Department of Surgery
WESTERN UNIVERSITY

12th ANNUAL RESEARCH DAY

Friday, June 24, 2016
Shuttleworth Auditorium, D0-104
St. Joseph’s Hospital
7:00 a.m. – 3:00 p.m.

Dr. Robert Zhong Lecture
“Targeting the Genomic and Metabolic Basis of Kidney Cancer”
Dr. W. Marston Linehan, Surgeon-in-Chief, National Institutes of Health
Department of Surgery
Western University

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### RESEARCH DAY 2016
Shuttleworth Auditorium, St. Joseph’s Hospital
Friday, June 24, 2016
Morning

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RESEARCH DAY 2016
Shuttleworth Auditorium, St. Joseph’s Hospital
Friday, June 24, 2016
Afternoon

1:00 – 2:00 p.m.  Robert Zhong Lecture
                  Dr. W. Marston Linehan

2:00 – 2:15 p.m.  Outstanding Scientist in the Department of Surgery

2:15 – 2:45 p.m.  Group Interactive Session: Should We Use Black Boxes in the Operating Room?

2:45 – 2:55 pm.   Research Award Presentations

2:55 – 3:00 p.m.  Closing Remarks: Dr. Emil Schemitsch
The Robert Zhong Department of Surgery Research Day was named in honour of Dr. Robert Zhong, a brilliant scientist and colleague who passed away in 2006.

Dr. Robert Z. Zhong was born in Shanghai, China on January 16, 1946. He graduated from Shanghai No 1 Medical University and was then assigned by the government to work as a general surgeon in a community hospital. Dr. Zhong attended a seminar led by Dr. Sun Lee – considered to be the founding father of experimental microsurgery – and whom he would later credit to be one of the most important mentors of his life. Dr. Zhong arrived in Canada first as a research fellow under the supervision of Drs. John Duff and Calvin Stiller in 1984. His persistence and vision led to a full-time appointment in microsurgical animal models that would be applied in human transplantation clinical practice.

Recognizing that molecular biology and transplant immunology were critical to the future of transplantation, Dr. Zhong began his study of these fields in Canada to become one of the world’s leading experts in transplantation and microsurgery. He went on to become a Tier One Canada Research Chair in Transplantation and Experimental Surgery in 2004 and was appointed a full Professor in the Departments of Surgery, Pathology, and Microbiology & Immunology at The University of Western Ontario. Dr. Zhong was a scientist at the Robarts Research Institute; Director of the Microsurgery Laboratory at LHSC; and a scientist at the Lawson Health Research Institute.

Dr. Zhong’s influence into the fields of transplantation and microsurgery were profound and far-reaching. He was Past President of the International Society of Experimental Microsurgery; a member of the Canadian Society of Transplantation, American Society of Transplantation; and the American Society of Transplant Surgeons. Dr. Zhong was awarded the Lifetime Achievement Award by the Canadian Society of Transplantation posthumously in 2007.

Dr. Zhong published over 180 peer-reviewed publications and achieved millions of dollars in research grant funding. He supervised more than 70 graduate students and fellows and trained over 70 microsurgeons worldwide during his 21-year career at Western. His superb leadership and vision were recognized as having created an internationally renowned program in experimental transplantation. A brilliant scholar, teacher, and mentor, Dr. Zhong is also remembered as a man of great humility, kindness, and respect.

Dr. Robert Zhen Zhong passed away in London, Ontario on September 8, 2006.

POSTER ABSTRACTS
Poster #01

Title: Comparing the anterior, posterior, and lateral approach: Gait analysis in total hip arthroplasty
Authors: Petis S, Vasarhelyi E, Lanting B, Jones I, Birmingham T, Howard J
Division of Orthopaedic Surgery

Poster Category: Clinical

Background: Patients report excellent functional outcomes, including subjective improvement in gait mechanics, following total hip arthroplasty (THA). However, few studies in the literature have outlined the impact of surgical approach on gait analysis.

