease.

ULTRASTRUCTURAL COMPARISON OF THE MORPHOLOGY OF THREE DIFFERENT PLATELET AND FIBRIN FIBRE PREPARATIONS

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The aim of the current study was to investigate the suitability to study ultrastructural morphology of three different sources of fibrin networks and platelets, namely lyophilised human platelet-rich plasma (LPRP) (kindly supplied by the South African National Blood Service), freshly prepared human platelet-rich plasma (FPRP) and human platelet concentrate (HPC).

The ultrastructural morphology of the three different fibrin networks was studied using the Scanning Electron Microscope (SEM). Turbidity curves were drawn at 405 nm at room temperature and fibrinogen concentrations measured. Scanning electron micrographs showed that all clots produced thick major fibrin fibres as well as a well-defined fine fibrin network which appeared to be a superimposed process which occurred after the major fibrin network was established. These features were decidedly more pronounced in the HPC specimens.

We suggest that LPRP could be used successfully in morphology studies and therefore might be a suitable substitute for FPRP to study morphological changes in fibrin fibres and platelets which may occur after exposure to certain therapeutic agents.

It would seem that the study of the activated platelet-fibrin networks may also provide valuable insights into the applicability of a topical platelet concentrate clotted with thrombin as a source of platelet growth factors in the treatment of recalcitrant ulceration of the skin.⁽¹⁾

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SPLIT-THICKNESS SKIN GRAFT (SSG, STSG) ADHERENCE: CORRELATION WITH ALBUMIN LEVELS, PRESENCE OF OEDEMA

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Introduction: Many factors contribute to a successful skin graft. One of them is the state of patient nutrition expressed as the level of serum albumin. It is believed and taught that skin grafts should not even be attempted in patients with albumin levels below the normal range (35 - 52 mg/L at Pelonomi Hospital, Free State). At our Burns Unit we have been pleasantly surprised by the good takes that we have noted in patients with less than ideal serum albumin levels.

Aim: This study sets out to answer the questions i) Is albumin alone the determinant of split-skin graft success at the Burns Unit, Pelonomi Hospital, Free State? ii) What is the role of oedema? iii) Is there a level of albumin below which split-skin graft take is seriously jeopardised, and if so what is this level?

Method: This is a cohort study in which patients who underwent SSG had the % take, preoperative albumin levels and presence of oedema tabulated and a correlation analysed. We hoped to collect 70 subjects from February 2006 to August 2006. At the Pelonomi Hospital Burns Unit serum albumin is determined as a regular weekly activity (along with full blood counts and wound swabs). The presence or absence of oedema was determined by standard clinical methods. Both these were tabulated against the degree of SSG take expressed as a percentage. This determination was made on the 5th post-graft day. The wound surface of all wounds receiving the graft was estimated as well as the total % take.

Results: 24 patients with 29 wounds between them were included in this study. 16 were males and 8 were females. The mean age was 30 years (SD=3.1). The median TBSA was 8.5% (range: 2 - 56%). Oedema was present in 6 patients and absent in 18 patients. Serum albumin (n=29) mean was 25.1 (SD=6.8), range 11 - 38 gm per litre. 89.7% of the subjects had a graft take of 100% (range 60 - 100%). Using the Spearman rank correlation coefficient there was no correlation between albumin levels and graft take ($r = 0.06$, p -value 0.7602).

Discussion and conclusion: Albumin comprises 60% of all plasma proteins, is used in wound healing and would be expected to play a role in all the phases of graft healing and survival. This study sample experienced good graft takes with 62.1% of them having a 100% take. The study did not show a correlation between serum albumin levels and degrees of take, re-emphasising the multi-factorial nature of split-thickness skin graft takes.

THE SPECTRUM OF HEAD INJURY PRESENTING TO A BUSY REGIONAL CENTRE

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Introduction: Access to specialised neurosurgical services in South Africa is limited. The management of these patients often relies on the input of non-

neurosurgeons. When a problem requiring urgent neurosurgical intervention is identified then it is imperative that the trauma system functions smoothly. This study aims at prospectively evaluating the spectrum of injury seen at a regional centre and in examining the efficiency of the referral system.

Methodology: All patients presenting to Edendale Hospital with a diagnosis of head injury during the two months of March and April 2007 were prospectively reviewed by the primary author. Standard demographic data were recorded. Referral times from the scene to our centre were examined as were referral times from our centre to the quaternary neurosurgical centre were documented.

Results: In the period March - April 2007 154 patients presented with a head injury to Edendale Hospital. There were 115 males and the average age was 33. Aetiology was assault (65), motor vehicle collision (44) fall (2) and gunshot wound (3). The mechanism of injury was unrecorded in 38. Three patients died in A and E and 64 (41%) required admission. The remainder were discharged home from A and E. Fifteen (23%) of the admissions required advanced care. Ten were admitted to the general surgical ICU and 5 required urgent transfer to our neurosurgical referral unit. The length of time from diagnosis to despatch to the neurosurgical unit was six hours (range 4 - 12 hours).

Conclusion: Head injuries are common. There are long delays associated with their management and with referral. Just under a quarter of admissions require specialised care either in a general ICU or in a specialised neurosurgical ICU. Ongoing detailed audit is essential. Adequate allocation of resources is required to manage these patients adequately.

GUNSHOT WOUNDS TO THE HEAD

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Introduction: Gunshot wounds have traditionally been common in countries like the USA and South Africa and a rarity in Europe. Recently this has changed with Europe witnessing an increase in this type of injury. As a result of this gunshot injury to the head has also increased with the expected dismal outcome.

Patients and methods: A retrospective study was undertaken of all patients admitted with gunshot injury to the head of a six and a half years period. The data collected included demographics, mechanism of injury and the condition and treatment of patients throughout the pre-hospital, hospital and later recovery phases. The patients were stratified in 3 groups: the ones who died in resus, the ones who died post-admission and the survivors. Parameters related to outcome were identified.

Results: Thirteen percent of the patients died in the resuscitation area. Thirty two patients died after admission to Trauma ICU. They were all admitted with a low GCS score (less 9/15) and in 1 out of 4 there was abnormal pupillary reaction. Eighty-eight per cent died within the first days. There were 30 survivors. The GCS score in this group was less than 9/15 only in 8 patients. The pupillary reaction was normal in all patients apart from one. At a three months follow-up there were 16 patients with a GOS of 3, 8 of 4 and 3 of 5. Three patients were discharged with a GOS of 3, lost to short term follow-up.

Conclusions: Civilian gunshot injury to the head is related to high mortality. Indicators of outcome are the GCS score on admission, pupillary reaction, severity of injury as evidenced by CT scan, aetiology and concomitant injuries. The majority of deaths occur at an early stage. Between the survivors the disability outcome can be acceptable. Lack of long follow-up and social economic circumstances does not let us come to solid conclusion about the full range of recovery. Further prospective multicentric studies are required to come to solid conclusions regarding the prognosis of patients with gunshot head and the possibility of futile care based on clinical findings on scene, response to resuscitation and CT imaging.

EMERGENCY THORACIC SURGERY FOR PENETRATING, NON-MEDIASTINAL TRAUMA

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Background: Penetrating thoracic injury is commonly found in South Africa. A review of our recent experience was undertaken to assess the effectiveness of our protocols for this type of injury.

Methods: A retrospective study of 61 consecutive patients with penetrating, non-mediastinal trauma to the chest was conducted over 32 months at a single trauma unit. Patient details, mechanism of injury, operative procedure and in-hospital mortality and morbidity rates were recorded.

Results: Two thousand and nineteen patients presented with penetrating chest injury of which 61 patients (3%) underwent thoracic surgery for non-mediastinal injury. Twenty-six patients had stab wounds and 35 had gunshot wounds. Overall mortality was 17/61 (28%). Gunshot wounds were more likely to result in death than stab wounds (relative risk = 11.9; 95% confidence interval 1.7 - 84.0) and thoracoabdominal injury resulted in death more commonly than chest injury (relative risk = 4.8; 95% confidence interval 2.2 - 10.3) resulted in death.

Conclusion: Penetrating chest injury is common and most patients can be managed without formal thoracic surgical intervention. However, the patients who do merit surgical intervention have a relatively high mortality and a rapid and practised operative approach is required to achieve acceptable results.

THE SPECTRUM OF BLUNT TRAUMA AT A TERTIARY TRAUMA CENTRE IN SOUTH AFRICA

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Introduction: The South African experience with penetrating trauma has been well documented. However the incidence of blunt trauma has never really been commented upon. This report looks at the spectrum of major blunt torso trauma that presents to a busy metropolitan tertiary trauma service in South Africa.

Methods: A prospective database of all major blunt torso trauma that required admission to the metropolitan trauma service in Pietermaritzburg, South Africa, was maintained from July 2006.

Results: Forty-seven patients who had experienced significant blunt trauma were treated from August 2006 till February 2007. There were 12 (24%) deaths and 34 survivors. A total of twenty-seven (60%) laparotomies were performed. There were 3 non-therapeutic laparotomies (10%). The abdominal findings were injury to small bowel (7), stomach (1), duodenum (1), bladder (5), gallbladder (1), vagina (1), liver (2), spleen (1), diaphragm (2), vena cava (1). The ratio of hollow visceral to solid visceral injury was 9:2. There were two conservatively treated liver lacerations and one splenic laceration. There was a single case of unsuccessful non-operative treatment of a liver laceration. Eight (29%) patients required a relaparotomy. Associated injuries included spinal (2), long bones (6), pelvic fractures (5), rib fractures (14) pulmonary contusions (2) pneumothoraces or haemothoraces (5), vascular injuries (1). Full ICU support was required in 14 (31%). The average length of stay in ICU was nine days. Abdominal CT scan was obtained in 17 patients (36%). There were two false negative CT scans and two false positive CT scans. In 13 the CT scan correctly diagnosed the pathology in the abdomen.