Materials and Methods: Thirty patients undergoing THA for primary osteoarthritis of the hip were assigned to one of three surgical approaches (10 anterior, 10 posterior, and 10 lateral). A single surgeon performed each approach. Each patient received standardized implants at the time of surgery. Patients underwent 3D gait analysis pre-operatively, and at 6- and 12-weeks following the procedure. Temporal gait parameters, kinetics, and kinematics were compared. Statistical analysis was performed using one-way analysis of variance.

Results: The groups were similar with respect to age (p=0.27), body mass index (p=0.16), and the Charlson Comorbidity Index (p=0.66). Temporal parameters (step length, stride length, gait velocity, percent stance/swing phase) were similar at all time points. The lateral cohort had higher pelvic tilt during stance on the affected leg than the anterior cohort at 6-weeks (p=0.033). Affected leg ipsilateral trunk lean during stance was higher in the lateral group at 6-weeks (p=0.006) and 12-weeks (p=0.037) compared to the other cohorts. The anterior and posterior groups demonstrated an increased external rotation moment at 6-weeks (p=0.001) and 12-weeks (p=0.005) compared to the lateral group.

Conclusions: Although temporal parameters were similar across all groups, some differences in gait kinematics and kinetics exist following THA using different surgical approaches. However, the clinical relevance based on the small magnitude of the differences remains in question.
Neuromuscular stimulation leads to improved lower limb edema and blood flow compared to standard compression devices following kidney and pancreatic transplantation
Bijad AlHarbi¹,³, Omar Ali¹,³, Manujendra Saha¹,³, Mounirah May¹, Patrick Luke¹,³, Alp Sener¹

Departments of Surgery¹ and Microbiology and Immunology²; Matthew Mailing Center for Translational Transplant Studies³. Western University, London, Ontario, Canada

Poster Category: Clinical

Introduction: Kidney and pancreas transplant recipients undergo significant fluid shifts in the post-operative period leading to significant lower limb edema, weight gain and are at high risk for thromboembolism due to immobility. Many institutions utilize intermittent pneumatic compression (IPC) devices to mitigate these risks, however improper fitting, inappropriate use of device, peroneal nerve injury, discomfort, excessive heat and sweating under the inflatable cuffs limit the use of IPC units. The Geko Plus device, is a novel, internally powered calf neuro muscular stimulator, which has previously been shown to have beneficial effects in improving blood flow and skin capillary perfusion. Its role in transplantation has not previously been assessed.

Objective: To prospectively evaluate the effects of IPC and Geko Plus devices on lower limb edema in renal and pancreatic transplant patients.

Methods: We performed a prospective, randomized, controlled, single-centre, study where 50 patients were randomly assigned to wear IPC (Group 1, n= 27) or the Geko Plus device (Group 2, n=23) post-operatively until day 6 after surgery. We measured patient weight and lower leg and thigh circumferences daily. Ultrasound Doppler of the allograft and of the lower limbs was carried out on post-operative days 1 and 5 to assess venous flow and velocity in the femoral vein. Also, we monitored total urine output, serum creatinine levels.

Results: Median age of the recipients was 50 (24-72) years and 66% were male. 44 patients underwent kidney transplantation and 6 underwent kidney and pancreas transplantation. There were no differences in the BMI of the recipients in either group. Donor type were as follows: Group 1: 5 DCD,12 NDD,10 LD and Group 2: 7 DCD,9 NDD,7 LD. We observed a significant increase in calf circumference following transplantation in Group 1 by 7.2% (2.3 +/- 2cm) compared to Group 2 which showed no change from baseline (0.13%, 0.05 +/- 0.95 cm, p <0.0001). Thigh circumference also followed a similar trend with only Group 1 showing a significant increase (5.5%,2.4 +/- 2cm) from baseline compared to Group 2 (p <0.001). Doppler ultrasound showed a remarkable increase in mean flow velocity in the Geko Plus patients of 19cm/s whereas the IPC patients showed lower velocities 11cm/s (p <0.0005). There was no significant difference between groups in serum creatinine, weight change, urine output, and resistive index of the allograft. There were no complications in either group.