Conclusion: There is a high volume of significant blunt trauma in Pietermaritzburg. The ratio of hollow visceral to solid visceral trauma is different to that reported in the literature.

CT scan is very accurate at predicting intra-abdominal injury and influenced management decisions significantly. Managing blunt trauma without liberal use of radiological imaging is inappropriate.

NON-OPERATIVE MANAGEMENT OF PENETRATING KIDNEY INJURIES: A PROSPECTIVE AUDIT

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Introduction and aim: The role of non-operative management for penetrating kidney injuries is unknown. The purpose of this study is to review the management and outcome of penetrating kidney injuries in a center with a high incidence of penetrating trauma.

Methodology: All patients presenting with haematuria and/or kidney injuries discovered at surgery admitted to the Trauma Centre at Groote Schuur Hospital over a 19-month period [Jan 2005 - July 2006] was prospectively collected and reviewed. These were analysed for demographics, injury mechanism, perioperative management, nephrectomy rate and non-operative success. Patients presenting with haematuria with an acute abdomen underwent single-shot intravenous pyelogram. Those presenting with haematuria without an indication for laparotomy had a contrasted CAT scan.

Results: Ninety-three patients presented with haematuria. There were 68 proven renal injuries. There were 85 men, with a mean age of 28.5 [16-55] years. There were 36 (52%) stab and 32 (47%) gunshot renal injuries. Investigations done: IVP - 24 and CAT scan - 57. There were 21 (31%) nephrectomies performed for uncontrollable bleeding (10), hilar injuries (3), and 'shattered' (6). Postnephrectomy complications included one infected renal bed haematoma requiring percutaneous drainage. Eight (12%) injuries found at laparotomy were not explored, 3 were drained and 4 underwent renorrhaphy. Thirty-two (47%) renal injuries were managed non-operatively without laparotomy. Three patients in this group presented with delayed haematuria and had successful angiembolisation of arteriovenous fistula (2) and false aneurysm (1). All nonoperatively managed renal injuries were successfully managed without surgery.

Conclusion: Penetrating trauma is associated with a high nephrectomy rate (31%). However, a high non-operative success rate (59%) is achievable with minimal morbidity.

NON-THERAPEUTIC LAPAROTOMY RATE AT JOHANNESBURG GENERAL HOSPITAL

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Introduction: Since the early 1980s the pressure on surgeons to be more conservative in their approach to both blunt and penetrating trauma has progressively increased. This study aims to assess the success of this approach in our unit by studying the number of non-therapeutic laparotomies performed.

Methods: Records of all trauma laparotomies performed in our unit between February 2005 and April 2007 were retrieved and analysed. Factors influencing the decision to operate were looked at and a common denominator sought.

Results: A total of 568 laparotomies for trauma were performed over this period. Of these, 42 were non-therapeutic in nature. This represents only 7.4% of the total. The majority of non-therapeutic laparotomies involved stab wounds, but gunshot wounds accounted for 31%.

Conclusions: Non-therapeutic laparotomies are an inevitable part of trauma surgery. There is at present no consensus on what constitutes an acceptable rate.

FEMORAL VESSEL INJURY: AN AUDIT OF 64 PATIENTS**Murugan N., Navsaria P. H., Edu S., Nicol A. J.***Trauma Centre, Groote Schuur Hospital and Faculty of Health Sciences, University of Cape Town***Introduction and aim:** Femoral vessel trauma is the second most common peripheral vascular injury seen. The aim of this study is to review the outcome of patients with such injuries in a centre with a high incidence of penetrating trauma.**Methodology:** The data of all patients with femoral vessel injuries admitted to the Trauma Centre at Groote Schuur Hospital over a 4-year period [Jan 2003 - Dec 2006] were reviewed. These were analysed for demographics, injury mechanism, perioperative management, intraoperative findings, type of repair and the incidence of fasciotomy. Presenting limb status was categorised into viable, threatened or non-viable limbs. Outcome was grossly categorised by limb salvage.**Results:** Sixty-four patients presented with femoral vessel trauma. There were 57 men, with a mean age of 28.5 [16-71] years. There were 50 (78%), 10 (16%), and 4 (6%), low-velocity gunshot, stab and blunt injuries, respectively. Thirty-eight patients presented with a viable limb, 25 with an ischaemic limb and one with a non-viable limb. Immediate exploration was performed in 17 patients, while 33 and 17 patients had formal and emergency room angiography, respectively. Arterial repair consisted of: primary anastomosis (37), RSVG (16), PTFE (3) and shunting (1). In two patients exploration revealed normal vessels and one patient with a compartment syndrome revealed only a venous injury. Two profunda femoral arterial injuries were ligated. Twenty seven fasciotomies were done, 16 of which were therapeutic. There were 4 (6.25%) amputations, one done primarily for a mangled limb, and 3 delayed amputations for patients who presented with ischaemic limbs after attempted limb salvage.**Conclusion:** An initial aggressive approach to femoral vessel injuries by trauma surgeons is associated with a good limb salvage rate. Amputation was highest in patients presenting late with ischaemic/non-viable limbs.**THORACOABDOMINAL TRAUMA EXPERIENCES AND PITFALLS****P. Shangase, D. Mogabe, A. Dasrath, A. Ally, F. Ghimenton, D. L. Clarke***Metropolitan Trauma Service, Pietermaritzburg***Introduction:** Thoracoabdominal trauma affects two body cavities and has the potential for significant morbidity and even mortality. This prospective study looks at the incidence and outcome of thoracoabdominal trauma in a busy metropolitan trauma service.**Methodology:** A prospective trauma database is maintained by the trauma service of the Pietermaritzburg metropolitan complex. All patients who had experienced thoraco-abdominal trauma between September 2006 and April 2007 were included in this study. They were divided up into three broad categories, namely confirmed diaphragmatic injury, diaphragmatic hernia and suspected diaphragmatic injury.**Results:** There were twenty-three patients with a confirmed diaphragmatic injury. The average age was 25 and they were all male. There were four deaths (17%) The mechanism of injury in this group was stab (13), gunshot (6), shotgun (1), blunt trauma (3). There was significant delay in the decision to operate (>12 hours) in five cases. All of these were stab wounds. In two cases uncertainty about the source of haemorrhage resulted in the incorrect body cavity being opened. (Blunt (1) gunshot (1)). Both these patients died. All diaphragm injuries were repaired at laparotomy. The wounds in the diaphragm were extended to allow irrigation of the thorax. Intercostal chest drains were left. None of these patients developed an empyema or required delayed thoracotomy. Other structures injured included liver (3), small bowel (2), stomach (7), duodenum (3), spleen (6), colon (3), pancreas (1). There were eight patients with diaphragmatic hernia. The mechanism was stab (4), Blunt trauma (4). One hernia presented as a chronic problem approximately 8 years after the initial injury. Four diaphragmatic hernias (50%) were inappropriately cannulated by closed tube thoracostomy prior to referral. The contents of the hernia was stomach (5) spleen (2), colon (3). These hernias were managed by laparotomy alone (7) and thoracolaparotomy (1). In two of the inappropriately cannulated hernias there was a visceral injury with leakage of contents into the chest. One patient required delayed thoracotomy to deal with a residual empyema. There were no deaths in this group. There were a total of eight patients with suspected diaphragm injury. Laparoscopy was used to exclude diaphragmatic injury in seven and laparotomy in one. Laparoscopy revealed a disrupted right hemidiaphragm in one patient.**Conclusion:** Thoracoabdominal trauma is common and presents diagnostic and management dilemmas. There is a significant incidence of delay involved in the management. The use of laparoscopy allows the physician to exclude diaphragmatic injury. We are reviewing our management algorithms to improve diagnosis in these patients.**BALLISTIC ARTERIAL TRAUMA TO THE LOWER EXTREMITY: RECENT SOUTH AFRICAN EXPERIENCE****E. Degiannis, F. Bode, W. R. Lynn, M. Glapa, S. Baxter, J. Shapey, M. D. Smith, A. Musthaq, D. Doll****Background:** An audit of management and outcome of ballistic arterial trauma to the lower extremity as practiced by general surgeons, experienced in trauma. The outcomes will be the basis for future comparison with those of the newly created Trauma Unit.**Methods:** There were 104 patients included in this retrospective study.

Patients presenting with hard signs of arterial injury were immediately operated. All patients with soft signs underwent routine pre-operative arteriography. Patients with proximity to injury alone underwent Doppler pressure studies and if significant proceeded to arteriography.

Results: There were 70 patients operated in the femoral group. Three patients proceeded to operation following positive Doppler studies. Amputation rate was 2% in the group that underwent completion arteriography compared to 11% in the group that did not. Overall amputation rate was 6%. Thirty-three patients underwent exploration for popliteal artery injury. One patient proceeded to operation following positive Doppler studies. Amputation rate was 14% in the group that underwent completion arteriography and 33% in the group that did not. Overall amputation rate was 21%.

Conclusion: In conclusion ballistic arterial trauma of the lower limb is related to a significant disability particularly when it involves the popliteal artery. In our study there is a 6% amputation rate in femoral artery and 21% in popliteal artery injury. The overall predictive value of physical examination in ballistic arterial trauma is close to 100%. Proximity to injury per se should not be considered as a soft sign of arterial injury. Although our patient numbers are small and our results not statistically significant we feel that completion arteriography is beneficial to patient outcome. In our limited follow-up there was no difference in outcome from the use of saphenous versus PTFE graft although we use preferentially saphenous vein graft in the presence of popliteal arterial injury. Popliteal opposite to femoral vein ligation is related to serious morbidity. Overall arterial gunshot injuries of the lower extremity are related to significant morbidity. Further studies are needed to explore the variables that affect the outcome of repair of these vascular injuries, resulting in improved limb salvage.

CHEST X-RAYS IN TRAUMA EMERGENCIES**M. S. Moeng, S. Darchiev, J. Goosen***Wits University*

Johannesburg Hospital is a level I Trauma Unit in Gauteng. As a busy teaching unit, protocols are implemented in order to ease in patient care during emergencies. We routinely do chest X-rays in indicated cases, if feasible, and prefer to perform a chest X-ray post intercostal drain (ICD) insertion to maintain quality care and to direct further care.

Aim: To audit the value of CXR in patients requiring intercostal drainage.

Method: A prospective data collection of patients who had injuries that required the insertion of intercostal drains over a period of eight months. A questionnaire was developed and it included the patients' demographics, mechanism of injury, reason for ICD insertion, findings of both the original and post-ICD insertion CXR, change in management and any acute complications noted.

Results: 109 patients were identified for the study; 9 (8.3%) were females and 100 (91.7%) were males. Age ranged from 11 to 64 years, with average age of 25.5 years. Sixty-two (62%) sustained stab-wounds and 13.9% had gunshot wounds. The remaining 24.1% had motor-vehicle accident (MVA), pedestrian vehicle accident (PVA) and miscellaneous causes of injury. 83 (76.1%) patients had intercostal drain inserted for both radiological and clinical reasons, while 17 (15.6%) patients had drains inserted due to radiological features and 8 (7.3%) patients on clinical grounds only. Clinical and/or radiological findings confirmed 37.1% of haemopneumothoraces, 41.9% of pneumothoraces, 19% of haemothoraces and 1.9% had significant surgical emphysema with fractures. No acute complications were noted with intercostal drain insertion. Sixty-six per cent showed good position of drain on CXR, with improvement in pathology, 20.21% showed inadequate ICD position, 11.9% showed significant retained haemothoraces and 1.8% had poor lung expansion despite an ICD. The post ICD CXR led to and/or contributed to change in management in 20.2% of the cases. 13.8% required a change in position of the tube, 5.5% had surgery performed, 0.9% had their conservative treatment escalated, 3.7% should have had their tubes adjusted.

Conclusion: CXR assists in management of chest trauma patients. Routine use of post-ICD CXR may assist in active change of management.

PRECORDIAL STAB WOUNDS IN THE DEVELOPING WORLD: A RETROSPECTIVE ANALYSIS**Boshoff M., Mitchell C., Surridge D., Eyal A., Goosen J.***Johannesburg Hospital Trauma Unit, Department of Surgery, University of the Witwatersrand*

Introduction: Although the gold standard for diagnosis of a stabbed heart is trans-oesophageal echo, this is not readily available in the developing world.

Aim: In a retrospective analysis we look for alternative or adjunctive modalities to diagnose penetrating cardiac injury.

Methods: Forty-three patients with precordial stab wounds were managed in Johannesburg General Hospital Trauma Unit from Jan 2005 to March 2007. The data for these patients were analysed.

Results: Of the forty-three patients, seven sustained cardiac injury. Of these seven, four presented with gross haemodynamic instability and three were initially stable. The following parameters proved significant for diagnosis of cardiac injury: haemodynamic instability on presentation, elevated Troponin T and positive trans-thoracic echocardiogram. The following findings were not significant: electrocardiogram, pre-hospital diagnosis, Glasgow Coma Scale, precise anatomical location of injury over the precordium, associated injuries, distension of the neck veins, findings on chest x-ray and raised central venous pressure.

Conclusions: In haemodynamically stable patients with precordial stab wounds, elevated Troponin T levels and positive trans-thoracic echocardiogram

are useful adjuncts in diagnosing cardiac injury. Haemodynamically unstable patients were immediately operated and the above modalities were not necessary.

PENETRATING CARDIAC TRAUMA AT A METROPOLITAN TRAUMA SERVICE IN SOUTH AFRICA

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Introduction: Cardiac trauma is a potentially highly lethal injury. This prospective study looks at the incidence of penetrating cardiac trauma at our metropolitan unit.

Methodology: A prospective database of all patients seen with cardiac trauma has been maintained since October 2006. Standard demographic data are kept on an ongoing basis.

Results: In the eight-month period from October 2006 till April 2007 a total of 18 patients with a penetrating cardiac injury were seen. The average time from injury to presentation was only documented in 6 cases and ranged from 30 minute to 32 hours. There was diagnostic delay of greater than six hours in 3 patients. A firm diagnosis of cardiac tamponade was recorded in 3 patients. In the remainder this information was not available. Average systolic blood pressure on admission was (77 ± 11) . The average base excess was (-10.8 ± 3.7) . A chest X-ray was performed in 6 and in only one was it normal. Two CT scans of the chest were obtained. Both revealed a pericardial fluid collection. Median sternotomy was performed in 5 the remainder underwent lateral thoracotomy. The most commonly injured chamber was the right ventricle (12) followed by the left ventricle (2) and the atria (4). There was breach of the pleura in two patients. There were 5 deaths (27%), 4 in the peri-operative period from hypovolaemia and one delayed death due to sequelae of ongoing neurological deficit. Of the deaths three injuries were to the right ventricle and two injuries were to the atria. None of three patients who were delayed for more than six hours died.

Conclusion: Penetrating cardiac trauma is relatively common in our centre and has a significant mortality rate. There are diagnostic delays and algorithms need to be streamlined to reduce these delays. The presence of hypotension and acidosis in the patient with a stab wound to the precordium are highly suggestive of a penetrating cardiac wound. Ventricular stab wounds have a more favourable prognosis than atrial stab wounds.

VENTILATED TRAUMA PATIENTS IN THE EMERGENCY DEPARTMENT

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It is not uncommon to find patients staying for over 6 hrs in our emergency department due to unavailability of beds in the Johannesburg Hospital

Aim: To evaluate the rate of over-ventilation rate in patients ventilated in the emergency department for trauma.

Method: A prospective collection of data for ventilated patients. The questionnaire included demographic information, indication for ventilation, blood gases analysis on initial and repeat gases, and management changes instituted were noted. Patients were recruited over a period of six months.

Results: Fifty-seven patients were identified, 52 were male and 5 were female. Indication for ventilation included isolated head injury in 28 patients, polytrauma in 13, polytrauma with severe head injury in 9 and isolated airway and ventilation indication in the remaining 9. Thirty-seven patients had a GCS of 3 - 8, thirteen had GCS of 9 - 12, and remaining 9 had GCS of 13 - 15. The first gas was done within 10 min of ventilating the patients in 81.3% of the cases, where as the second was done within 90 min in 71.9% of the cases. 38.9% showed PCO_2 of less than 30 mmHg on the first gas, and 33.4% on the second gases. Oxygenation was good in 67.8% of initial gases and 83.3% of second gases. The most common ventilatory manipulation was reduction in minute volume after the first gas (23.7%). Reduction of respiratory oxygen was the most common change after the second gas (49.1%). The number of cases that should have had manipulation was reduced from 20.3% after first gas, to 1.9% after the second gas.

Conclusion: There is a tendency to hyperventilate patients in the emergency care of ventilated trauma patients.

THE ROLE OF LOOPGRAMS IN REVERSAL OF LOOP COLOSTOMY

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Johannesburg Hospital is a level one trauma unit with an average 1 800 resuscitation cases seen over a year. The exposure of patients to radiological investigation should be stratified according to clinical necessity and value in directing management. The uncontrolled use of these investigations leads to wastage of resources, wastage of patients' time and unnecessary exposure to radiation.

Aim: To determine the value of a Loopogram in patients planned surgery for reversal of loop colostomy performed for trauma.

Method: Retrospective study of patients who underwent reversal of loop colostomy for trauma in the past 18 months. The theatre list and radiology registry were combined to compile a list. Clinical notes were reviewed and X-ray reports double checked. Data were collected for demographics, indication for colostomy, findings on Loopogram, time to reversal of colostomy, and any complications noted.

Results: 28 patients were identified, of whom 2 had inadequate records for the study. The remaining 26 patients were included in the study. Two (7.7%) patients were females and 24 (92.3%) were males. Average age was 28.04 yrs, with 16 patients aged 19 - 29 yrs, and 10 (10) aged from 30 - 45 yrs. All patients had colostomy performed for rectal injury sustained from gunshot wounds. Time to reversal varied from four (4) weeks to forty (40) weeks, with the average at 18.3 weeks. Patients stayed on average, 21 patients (80.8%) stayed for 3 days post operation, 3 patients (11.5%) stayed for 4 days, 2 patients each (3.8%) stayed for 5 and the other (3.8%) for six days. One Loopogram was inconclusive, and the patient had a successful reversal of colostomy without any complications. Only one complication was noted, which was not related to the operative site and was due to sepsis from a separate site.

Conclusion: This retrospective study affirms that there is no benefit in exposing patients who have sustained low energy gunshot wounds to radiation from Loopograms. All these patients had their repair after at least a month.

ABUSE OF WOMEN AND BURN INJURIES: AN ALARMING OBSERVATION

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Introduction: Many people believe there is a hidden epidemic in which women are burnt intentionally. Violence in general, and towards women in particular, is of great concern in South Africa.

Aim: To determine how common violence is in the causation of burns in adult women seen at the Burns Unit, Pelonomi Hospital (Free State, RSA).

Methodology: The study was prospective and descriptive and the sample size was 20. Hospitalised, stabilised, adult burnt women were interviewed by the first author after giving consent regarding what burned them, who burnt them and in what circumstances. Excluded were patients who refused to be interviewed or who withdrew from the study. The data collection period was mid-March to mid-September 2005.

Results: The age range was 18 - 62 years. 15 women were younger than 40 years, which was the mean age of the group. The median level of education was grade 8. No patients had tertiary education. The majority of women came from low social economic status and only 7 had an indoor water supply. 7 of the women had been burnt deliberately in assaults, 11 in domestic accidents, 1 in a parasuicide and 2 in epileptic fits.

Conclusion: Assault is second only to accidents as a cause of burn injuries in adult women seen as in a Burn Unit. Caregivers should keep this in mind constantly and ensure that these patients have access to all available social and legal services.