Conclusion: We report, for the first time, that the use of the Geko Plus device in the immediate post-operative period leads to an improvement in lower limb edema and in venous flow in kidney and pancreas transplant recipients compared to standard IPC.
Poster #03

Do Changes in Patellofemoral Joint Offset Lead to Adverse Outcomes in Total Knee Arthroplasty with Patellar Resurfacing? A Radiographic Review

Matz, J, Howard, J, Morden, D, MacDonald, S, Teeter, M, Lanting, B
Division of Orthopedic Surgery

Poster Category: Clinical

Background: Patellofemoral joint biomechanics contribute to anterior knee pain, instability, and dysfunction following total knee arthroplasty (TKA). Information about specific factors leading to anterior knee pain and dysfunction is currently limited. Changes in patellofemoral offset (PFO) refers to a mismatch between the preoperative and postoperative anteroposterior geometry of the patellofemoral joint. It remains unclear whether these changes lead to adverse outcomes in TKA.

Methods: A retrospective radiographic review of 975 knees pre- and post-total knee arthroplasty was completed to correlate the radiographic and clinical outcomes of changing the PFO using a posterior-stabilized single knee design with patellar resurfacing.

Results: A total of 975 patients were reviewed. Post-operatively, the anterior femoral offset, anterior-posterior (AP) femoral size, and anterior patellar offset were changed in 40%, 60%, and 71% of knees, respectively, compared to pre-operative values. The WOMAC total score as well as subscale scores for pain and function were not significantly affected by an increase or decrease in PFO. Similarly, KSS scores and range of motion were not significantly affected. Increased anterior patellar offset was, however, associated with increased post-operative patellar tilt. Postoperative patellar tilt was not correlated with adverse patient satisfaction scores or loss of ROM.

Conclusion: Changes in PFO (decreased, maintained, or increased) are common post-TKA and are not associated with a difference in clinical outcomes. Increases in anterior patellar offset led to increased patellar tilt, which was not associated with adverse patient satisfaction scores.
Poster #04

Identifying primary spontaneous pneumothorax from administrative databases: a validation study


Divisions of Thoracic Surgery, Pediatric Surgery, and Urology

Poster Category: Clinical

Background: Primary spontaneous pneumothorax (PSP) is a disorder commonly encountered in healthy young individuals. The recommended treatment varies from simple observation to surgical resection of lung bullae. Its etiology, pathophysiology, and principles of treatment are different than those of secondary pneumothorax (SP) that results from chronic disease or acute medical condition. There is no differentiation between PSP and SP in the current version of the International Classification of Diseases (ICD-10). This absence of a specific diagnostic code complicates the conduct of large-scale epidemiological and clinical studies on the subject. Our objective was to validate the accuracy of an algorithm that identifies cases of PSP from administrative databases.

Methods: The charts of 150 patients who consulted the emergency room (ER) with a recorded main diagnosis of pneumothorax were reviewed by two independent physicians to define the type of pneumothorax that occurred. The corresponding hospital administrative data collected during previous hospitalizations and ER visits were processed through the proposed algorithm. The results were compared over two different age groups.

Results: There were 144 cases of pneumothorax correctly coded (96%). The results obtained from the PSP algorithm demonstrated a significantly higher sensitivity (97% vs. 81%, p=0.038) and positive predictive value (87% vs. 46%, p<0.001) in patients under 40 years of age than in older patients.

Conclusions: The proposed algorithm is adequate to identify cases of PSP from administrative databases in the age group classically associated with the disease. This makes possible its utilization in large population-based studies.
Poster #05

Cost-effectiveness analysis of Bariatric Surgery versus Medical Management for Obesity in Canada
Scott Rieder, Donald Simonsen
Division of General Surgery

Poster Category: Clinical

Objective: This study aims to examine the cost-effectiveness of the two most commonly performed weight-loss surgeries, roux-en-y gastric bypass and vertical sleeve gastrectomy against medical management for obesity in Canada.

Background: The rate of obesity in Canada has steadily increased over the past two decades is now estimated to be upwards of 25%. Medical management for obesity has been demonstrated to be inferior to surgery for resolution and remission of obesity in other countries. This study aims to provide evidence that bariatric surgery in Canada is both cost-effective and cost-saving.

Methods: The long-term cost-effectiveness analysis was performed using a Markov model that places both surgical and medical patients into three health-care states. Probabilities of initial disease burden and short-term costs will be derived from the Ontario Bariatric Network’s database. The case-costs of bariatric procedures were taken from the Ministry of Health. The model estimated costs accrued over each cohort’s lifetime and compared them using ICERs.

Results: The bariatric patients had a dramatic decrease in the amount of weight lost, in the amount of medications taken and in the comorbidities associated with obesity. The Markov model was run for 20 years and the predicted incremental cost-effectiveness ratio (ICER) was $5582/QALY for the surgical arm compared to medical management.

Conclusions: Bariatric surgery in Canada over a 20 year cycle is much more cost-effective than medical management according our model. This result parallels much of current literature in other countries as well. In order to save further dollars, access to bariatric surgery must be increased.
Poster #06

Development of a Cost-Effective In-Situ Thoracic Surgery Crisis Simulation Model.
Divisions of Thoracic and General Surgery

Poster Category: Clinical

Background: Surgical training simulations are being widely adopted as integral components of resident programs but many are composed of expensive animal or mannequin models. Our vision was to develop a cost-effective training simulation scenario in a functional operating room (in-situ) that includes the full surgical team. In addition to fostering competent technical skills, our simulation training would also focus on effective interprofessional communication, teamwork skills, and to identify latent safety threats (LST).

Material and Methods: The simulation scenario consisted of an acute life threatening post-pneumonectomy airway obstruction by residual tumor. The model included a Thoracic operating room with the patient represented by an inexpensive modified Laerdal airway mannequin. A customized shareware vital sign simulator projected vitals on OR screens, controlled in real time by the simulation operator. Four Thoracic surgeon consultants and three residents were assessed for their team interactions with six nurses from the recorded scenarios using the validated NOTSS and the TeamSTEPPS scales. A 15 minute debriefing was done afterwards to identify LST and obtain simulation feedback using the MMMO questionnaire.

Results: Several LST were identified which included missing and redundant equipment, and knowledge gaps in participants roles. The MMMO overall simulation experience score was 4.7/5. Consultant surgeons scored higher than residents on the domains in the NOTSS (range: 3.6 to 4 vs. 2.8 to 3.8) and TeamSTEPPS (range: 3.5 to 4.8 vs. 3.0 to 3.7) scales demonstrating potential for improvement.

Conclusions: A novel Canadian inexpensive in-situ Thoracic Surgery crisis simulation model was developed and used to identify LST and reinforce team training behaviors in a high risk clinical setting.
Poster #07

Injury profile of the antipersonnel improvised explosive device
Shane S, Devine M, Taddeo J, McAlister V
Division of General Surgery

Poster Category: Clinical

Background: Multiple limb injuries caused by antipersonnel improvised explosive devices (AP-IED) were the most common serious trauma during the Afghanistan conflict. The goal of this paper is to describe the injury pattern of the target of AP-IED. We defined the target as the dismounted victim of an AP-IED with a traumatic amputation.

Methods: The injuries from 99 sequential victims of AP-IED, who presented to the Role 3 Multinational Medical Unit in Kandahar between January 2010 and July 2011, were recorded. The target of the AP-IED was defined as the casualty that received an amputation, which was an inclusion criterion.