1. Hamber B, Lewis S – An overview of the consequences of violence and trauma in South Africa, Report written for the Centre for the study of violence and Reconciliation: August 1997. Last accessed 10 May 2006.

TUBERCULOUS VASCULITIS: THE DURBAN EXPERIENCE

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Introduction: Infection of arteries by *Mycobacterium tuberculosis* (TB) is a rare occurrence. South Africa is in the midst of an AIDS epidemic, this provides an environment in which TB in all its manifestations can flourish. Vascular manifestations of TB have been previously described in the world literature, we review our experience.

Methods: The records of all patients with histologically confirmed TB vascular involvement were reviewed retrospectively with regards to their presentation and management.

Results: We identified 21 patients with histologically proven tuberculous vascular disease. It comprised 10 common carotid artery aneurysms, 2 infrarenal aortic aneurysms, 2 aortoiliac aneurysms, 2 iliac artery aneurysms, a renal artery aneurysm, an aortoduodenal fistula, an aorto-oesophageal fistula, and 1 case of multiple aneurysms. All patients underwent surgical repair with concomitant or subsequent anti-TB chemotherapy. The patient with the aorto-enteric fistula died on day 5 postoperatively due to haemorrhage.

Conclusion: Vascular involvement due to TB is a rare occurrence compared with pulmonary and other extra-pulmonary manifestations. Vascular involvement presents commonly with aneurysms. Surgical repair with autologous or prosthetic material has proven to be an effective method to treat these patients in conjunction with anti-TB chemotherapy.

BREAST CANCER IN THE UNDER-35-YEAR-OLDS FROM A SINGLE SPECIALIST UNIT IN SOUTH AFRICA

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Background: Although breast cancer is less common in younger women it has been estimated that approximately 2% of all cases occur in women under the age of 35 years. The incidence of young breast cancer has been perceived to be on the increase in South Africa. Whether this apparent increase is due to awareness of the disease or an actual increase in patient numbers is unknown.

Method: A corroborative look at the statistics from a single unit that only sees women with breast related problems. 1 200 women with breast cancer were seen in a 6-year period. Of these over 4% were under the age of 35.

Results: This study looks at the age distribution, clinical presentation, and treatment protocols offered in a specialist unit. 99% of the patients treated had immediate reconstruction and over 50% underwent primary chemotherapy.

Conclusion: Whether the incidence is truly increasing or whether patients in the under-35 age group are sent to a specialist unit makes it difficult to assess true incidences. These patients require a multidisciplinary approach due to late onset of diagnosis, challenges around fertility and aesthetic need to be counterbalanced with aggressive oncological and surgical managements and often intensive psychological support for patient and family.

BREAST CANCER POST PRIMARY CHEMOTHERAPY SENTINEL LYMPH NODE DATA: THE FIRST 60 CASES FROM ONE CENTRE IN SOUTH AFRICA

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Background: Sentinel lymph node biopsy after primary chemotherapy remains controversial. Problems around micrometastases and accuracy that might impact on further treatment are documented. There are however 11 large studies showing similar accuracy to use in the primary surgery scenario.

Method: All patients undergoing primary chemotherapy with clinical and ultrasound positive lymph nodes prior to chemotherapy were re-assessed post chemotherapy and all patients with clinical and ultrasound negative (non-palpable lymph nodes) were offered a sentinel lymph node biopsy with dye (peri-areola) and isotope (peritumoural) and a 5 node axillary sampling if the sentinel lymph node was negative intra-operatively. All positive sentinel lymph nodes and clinically positive nodes underwent an axillary dissection.

Results: 60 patients who had complete clinical nodal response, underwent sentinel lymph node biopsy and had negative sentinel lymph nodes at time of surgery. In only 2 of the 60 did we find micrometastases in a non-sentinel lymph node.

Conclusion: In our unit strict adherence to following protocol is maintained. All patients with clinically and ultrasound negative lymph nodes who may fit criteria for primary chemotherapy undergo sentinel lymph node biopsy prior to starting chemotherapy. All patients who have clinically, ultrasound and FNA positive lymph nodes that have complete clinical and ultrasound nodal response, undergo a sentinel lymph node and sampling. In our unit this is a safe and accurate procedure.

A DESCRIPTIVE STUDY OF THE HISTOLOGY OF PEAU D'ORANGE IN BREAST CANCER

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Introduction: Surgery is sometimes performed on patients with peau d'orange. This may be done to achieve local control of breast cancer after neo-adjuvant chemotherapy. Conventional practice is not to place excision lines through areas of peau d'orange for fear of recurrence in such an area. The question can be asked whether this wisdom is still valid in modern practice. No formal studies of the histopathology of peau d'orange have been published and available descriptions are scanty.

Aim: To describe the histopathology of peau d'orange and to determine the presence of cancer cells in such tissue.

Method: Consecutive patients undergoing mastectomy for cancer in whom peau d'orange was present were selected. Blocks of skin and subcutaneous tissue were excised from areas of peau d'orange and examined histologically. The presence and location of malignant cells were recorded. Administration of neo-adjuvant therapy was noted.

Results: Twenty mastectomy specimens were examined. Malignant cells were identified in 10 of the 20 specimens. These cells were found in lymph vessels in the dermis and subdermis. In 2 specimens the presence of malignant cells was uncertain. In 1 specimen there was an additional skin infiltration. Malignant cells were present in axillary lymph nodes in 16 of 19 specimens. Nine patients had been treated with neo-adjuvant chemotherapy. Four of these exhibited lymphovascular malignant cells.

Conclusion: Tumor cells were present in the lymphatic vessels in areas of peau d'orange in half of the specimens studied. It would be expected that placing an excision line in such an area would result in an incomplete cancer operation in a high percentage of, but not all cases.

LOBULAR BREAST CANCER FROM A SINGLE SPECIALIST UNIT IN SOUTH AFRICA

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Background: Lobular breast cancer is less common than ductal breast cancer. It has a higher incidence of being multicentric, multifocal and bilateral and accounts for 10% of breast cancers.

Method: Patients with lobular carcinoma are reviewed in this study, accounting for approximately 10% of the cases reviewed. Over a 5-year period protocols were refined to decrease inaccuracies with mammogram, ultrasound ability to detect this tumour, to improve sentinel lymph node biopsy accuracy and to ensure safe onco-reconstructive surgery.

Results: This study looks at the age distribution, clinical presentation, and treatment protocols offered in a specialist unit. 99% of the patients treated had immediate reconstruction with 1 patient having reconstruction abandoned. 8 of the patients opting for bilateral mastectomy had either pre-invasive or invasive lobular carcinoma in the other breast

Conclusion: The ability to treat patients with lobular carcinoma in an onco-reconstructive unit involves extensive pre-operative assessment. Preferably sentinel lymph node biopsy as an initial separate procedure is required. Pathologically this is one of the more difficult cancers to assess intra-operatively and requires extensive and detailed teamwork during surgery to ensure best oncological and aesthetic outcome.

EPIDEMIOLOGY OF BREAST CANCER DIAGNOSED IN NORTHERN GAUTENG AND MPUMALANGA IN THE ERA OF HER-2/neu

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In recent years, breast cancer has become the leading cancer in South African women, overtaking cervical cancer. This has coincided with increasing knowledge of this disease and new therapeutic modalities at the molecular level. No published reports looking at the epidemiology of this disease in the modern era are available at present.

Methods: A retrospective analysis from late 2002 until early 2007 was performed, looking specifically at HER-2/neu up-regulation. A total of 699 patient results were enrolled into the study. The following parameters were analysed: age, receptor status and HER-2/neu status.

Results: There have been no major changes in the age distribution of breast cancer in this population compared to studies performed 22 years and 14 years ago respectively. The percentage of women who have up-regulation of the HER-2/neu gene is 27.75%.

Conclusion: There have been no major changes in the mean age of patients with breast cancer in the era of HIV/AIDS. The incidence of HER-2/neu up-regulation is similar to American and European figures.

RISK-REDUCING MASTECTOMY FROM A SINGLE SPECIALIST UNIT IN SOUTH AFRICA

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Background: Risk-reducing mastectomy in patients with strong family histories of breast cancer is a controversial and emotive procedure

Methodology: This study looks at 18 women who underwent risk reducing surgery, involving bilateral skin-sparing mastectomies, immediate expander/prosthetic reconstruction and delayed nipple areola reconstruction

Results: All patients were counselled for a 6-month period prior to undergoing surgery, had to have spoken to women who had undergone the same surgery from the unit, had a psychological assessment and partner counselling prior to surgery and 17/18 of the patients were happy about their decision, 17/18 were happy with their reconstruction and 2/18 had DCIS found at time of risk reduction

Conclusion: Risk reduction mastectomy should be only offered to women seen in specialised breast centres. Patient counselling, problems with BRCA testing including sibling and parental guilt should be addressed prior to surgery. Close and regular follow-up should be offered post surgery including repeated psychological assessments.

DYSLIPIDAEMIC PANCREATITIS CLINICAL ASSESSMENT AND ANALYSIS OF DISEASE SEVERITY AND OUTCOMES

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Introduction: The relationship between pancreatitis and dyslipidaemia is unclear and has never been studied in a South African context.

Patients and methods: Admissions with acute pancreatitis were prospectively evaluated. A comparison of the demographic profile, aetiology, disease severity scores, complications and deaths were made in relationship to the lipid profiles.

Results: From June 2001 to May 2005, there were 230 admissions. The pancreatitis was associated with alcohol (63%), gallstones (18%), idiopathic (9%) and isolated dyslipidaemia (10%). The amylase was significantly higher with a gallstone aetiology ($p<0.001$) and significantly lower with dyslipidaemia ($p<0.001$). Dyslipidaemia was significantly different between the two predominant race groups: Indian 50.5% and African 17.9% ($p<0.000017$). Seventy eight (34%) had associated dyslipidaemia and 152 (66%) were normolipidaemic at admission. The average body mass index was higher in the dyslipidaemic group ($p=0.004$). The mortality rate was similar between the dyslipidaemic and normolipidaemic patients ($p=0.58$). In the dyslipidaemic group, deaths occurred in those with hypertriglyceridaemia ($p=0.05$) or with persistent lipid abnormalities ($p=0.003$).