Results: The mean age of the victims was 25 years. The ages ranged from 6 to 44 years. 70% of AP-IED victims had multiple amputations: 5 quadruple amputations, 26 triple amputations, and 38 double amputations. Twenty-one victims had pelvic fractures; all but one of the patients with pelvic fractures had multiple amputations. Forty-six victims had perineal, gluteal, or genital injuries. Severe soft tissue injury with injection of contaminated soil along tissue planes well above entry sites was universal. There were 13 facial injuries, 9 skull fractures, and 3 traumatic brain injuries. Eleven eye injuries were seen. The casualty fatality rate was 18%.

Conclusion: The injury pattern of the AP-IED is multiple extremity amputations with severe soft tissue injury extending into gluteal muscles, perineum and genitals, and pelvic ring disruption with severe soft tissue contamination by soil. This injury profile is markedly worse than that of antipersonnel mines.
Background: Hydronephrosis is commonly seen in urological practice and may be associated with renal injury. Recent studies have proven that serum creatinine may not be the best kidney function parameter, but it is used to determine acute kidney injury (AKI) in patients with hydronephrosis. Some studies have proposed the use of novel biomarkers to discriminate patients with hydronephrosis or subclinical AKI. Our main objective is to determine whether urinary levels of KIM-1, total and monomeric NGAL (tNGAL and mNGAL) are clinically relevant and useful in the evaluation of hydronephrosis in urological patients.

Methods: We conducted a prospective cohort study including two groups of patients and a control group: 1) patients with unilateral hydronephrosis and 2) patients with stone disease without hydronephrosis amenable to receive urological management. Demographic, clinical and radiological information was collected, and preoperative and postoperative KIM-1, tNGAL and mNGAL concentrations were determined, and those values were normalized to urinary creatinine concentration.

Results: A total of 48 patients and 11 healthy subjects were evaluated. We found significantly higher levels of KIM-1, tNGAL and mNGAL in the hydronephrosis group compared to healthy individuals (p<0.05). After appropriate management KIM-1 significantly decreased in the hydronephrosis group. KIM-1 was different between the two groups of patients, and it showed moderate correlation with the grade of hydronephrosis (r_s=0.39, p=0.002). Total NGAL and mNGAL had a moderate correlation with the presence of leukocyturia.

Conclusion: Besides reflecting subclinical AKI, KIM-1 is a potential candidate to detect hydronephrosis in urological patients. Total NGAL and mNGAL expression could be affected by the presence of leukocyturia, precluding their use as potential markers of hydronephrosis or subclinical AKI in this population.
Poster #09

A microparticle based liquid biopsy for prostate cancer screening and risk stratification. Williams K, Willis L, Deng F, Nitz M, and Leong H.S. Department of Surgery

Poster Category: Clinical

Abstract requested to not be in print.
Poster #10

The Development of Novel Drosophila Melanogaster Models for Human Nephrolithiasis
Sohrab Naushad Ali, Jihye Kim, Dajung Kim, Thomas Tailly, Hassan Razvi, Hon Sing Leong
Division of Urology

Poster Category: Basic Science

Background: Nephrolithiasis is a common urological disorder, however, research is limited due to lack of viable preclinical models. Recently, Drosophila Melanogaster (DM), has emerged as a powerful translational model. Here, we describe the development of novel DM models for calcium oxalate, uric acid and cystine nephrolithiasis including innovative applications such as intravital imaging and large scale high throughput drug screening.

Materials & Methods: DM models for calcium oxalate, uric acid and cystine were developed using simple dietary manipulation, genetic knockdown of uricase enzyme and SLC7A9 co-transporter respectively. Survival analyses, SEM/EDX to characterize stone morphology and composition plus intravital imaging studies were carried out using confocal microscopy in all DM models. Each model was subjected to high throughput drug screening with an experimental library of 360 using a novel indirect platform.

Results: We have successfully developed DM models for calcium oxalate, uric acid and cystine nephrolithiasis. All models have been verified via survival and SEM/EDX analysis. Ex vivo and in vivo visualization of stone formation was successful in the calcium oxalate, uric acid and cystine models. 7 drug candidates that reduce calcium oxalate stone formation in DM have been identified.