Conclusion: Dyslipidaemic pancreatitis was more common in the Indian ethnic group. Adverse outcomes in those with dyslipidaemia are associated with persistent hypertriglyceridaemia.

FAILURE OF QUADRUPLE THERAPY FOR THE ERADICATION OF *HELICOBACTER PYLORI* IN BLACK SOUTH AFRICAN PATIENTS

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Helicobacter pylori is established as a leading cause of duodenal ulcers and is associated with gastric cancer. Eradication is recommended in patients with peptic ulcer disease, low-grade gastric mucosa-associated lymphoid tissue lymphoma (MALT lymphoma) and other gastro-duodenal pathologies; atrophic gastritis; close relatives of patients with gastric cancer; iron-deficiency anaemia and chronic idiopathic thrombocytopenic purpura (1). Eradication of the bacterium has lead to a decrease in gastric cancer rates in developed nations. Although *H. pylori* is endemic in black South Africans, the low incidence of gastric cancer in this population has lead to primary care physicians in South Africa being less concerned as to the possible pathological role(s) of *H. pylori* (2).

Methods: As part of a separate study investigating the effect of eradicating *H. pylori* on plasma arginine concentrations, we attempted to eradicate *H. pylori* in black South African patients. Patients gave informed written consent for the study. They were treated using recommended quadruple therapy (1) of clarithromycin, amoxicillin, colloidal bismuth and a proton pump inhibitor for either 1 or 2 weeks. The ¹⁴C-urea breath test was used to confirm *H. pylori* infection at baseline and 8 weeks after completing treatment.

Results:

	Number (n/total)	Median age (years)	Current (ex-) smoker	Non- alcohol users
1 week therapy				
Eradicated	4/9	41	1/4 (2/4)	3/4
Not eradicated	5/9	47	3/5 (2/5)	0/5
2 week therapy				
Eradicated	1/8	39	0/1 (1/1)	1/1
Not eradicated	7/8	38	3/7 (2/7)	3/7
Total	5/12 (17)	43	7/17 (7/17)	7/17

Conclusions: Although compliance may be an issue, treatment failed in 12/17 patients. This did not appear to be associated with age, or cigarette use by the patient. Alcohol consumption may be a significant factor. Further work is required to improve eradication rates in these patients.

1. Malfertheiner *et al*. *Gut* 2007; Jan 17; [Epub ahead of print]

2. Huang *et al*. *J Gastroenterol Hepatol* 2003; 18:512-520.

TEN YEARS REVIEW OF THE MANAGEMENT OF GASTRIC OUTLET OBSTRUCTION AT A PUBLIC HOSPITAL IN THE *HELICOBACTER PYLORI* ERADICATION ERA

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Introduction: Gastric outlet obstruction may complicate peptic ulceration disease. The causative ulcer is usually in the duodenum. Ninety percent of duodenal ulcers are *H. pylori* positive. However, < 56% of ulcers complicated by gastric outlet obstruction are *H. pylori* positive. Specific ulcer procedures are generally discouraged and we are advised to first address the complication. Endoscopic treatment of established stricture often fails. Open surgical intervention is still necessary.

Aim: To analyse how often we resorted to ulcer specific procedures in patients presenting with established gastric outlet obstruction in the past 10 years.

Methods: A retrospective review of computer records of all patients with the discharge diagnosis of gastric outlet obstruction between January 1997 to May 2007. Data collected included patient demography, admission year, underlying cause, con-current GORD, management and immediate outcome.

Results: A total of 79 patients. Complete records were found for 63 patients. Thirty-nine (65.90%) were due to peptic ulcer disease. Only 2 (0.05%) had recorded associated GERD. One perforated and died after attempted endoscopic dilatation. Twelve (12) had truncal vagotomies of which 6 (50%) were done with gastrojejunostomy. Nine (23.47%) had gastric resections.

Conclusion: Peptic ulcer disease is the commonest cause of gastric outlet obstruction. Either endoscopic or surgical intervention is indicated in patients with established stenosis, but endoscopic therapy is not trusted in our hospital. Patients with unresolving obstruction should be taken to theatre for drainage procedures. And, we recommend that vagotomy be re-considered in *H. pylori*-negative patients presenting with gastric outlet obstruction.

ENDOSCOPIC PLACEMENT OF SELF-EXPANDING METALLIC STENTS FOR OESOPHAGEAL CANCER WITHOUT THE USE OF FLUOROSCOPY

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Introduction: Endoscopically placed self-expanding metallic stents (SEMS) are commonly used to provide palliation for oesophageal cancer. Most of these SEMS are placed with the aid of fluoroscopy in the radiology suite. We have

developed a technique to place SEMS under direct vision so obviating the need for fluoroscopy. This study reviews our experience with this technique.

Methods: A retrospective review of all SEMS placed at the Grey's Endoscopic Unit from Jan 2005 until May 2007 was undertaken. All irresectable tumors are dilated at upper endoscopy. A routine upper endoscopy is then performed to assess the extent of the tumor. The proximal and distal extents are noted and recorded in centimetres from the incisors. The delivery device is calibrated in centimeters. This allows us to place the device at a level approximately 3 cm proximal to the upper extent of the lesion. (The formula used is proximal extent of lesion in cm from the incisors - 3 cm.) The endoscope is then placed just above the stent and the stent is deployed under direct vision. After deployment an endoscopy is repeated to assess patency. The patient is allowed liquids on the day of stenting and started on a soft diet the following day.

Results: A total of 155 expandable metallic stents were placed in patients with severe dysphagia due to carcinoma of the oesophagus. 95 (61%) were males and 60 (39%) were females. The average age was 60 years old with a range from 32 to 89 years old. Most tumors 96 (62%) were in the distal third of the oesophagus, with 56 (36%) mid third and 3 (2%) in the proximal third. 13 (8%) were documented to have evidence of a fistula. There was a single incidence of the stent being deployed below the proximal extent of the tumor. Correct placement was confirmed endoscopically in all the remainder.

Conclusion: It is feasible to place oesophageal SEMS successfully without using fluoroscopy. This reduces radiation exposure for staff and patient and reduces time for the procedure. It is the method of choice in our endoscopic unit.

PRIMARY DUODENAL STENTING FOR MALIGNANT OBSTRUCTION WITH SELF-EXPANDING METAL STENTS (SEMS)

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Aim: To audit the efficacy of SEMS as a primary intervention for malignant duodenal obstruction.

Background: Duodenal obstruction secondary to advanced malignancy is difficult to palliate. Surgical bypass is frequently inappropriate or contra-indicated due to advanced disease or co-morbidity. SEMS are gaining acceptance internationally as an alternative to surgery.

Method: Patients with clinical and endoscopically proven gastric obstruction and relative contra-indication to surgical bypass (locally advanced tumour n=14, metastatic disease n=4) were considered eligible. A side-viewing duodenoscope was used to place the SEMS under direct vision and combined with fluoroscopy. Data were collected prospectively.

Results: 17 patients, median age 67 years (range 45 - 76) underwent SEMS placement. The obstruction was due to pancreatic adenocarcinoma (n=13), cholangiocarcinoma (n=1), gallbladder carcinoma (n=1) and extrinsic compression from metastatic adenocarcinoma (n=2). The site of obstruction was D1D2 (n=8) and D2D3 (n=9). There was one technical failure and this patient subsequently had a surgical bypass. In the 16 technically successful stent placements, 15 patients resumed oral intake (n=3 liquid, n=6 soft diet, n=6 full diet) and one failed (proximal jejunal obstruction after successful relief of duodenal obstruction). 8 patients required additional biliary stenting. All patients were discharged from hospital. Median survival following SEMS was 47 days (range 15 - 156) with two patients still alive. One patient was lost to follow-up. There were no immediate complications.

Conclusion: SEMS provides good palliation for malignant duodenal obstruction in patients unsuitable for surgery.

AUDIT OF INTRA-ABDOMINAL TUBERCULOSIS CASES TREATED AT KALAFONG HOSPITAL IN THE PAST 10 YEARS

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Introduction: The incidence of both pulmonary and extrapulmonary tuberculosis has increased due to HIV and AIDS. The gastrointestinal tract is a frequent site for extrapulmonary TB. Intra-abdominal TB may affect the peritoneum, intestine, solid organs and lymph nodes. Associated active pulmonary TB is rare. Diagnosing intra-abdominal TB can be difficult.

Aim: To analyse the incidence of and modalities used in diagnosing intra-abdominal tuberculosis in our hospital.

Methods: A retrospective review of computer records and discharge letters of patients with discharge diagnosis of intra-abdominal TB. The period reviewed was between January 1997 to April 2007. Data analysed were year of diagnosis, patient demography, site, associated PTB, HIV status and method of diagnosis. Finally the need for bowel resections and mortalities were noted.

Results: Records of 71 patients were found. Thirty-two (52.46%) presented in the last 3 years of study. Ages ranged between 14 - 76 (34.35). The age of one patient was not recorded. Thirty-two (52.46%) were females. Twenty-three (37.70%) were recorded as HIV positive. Seven (11.47%) had associated active PTB. Biopsy through formal laparotomy was necessary in 39 patients (63.93%). Bowel resections were performed in 6 of 12 patients (19.67) with isolated bowel involvement.

Conclusion: Intra-abdominal tuberculosis affect young people and its incidence has increased with rising in HIV infections. Associated active pulmonary tuberculosis is still rare. Diagnosis frequently requires formal laparotomy. We therefore recommend that the diagnosis of intra-abdominal tuberculosis be considered in all HIV-positive patients presenting with abdominal pain.

THE CLINICAL AND PATHOLOGICAL FEATURES OF A SOUTH AFRICAN FAMILY WITH HEREDITARY MIXED POLYPOSIS SYNDROME (HMPS)

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The HMPS syndrome is characterised by multiple large bowel polyps (<15) of differing histological types including a mixture of atypical juvenile polyps, hyperplastic polyps and adenomas. Causative mutations have been identified on chromosome 15 and 18. Affected individuals are thought to have an increased risk of malignancy possibly via the juvenile polyposis pathway.

Method: A 51-year-old female with a history of a colectomy for polyps during childhood presented with rectal bleeding. Endoscopy 40 years later revealed a combination of juvenile retention and adenomatous polyps. A family tree was drawn up and the 2 (25-year-old male and 17-year-old female) of her 3 children underwent flexible sigmoidoscopy.

Results: Endoscopic surveillance of 2 children revealed that both displayed similar phenotypes to the mother. The younger child underwent a colectomy and ileorectal anastomosis. The pathological specimen revealed more than 70 polyps. Each individual had a combination of juvenile retention, hyperplastic and adenomatous polyps.

There are at least 3 affected individuals in 2 generations. The mutation in this family is currently unknown.

Conclusion:

1. A rare inherited polyposis syndrome has been identified in a South African family.
2. Where there is a clinical suspicion of a possible inherited condition, investigating at risk first degree relatives confirms the inherited nature of the disease.

ANAL CANCER IN DURBAN: CLINICOPATHOLOGICAL STUDY

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Introduction: Anal cancers are a rare and of varied histopathology. The majority are of squamous cell origin. Recent literature suggests increasing incidence linked to retroviral infection and antiretroviral drugs treatment. Loss of anal sphincter function can result from cancer infiltration or surgical treatment. Treatment has shifted from mainly surgical to multimodal approach, where chemoradiation plays a crucial role and surgery is employed selectively. The purpose of this study was to document our local experience with the management of anal cancer.

Patients and methods: This study comprises prospective and retrospective arms of all patients with anal cancer treated in the Durban Metropolitan Teaching Hospitals. The retrospective arm included patients treated from 1998 to 2002 and the prospective arm patients treated from 2003 to 2006. Personal, clinical, management and follow-up data were extracted from in-hospital and follow-up records.

Results: Thirty-eight patients were enrolled over this period (22 Africans, 11 Indians and 5 whites and coloureds) giving an average of 9 patients per year. The average age was 52 for Africans, 62 for Indians and 57 for whites and coloureds. The overall male to female ratio is 3:5. Patients presented with perianal mass (14), change in bowel habits (9), bleeding (7), ulcer (2) and perianal abscess (1). Lesions were located in the anal canal (14), anal verge (9) and anal margin (2). Documented palpable inguinal nodes (6), metastasis on radiological investigations (2) and squamous cell carcinoma on histopathology (21). All patients received chemoradiation.

Conclusion: There was a low hospital prevalence rate. Most patients presented with localised disease. Almost all patients had squamous cell carcinoma. Chemoradiation remains central to the management of anal cancer.

CAROTID ARTERY STUMP PRESSURE AND ASSOCIATED NEUROLOGICAL CHANGES IN PATIENTS UNDERGOING AWAKE CAROTID ENDARTERECTOMY

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Purpose: To determine the mean carotid stump pressure at which patients develop neurological changes while undergoing awake CEA under cervical block anaesthesia.

Methods: Analysis of patients undergoing awake carotid endarterectomy under cervical block anaesthesia between February 2004 and April 2007. All patients had carotid stump measured with selective shunting on those who develop neurological symptoms on carotid artery clamping regardless of stump pressure. A ball connected to a pressure sensor was put in the contralateral hand.

Results: Forty one (41) patients had CEA under local, of whom 30 were male. The age range was 49 - 79 years (median=63 years). Indications for CEA were high grade stenosis in 7 (17%) asymptomatic patients and 34 (83%) symptomatic patients (stroke: 16, TIA: 18 patients). Five (12%) patients required shunting, one for transient ischaemic attack (TIA) and 4 for loss of consciousness. Both these 5 patients had presented with symptomatic carotid diseases (TIA: 1, stroke: 4). Shunt was used in 23% (4/17) with the mean $SP < 50$ mmHg. This was not statistically significant. Looking at the mean $SP < 40$ mmHg, 40% (4/10) required shunting. This was statistically significant.

The contralateral internal carotid arteries were occluded, normal, 45%, 60%, 90% respectively.

13 (32%) patients were complicated by transient hoarseness of voice. 1 (2%) had haematoma that required re-exploration. None of these patients had any major post operative neurological complications.

Conclusion: Even though the sample in this study is small, awake CEA under local anaesthesia is a safe procedure. It has a lower shunt rate. It would appear safe to use the mean SP of 40 mmHg as a threshold for selective shunting in CEA under general anaesthesia.

LAPAROSCOPIC PIG NEPHRECTOMY IN PREPARATION FOR HUMAN LIVE DONOR NEPHRECTOMY

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Aim: To prove technical ability and gain skills sufficient to initiate a laparoscopic live kidney donor program.

Method: Two laparoscopically experienced surgeons visited an accomplished unit where they were introduced to the procedure and gained initial exposure. 12 pigs were obtained with full ethics approval for purposes of bilateral laparoscopic nephrectomy under general anaesthesia. The 2 surgeons both operated on each pig, alternating left and right nephrectomies. Operative time, warm ischaemic time, bleeding, and any complications were recorded. A second visit was arranged to a different accomplished unit after the 12 pig operations were completed. The first human donor nephrectomy was then planned.

Results: 2 pigs had technical complications. Operative time, warm ischaemic time and bleeding were shown to be well within accepted values for live kidney donation. Valuable experience and lessons were gained in making a safe transition to humans. Theatre staff was exposed to the procedure as a team prior to initiating the human live kidney program.

Conclusion: A structured approach, with exposure to other centres and animal nephrectomy, provides valuable experience to be gained prior to initiating laparoscopic nephrectomy in humans.

12 pigs undergoing bilateral nephrectomy by two laparoscopically adept surgeons is sufficient experience to gain the skills necessary for laparoscopic live kidney donation.

PILOT VALIDATION TRIAL: USE OF BLUE DYE ALONE TO IDENTIFY THE SENTINEL NODE IN BREAST CANCER

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Aim: To determine if the use of blue dye alone is adequate for sentinel lymph node (SLN) biopsy in patients with breast cancer.

Methods: Patients with operable breast cancer and no palpable lymph nodes were recruited. Patients with locally invasive lesions and those with previous surgery to the breast or axilla were excluded. Methylene blue dye was injected intradermally in the peri-areolar region corresponding to the tumour quadrant. All patients had a level I and II axillary dissection after the SLN biopsy.

Results: 12 patients were recruited to the study during the period May 2006 to December 2006. The sentinel lymph node was successfully identified in 9 out of 12 patients (75%). The accuracy of the SLN biopsy was 100% and the false negative rate was 0%.

Conclusion: Although the study was small, it appears that the use of blue dye alone as a method of identifying the SLN is accurate and has an acceptable false negative rate. The success rate of 75% should improve with further experience.

ABDOMINAL TRAUMA REVISITED: AN EXPERIENCE FROM DURBAN

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Introduction: Abdominal trauma has a significant impact on the mortality rate in our country. There is a tendency towards male predominance. Laparotomy is the common modality of management. However, negative laparotomy result in significant complications, associated with increased length of hospital stay.

Aim: To present our experience with the management of abdominal trauma in Durban.

Methods: Prospective study of patients with abdominal trauma in one surgical ward at King Edward VIII Hospital in Durban from 1998-2004. Demographic details, cause of injury, delay before surgery, presence of shock, findings at surgery, management and outcome were documented.

Results: A total of 476 patients were included in the study, of whom 436 were male (M: F ratio= 11:1) and the mean age was 28.05 ± 10.72 years. There were 428 penetrating injuries (firearms = 235 and stabs = 193) and 48 blunt injuries. 379 patients had a delay of ≤ 12 hours before surgery and 97 patients had a delay of > 12 hours before surgery.

53 patients (11%) presented in shock. 472 patients presented with varying degrees of peritonism, 4 patients did not have peritonism and did not undergo surgery. 69 of 193 patients with stabs had dismemberment (36%). The injury severity score was 11.06 ± 6.67 . The most common injured organs were the small bowel followed by the liver and the stomach.

A total of 119 patients (25%) were admitted to ICU. (89 firearms, 17 stabs and 13 blunt trauma). The mean ICU stay was 5.99 ± 5.70 days (range 1-125 days). 112 patients developed complications (24%). Fifty-six patients died (11%). 31 deaths were due to firearms, 16 from stabs and 9 from blunt trauma. 45 of 56 patients who died were in shock (80%). The mortality increased

with the number of organs injured. 83 of 379 patients (22%) with delay \leq 12 hours developed complications and 28 of 97 patients (29%) with delay $>$ 12 hours developed complications.

Conclusions: The majority of abdominal injuries are due to firearm injuries. Shock, mechanism of injury and presence of associated injuries influence outcome.

EARLY MANAGEMENT OF GUNSHOT INJURIES TO THE FACE IN CIVILIAN PRACTICE

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Background: Gunshot injuries to the face in civilian practice are scarcely reported. Potential complications in the emergency department can have catastrophic consequences and inappropriate operative management of the facial soft and skeletal tissues are related to outcome.

Methods: A structured diagnostic and management approach is used in our Trauma Unit to deal with gunshot wounds to the face. A retrospective study of 55 patients who sustained gunshot injury to the face was conducted over a 6½-year period. Demographic details, mechanism of injury and mode of presentation and management were recorded. Mortality and morbidity data were collated.