Conclusions: DM is a viable model for human nephrolithiasis. All developed models are robust and reproducible. We describe unique imaging modalities to study stone formation both ex vivo and in vivo. We have also developed an innovative high throughput platform for large scale library drug screening and demonstrate the potential for translational research in this unique model.
Poster #11

Carbon Monoxide and Hydrogen Sulphide as Possible Therapeutics for Abdominal Compartment Syndrome: A Rat Model
Murphy PB, Bihari A, Parry NG, Ball I, Leslie K, Vogt KN, Lawendy AR
Division of General Surgery

Category: Basic Science

Background: Abdominal compartment syndrome (ACS) results in significant organ, inflammatory, and metabolic derangement. Carbon monoxide (CO) and hydrogen sulphide (H₂S)-releasing molecules (CORM-3 and GYY4137) are potent anti-oxidant and anti-inflammatory agents at the tissue and systemic level. Our objective was to determine the effect of the two drugs given after ACS, using a rat model.

Materials and Methods: ACS was maintained for two hours in 19 rats using an abdominal cast and intra-peritoneal CO₂ insufflation (20 mmHg). Three experimental groups underwent ACS: inactivated CORM-3, active CORM-3 and GYY4137; while one arm served as a sham (no ACS). Perfusion, inflammation and cell death were quantified in exteriorized livers using intravital video microscopy. Respiratory, liver and renal dysfunction was assessed biochemically.

Results: Hepatocellular death and activated leukocytes within post-sinusoidal venules were significantly increased in rats undergoing ACS (16-fold and 17-fold increase respectively, \( p<0.05 \)). Administration of CORM-3 or GYY4137 resulted in a significant decrease of both (\( p=0.03 \) and \( p=0.009 \)). ACS resulted in an increase in serum markers of renal and liver injury; CORM-3 or GYY4137 were able to partially restore the levels to those seen in sham animals. Myeloperoxidase (MPO) levels were significantly elevated in the ACS group and CORM-3 treatment, but not GYY4137, reduced MPO to levels no different than sham (\( p>0.05 \)).

Conclusions: The organ dysfunction associated with ACS is severe and both CO and H₂S tempered the associated metabolic and organ derangement to levels of sham animals. CORM-3 and/or GYY4137 may have potential as a therapeutic agent for ACS.
Poster #12

The microbiome of a *Drosophila melanogaster* model of nephrolithiasis


Division of Urology, Department of Surgery, Department of Microbiology and Immunology, Department of Biology, Western University, Canadian Centre for Human Microbiome and Probiotic Research, London, Canada.

Poster Category: Basic Science

The prevalence of nephrolithiasis in North America has risen to about 10%. The gut microbiota is now recognized as an important aspect of human health and has been implicated in the formation of kidney stones; colonization with *Oxalobacter formigenes* appears to protect against formation of calcium oxalate (CaOx) stones by reduction of urinary oxalate. Importantly, the role of the microbiota as a whole in kidney stone formation is unknown. *Drosophila melanogaster* (DM) were reared on standard and lithogenic diets. CaOx stones were formed by supplementation of the diet with ethylene glycol and sodium oxalate. RNAi mediated knockdown of Uricase were utilized to develop uric acid stones. The DM malpighian tubules/gut were dissected for DNA extraction from stone forming and control flies. The bacterial communities were analyzed using high-throughput techniques, whereby the V4 region of the 16S rRNA gene was amplified and sequenced. The flies’ microbiotas were composed of 22 operational taxonomic units (OTUs), dominated by the family *Rickettsiales* and genus *Acetobacter*. Many OTUs were comparable between groups, however one OTU was significantly increased in the lithogenic group, corresponding to a group of *Lactobacilli*. *Lactobacilli* are an important component of DM physiology and are shown to be up-regulated in our fly model of CaOx nephrolithiasis. This may be a protective mechanism or a potential biomarker of stone disease. This demonstrates a greater role for the gut in nephrolithiasis, beyond *Oxalobacter* colonization. By better understanding the role of the microbiota in this disease, we can develop new prevention strategies and alternative treatments.
Poster #13