Results: There were 51 male and 4 female patients. All injuries were due to low velocity gunshots apart from one patient who sustained shotgun injury. Overall 28 out of 55 patients (50%) underwent orotracheal intubation on scene or in the resuscitation room and 2 cricothyroidotomy. Apart from the maxillofacial trauma, associated injuries were common. Forty patients underwent operation for maxillofacial trauma, 34 on the day of admission and the remaining 6 within 5 days of injury. Multiple operations over a 2-week period were necessary for 18 out of the 40 patients. Complications directly related to the gunshot injury to the face were very limited. Mortality was related to associated injuries.

Conclusions: Gunshot injury to the face in civilian violence is a 'benign' condition as long as airway and haemorrhage control is succeeded. Early operative intervention for repair of the soft and skeletal facial structures leads to satisfactory results. Mortality directly related to the facial trauma is uncommon.

THE OPERATIVE MANAGEMENT OF BURNS AT A REGIONAL HOSPITAL OVER A 6-MONTH PERIOD

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Introduction: Burns are common at Edendale Hospital. Prior to the establishment of a burns unit these were managed by individual surgical firms. This audit was commenced to document the work load and the outcome of burns when managed by a newly established burns team.

Methods: A prospective data base was maintained from July to December 2006. Standard demographic data was recorded along with mechanism of burn, percentage and distribution of body surface area burnt, time from injury to graft and from graft to discharge.

Results: A total of 37 split skin grafts were performed. There were 13 children, with an average age of 3 and a range of 1 to 9 years. There were 24 adults with an average age of 38 years and a range of 16 to 65 years. Fifty per cent of the adults were epileptic. The male to female ratio was equal. In the adults 60% were flame burns and 40% were hot water burns. The average area grafted was 7% total body surface area. (range 1 - 18%). Limbs were most commonly involved (28% legs, 26% arms and shoulders, 7% hands, 5% feet, 19% torso and 11% buttocks). There was an average of 57 days from the time of burn to the day of skin graft (range 138 days - 12 days). Average length of stay post grafting was 19 days (range 9 - 60 days). At discharge 40% of wounds were almost healed and 11% of patients left the hospital were completely healed. The rate of graft loss was 16%.

Conclusions: Burns are a major public health issue and tend to be neglected. Epileptics and children are at high risk for burns. The aetiology of the burn is different in children and adults. There is a long delay in the operative management of burns. We are attempting to address this. The operative management of full thickness and deep burns is effective and the results can be rewarding. However, for optimal management a combined multi-disciplinary team is needed.

OUR EXPERIENCE WITH 24 PATIENTS PRESENTING WITH ELECTRICAL BURN INJURIES

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Introduction: The main determinants of outcome in patients with burn wounds are age, total body surface area burned and the presence of associated inhalational injuries. Mortality approaches 100% if the sum of age and TBSA burned in percentage is above 80%. Less burn injuries are caused by electricity but the consequences may be debilitating. Severe injuries are caused to tissues sanguined between the skin and bone. The damage is often underestimated.

Aim: To analyse the outcome in the management of patients presenting with electrical burns.

Methods: Retrospective review of records from January 1997 to December 2005. Records of all patients treated for electrical burn in our dedicated burn ward were analysed. Data retrieved included demography, treatment year, cause, admission depth assessment, sloughectomies and length of stay. The outcome assessment included amputation and death.

Results: A total of 24 patients were seen. Only 1 was female. Their ages ranged between 13 and 54 years (average 36.39%). Two were from lightning.

The burn widths were between 2 and 66% (24.70%). Their length of stay was 1 - 100 days (23.74). Amputations were done in 4 patients. Mortality rate was 16.67% (4 patients).

Discussion: Electrical burns are rare. They predominantly involve adult males. They stay longer in hospital and amputation was necessary in patients with 4° burns. We therefore encourage over-diagnosis and aggressive management in patients presenting with extremity electrical burns.

A PROSPECTIVE AUDIT OF BURN WOUNDS ADMITTED TO A REGIONAL HOSPITAL

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Introduction: Burns are common injuries in peri-urban informal settlements. This study looks at the spectrum of burns admitted to Edendale hospital in Pietermaritzburg.

Methods: A formal burn unit was established in October 2006. A prospective database was started from August 2006. Standard demographic data, detailed description of the burn, resuscitation surgical intervention, outcome and length of stay was recorded.

Results: In the six months under review a total of 201 patients were admitted (males 102, females 99). The ratio of adults to children was 55:45%. There were 12 deaths (6%). Average age for adults was 40 years (range 16 to 82 years) and for children 3 years (range 6 months to 9 years). The average burn size was 14% BSA. Burn depth was superficial (40%), deep dermal (16%) and full thickness (31%). In children superficial burns (70%) predominated whilst in adults full thickness wounds (57%) were in the majority. In adults the aetiology of the burn was flame (48%), hot water (26%) and electrical (7%). In children the aetiology was hot water (70%) and fire (8%). Miscellaneous causes included hot oil or porridge, hot plastic, stove plates, petrol bombs, and lightning. Fifteen per cent had a delayed presentation of on average 11 days. Hospital stay averaged 68 days (range 1 day to 161 days). Of the deaths average age was 50 years (range 3 to 82 years) and a total burn surface area of 50% (range 14 - 85%). Aetiology of the burn in the deaths was fire in 8 (70%) and lightning in 4 (30%). Length of time survived was 10 days (range 1 to 28 days). Cause of death was burn wound sepsis in 2 (16%), inadequate resuscitation in 4 (30%). In the remaining 6 patients palliative treatment was decided on *ab initio* due to extent of the burn.

Conclusion: Burns are common and affect the most vulnerable sectors of society. They consume a great deal of resources. Although a formal burn team has improved our results a burn area of greater than 40% is still fatal in our hands. Limited resources have necessitated a pragmatic approach. Awareness campaigns may reduce the incidence of burn wounds and secure improved funding for the management of these injuries.

PALLIATIVE TREATMENT OF CA OF THE OESOPHAGUS: STENTING OR RADIOTHERAPY? MEDUNSA EXPERIENCE

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Aim: The aim of the study is to render the best palliative treatment for our patients with the aim of improving quality of life and prolonging the survival period.

Methods: We selected patients with non-resectable carcinoma who were still ambulatory and could take care of their basic needs. Patients were randomised to either brachytherapy at a referral hospital or stenting at our hospital. They were then followed up to determine the survival period.

Results: There were 54 patients in total. 29 patients belonged to the radiotherapy group, whereas 25 patients were stented.

Radiotherapy group: The male:female ratio was 11:14. The mean age was 63 years. The dysphagia score varied from 1 to 3 with a mean of 2. The site of the tumour was mostly in the middle third. The tumour length varied from 5 to 12.5 cm with a mean of 7 cm. The pathology was SCC in 23, Adeno Ca in 1, and infiltrating basaloid in 1 patient.

Stent group: The male:female ratio was 20:9. The mean age was 52 years. The dysphagia score varied from 1 to 4 with a mean of 3. The tumour site was mostly in the middle third. The tumour length varied from 5 to 10 cm with a mean of 7 cm. The pathology was SCC in 24 and Adeno Ca in 1 patient. The average survival period was 7 months in the radiotherapy group versus 4 months in the stent group.

Conclusion: It seems that more patients survive past the 3 months period in the radiotherapy group than in the stent group.

Acknowledgement: Mrs S. Liebenberg, Mrs C. Mphahlele.

THE INCIDENCE OF SUBCLINICAL METASTATIC SUPRACLAVICULAR LYMPH NODES SEEN ON ULTRASOUND IN BREAST CANCER

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Introduction: Metastatic invasion of suprACLAVICULAR lymph nodes (SCLN) in breast cancer is seen as an important factor. AJCC revised SCLN metas-

tases to N3c, which prior to 2002, was classified as M1 disease. Accuracy of ultrasonography alone has been previously proven for the detection of axillary metastases. Ultrasonography has a high sensitivity in determining malignant superficial lymph nodes of up to 90%.

Survival of SCLN metastases is not different from survival of patients presenting with M1 disease.

Aim: To evaluate the incidence of subclinical metastatic supraclavicular lymph nodes, detected by ultrasound, in breast cancer.

Method: This is a prospective, cross-sectional study. Patients will be enrolled from the surgical outpatients of Pretoria Academic Hospital, Kalafong Hospital and 1 Military Hospital. Histological confirmation of breast cancer is required. Patients with clinical staging of up to IIIa (T3N2M0) will qualify for enrolment. Patients are then sent for a sonar of the supraclavicular fossae using high resolution ultrasonography (7.5 Mhz and above). Differentiation of malignant from benign lymph nodes is done, using sonomorphologic features of lymph node shape, central hilus and peripheral cortex. The duration of the study will be 36 months.

Results: 40 patients between the ages of 31-78, have been currently enrolled in the study. 3 patients have ultrasonographically significant supraclavicular lymph nodes.

Conclusion: The presence of occult metastatic supraclavicular lymph nodes in breast cancer, is rare, but has important prognostic and therapeutic implications. The incidence of SCLN in breast cancer is determined using ultrasonography. Follow-up of ultrasonographically significant lymph nodes is important and may require further intervention.

DECOLONISATION OF DISTAL COLOSTOMY LIMB AT THE TIME OF COLOSTOMY: CONTRIBUTES TO WOUND HEALING

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Background: Colorectal microflora ranges from 108 to 1011 per millilitre of luminal contents. Antimicrobial prophylaxis in colorectal surgery is undisputed.

Purpose: To show that there is a reduction in the distal limbs of colostomies over time. This decrease contributes wound healing when the colostomy is reversed.

Patients and methods: Microbiological evaluation of the colostomy limbs of 60 consecutive patients was carried out. Forty-seven were trauma patients and 13 were benign non-trauma patients. The duration of the stoma ranged from 1/12 to 5 years. Closure of colostomies was done by the author and immediately taken to the microbiology laboratories observing all collection, transport and storage principles.

Metronidazole and a cephalosporin were administered with anaesthetic induction and continued for 24 hours.

Results: There was no mortality. There was superficial wound infection. The distal segments revealed a significantly low bacterial content compared to the proximal limbs at the time of closure $p = 0.0016$ by McNemar's test.

Conclusion: The study showed a significant decrease in distal colostomy limb microflora. This among other factors contributes to sound wound healing.

LAPAROSCOPIC ADRENALECTOMY: A STEEP LEARNING CURVE

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Introduction: laparoscopic adrenalectomy (LA) has become internationally preferred in the surgical management of almost all adrenal pathology, and is regarded as the surgical gold standard. It is a demanding procedure which requires a particular laparoscopic expertise.

Aim: to evaluate the outcome of LA in our institution, and identify factors that have impacted on the procedure.

Patients and methods: 23 LA were performed in 20 patients (7 male, 13 female) by two surgeons (ER and RB) from April 2002 to March 2007. All procedures were performed via a lateral transperitoneal approach. Indications were Conn's syndrome (6), phaeochromocytoma (5), incidentaloma (2), and Cushing's syndrome (7), of which 3 were bilateral resections. The mean tumour size was 5 cm (range 1.3 - 10). All data were collected prospectively.

Results: LA was completed in 17 cases (74%). Six patients underwent conversion because of intraoperative bleeding (3), unclear anatomy (2), intraoperative hypertensive crisis (1). All conversions occurred during the first 10 patients, and 3 in patients undergoing bilateral LA for Cushing's syndrome. The mean operating time was 136 minutes (range 86 - 210). The first 12 LA (in 10 patients) had a mean op time of 151 minutes, which decreased to 121 minutes in the next 11 operations. Median postoperative discharge was on day 2 (range 1 - 7). Postoperative complications were atelectasis in 2 patients, and aspiration pneumonia in a patient with a severe pre-existing neurological deficit.

Conclusion: LA is a challenging procedure with a long and steep learning curve. Critical to the success of the procedure is correct identification of important vascular structures: the IVC on the right, and the renal and splenic veins on the left. Injury to these usually results in significant haemorrhage which is difficult to control, even after conversion. Bilateral adrenalectomy for Cushing's disease is particularly challenging and is probably best avoided during initial experience. We found great benefit in being two experienced laparoscopic surgeons learning this technique together.

EFFECT OF ERADICATION OF *HELICOBACTER PYLORI* ON BLOOD PRESSURE - STUDY AND PRELIMINARY RESULTS

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Associations between cardiovascular disease and *Helicobacter pylori* infection have been shown. One study showed in patients with mild hypertension blood pressure decreased following eradication of the bacteria. Black South Africans are at excess risk for cardiovascular disease and *H. pylori* are endemic in this population. It is known that *H. pylori* rapidly depletes arginine, the nitric oxide (NO) precursor. Studies have shown that arginine supplementation can improve outcome in various cardiovascular diseases (heart failure) and by vasodilation, decrease blood pressures.

We hypothesised that *H. pylori* infection limits the availability of arginine (and NO) and may influence cardiovascular disease such as hypertension and potentially outcome in clinical interventions.

Methods: Black South African hypertensive patients (mean daytime ambulatory (ABPM) SBP>140 mmHg/DBP>85 mmHg) and a positive 14C-urea breath test were randomised to either placebo or conventional quadruple (two antibiotics, PPI and bismuth) therapy for one week (routine duration at time of design of study). ABPM was repeated at follow-up visits (up to 10 weeks).

Results: Blood pressure changes in patients assigned to placebo or active treatment ($*p<0.05$) (see table):

	Baseline	Interim visit	End of study
Active treatment			
<i>H. pylori</i> positive (n/total)	14/14	(nd) /12	9/11
Daytime SBP (mmHg)	152±19	147±18	152±18
Daytime DBP (mmHg)	100±13	95±11	99± 11
Nighttime SBP (mmHg)	144±13	138±15	148±17
Nighttime DBP (mmHg)	93±10	86±10*	93±11
Placebo			
<i>H. pylori</i> positive (n/total)	7/7	(nd) /6	4/4
Daytime SBP (mmHg)	149±15	151±7	153±9
Daytime DBP (mmHg)	100±8	99±7	102±9
Nighttime SBP (mmHg)	140±16	143±14	151± 8
Nighttime DBP (mmHg)	89±11	88±14	98± 10

Conclusions: Treatment of *H. pylori* infection resulted in a modest decrease in blood pressure, which was not sustained, probably because the infection had not been eradicated. Culture of biopsy specimens showed no evidence of resistance to the antibiotics used; in consequence, the results require confirmation in patients where eradication is proven, using a longer duration of treatment (14 days).

THE EFFECT OF GOLYTELY ON THE MUCUS LINING THE EPITHELIAL MUCOSA OF THE COLON

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We recently reported a study on the biochemical characterisation of mucus and mucus in cancer of the colon¹. The median wet weight of the crude scraped material was 4 928 mg. In another study, in which patients had bowel-prep prior to surgery, the amount of removable material on the mucosal surface had a median wet weight 2 070 mg, an approximately 2-fold difference. Our hypothesis was that the administration of bowel-prep caused the removal of mucus from the mucosal surface.

Approximately 5 litres of bowel washings were obtained from a patient administered bowel-prep prior to a colonoscopy. Mucus was extracted and isolated from an aliquot of a 10 ml colon wash, diluted to 100 ml (1:10) in 6M guanidinium chloride and a cocktail of proteolytic inhibitors. The material was first partially purified on a Sepharose 2B gel filtration column and further purified by density gradient centrifugation in caesium chloride.

Gel filtration analysis produced a large mucin positive peak eluting in the void volume of the column. Bowel-prep by itself (as a control) showed no peak

in this region after gel filtration. The caesium chloride profile showed a distinct peak for mucin positive material, separated from contaminant protein, giving a yield of 230.4 mg purified mucin. To further test whether the material was mucin, we loaded it on a SDS-PAGE gel.

Polyacrylamide gel electrophoresis stained with PAS (mucin stain) showed material at the top of the gel of molecular size >200 kDa. In all instances the material behaved as mucin, suggesting that bowel-prep contained mucin which was removed from the mucosal surface by shear during defaecation. The fact that the purified mucin eluted as an excluded peak on a gel filtration column suggested that the crude mucus gel itself, containing polymeric gel-forming mucin and other macromolecules (which were separated and removed by CsCl density gradient ultra-centrifugation) was almost entirely removed from the mucosal surface.

Chirwa Nthato, Mall Anwar, Tyler Marilyn, Govender Dhiren, Kavin Bruce, Goldberg Paul, Krige Jake, Lotz Zoe, Alistair Hunter and Kahn Delawir. Biochemical and immunohistochemical characterization of mucins in 8 cases of colonic disease-a pilot study. *South African Journal of Surgery* 2007; 45(1): 18-23

NEW-ONSET DIABETES MELLITUS: THE ROLE OF ORAL GLUCOSE TOLERANCE TEST (OGTT), FASTING PLASMA GLUCOSE (FPG) AND GLYCOSYLATED HAEMOGLOBIN (HbA1c), IN THE FOLLOW-UP OF POST-KIDNEY TRANSPLANT PATIENTS

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Background: New-onset diabetes mellitus (NODM) is a well-recognised complication in renal transplantation. Glucose intolerance is mentioned as one of the risk factors for developing NODM.

As a follow-up to a retrospective study on the incidence of NODM in patients transplanted from 1984, in our institution, we decided to monitor survivors through FPG, OGTT, and HbA1c. The aim was to identify those patients who are prone to develop NODM among the non-diabetic group or relapse amongst those with transient diabetes mellitus (DM).

Method: Thirty-three patients were followed up from January 1984. The group included 3 diabetics, 3 who had transient DM and 27 non-diabetics.

• FPG was done 3 monthly in all the 33 patients, OGTT in non-diabetics and those with transient DM (27 patients).

• HbA1c was monitored in the 3 diabetic patients.

- Impaired fasting glucose (IFG) was defined as glucose > 110 mg/dl (6.1 mmol/l) < 126 mg/dl (7.0 mmol/l)

- Impaired glucose tolerance (IGT) was defined as a 2 hour glucose > 140 mg/dl (7.8 mmol/l) and < 200 mg/dl (11.1 mmol).

Results: IFG was identified in 6 of the 33 patients (18.2%), including the 3 diabetics, 2 non-diabetics and 1 with transient DM.

Five had impaired glucose tolerance (18.5%) including 4 diabetics and the same patient mentioned above, with transient DM.

One of the 3 diabetics had an abnormal HbA1c of 8%.

Conclusion: The fact that 8 patients with poor glycaemic control were identified, indicates the need for strict glycaemic control in all post-transplanted patients.

THE EXPRESSION OF MUCINS IN SMALL-BOWEL ADENOCARCINOMA

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Small-bowel adenocarcinoma is a well-recognised, but rare complication of Crohn's disease (CD), and chronic inflammation is thought to play a role in carcinogenesis. While the majority of these tumours have adjacent dysplasia at the time of surgical resection, the natural history and rate of progression is unknown. Here we report on the expression of mucin in an unusual case of a 48-year-old woman with CD disease-associated small-bowel adenocarcinoma, in whom the diagnosis was preceded by flat low-grade dysplasia (LGD) in the terminal ileum, 18 months previously.

There were 4 groups in this study, namely normal tissue, duodenal carcinoma, CD only and CD with intestinal adenocarcinoma.

Normal small-bowel tissue showed a mixture of acidic and neutral mucin with no sulphation. Acidic mucins were elevated in patients with adenocarcinoma in the CD setting, compared with other groups. However the expression of sulphated mucin in small bowel adenocarcinoma associated with CD were higher than that observed with duodenal adenocarcinoma.

Metaplastic portions of tissue from patients with CD showed decreased levels of MUC2 expression compared to that in normal small bowel. In patients with adenocarcinoma and CD there was a marked increase in MUC2 expression. Both MUC5AC and MUC6 levels are elevated in CD patients, whereas only MUC5AC is elevated in patients with adenocarcinoma and CD.