In-Vitro study of the Effect of Humeral Cup Constraint in Reverse Shoulder Arthroplasty
Abdulla I, Langohr GDG, Giles JW, Johnson JA, Athwal GS
Division of Orthopaedic Surgery-Western University, London Ontario Canada

Poster Category: Basic Science

Background: Reverse shoulder arthroplasty (RSA) is an effective treatment option for rotator cuff tear arthropathy and as a salvage procedure for failed primary shoulder arthroplasty. Computer studies show that the level of polyethylene insert constraint influences range of motion (ROM) and joint stability. There is a paucity of information regarding the effects of constraint on joint load and resultant load angle. The purpose of this study was to investigate the effects of increasing humeral cup constraint on joint load, load angle, deltoid force, and range of motion in RSA.

Materials and Methods: A custom RSA implant capable of measuring forces across the joint with varying humeral cup constraint (standard, retentive) was implanted in 7 cadaveric shoulders (age: 71 ± 9 yrs). A shoulder simulator capable of loading musculature to produce active glenohumeral and scapulothoracic motion was then used to simulate active and passive motion and joint kinematics and loads were recorded.

Results: When cup constraint was increased, joint load during active abduction showed no significant differences (P=0.15). Similarly, joint load angle was not significantly affected by increasing cup constraint (P=0.42). Increasing cup constraint did significantly increase the angle between the resultant joint load and cup edge (P<0.001). Cup constraint did not significantly affect the required deltoid force for active abduction (P=0.125). Interestingly, range of motion was not significantly affected by increased cup constraint in both internal/external rotation (P=0.276) and abduction (P=0.282).

Conclusion: Our findings suggest that with increased cup constraint, range of motion, the resultant joint loads and required deltoid forces are not altered. This unexpected result occurred because impingement and terminal motion was limited by bone and soft tissue, rather than implant-related restriction. We found that the joint load migrated further from the edge of the cup when cup constraint was increased, which may have a positive impact on wear characteristics and long term RSA performance.
Poster #14

Water jet dissection of the cavernous nerves: a comparative study to blunt cavernous nerve injury in a rat model and its implication on erectile function
Alenezi H, Young L, Brock G, Pautler S
Division of Urology

Poster Category: Basic Science

Introduction: Our objective is to study the impact of water-jet dissection (WJD) of the cavernous nerves (CNs) on postoperative erectile function (EF) and compare it to standard dissection in an established model of blunt surgical trauma of CNs in rats.

Methods: Fifteen Sprague-Dawley male rats were randomly divided into two groups: group 1 (WJD) rats were subjected to WJD and barotrauma of bilateral CNs using a fluid pressure of 15 atm (n=8), while group 2 (BT) rats were subjected to standard dissection of the nerves and blunt trauma of bilateral CNs (n=7), in a survival surgery. After 4 weeks, postoperative erectile function was assessed by measuring the intracorporeal pressure (ICP) during 3 electrical stimulations of the CNs under anesthesia. Euthanasia was performed after harvesting the penile tissue for histopathological examination. The peak ICP was noted and the area under the curve (AUC) was calculated for each stimulation. Digital copies of Masson’s trichrome stained cross-sections were obtained and analyzed quantify fibrosis ratios.

Results: WJD rats demonstrated a significantly higher mean peak ICP of 65.7 ± 32.2 cm H$_2$O in comparison to a mean peak ICP of 33.4 ± 23.5 cm H$_2$O in BT (p <0.0001). WJD was also associated with more sustainable rise in the ICP in comparison to BT as the mean AUC was 3425.7 ± 1671 and 2163.2 ± 1551, respectively (p= 0.012). Fibrosis ratios were comparable between the groups.

Conclusion: In this study, WJD of the CNs was associated with a significantly better postoperative ICP than blunt trauma.
Poster #15

Oncosomes as a Novel "Liquid Biopsy" for Quantifying Metastatic Cancer Dynamics in Real-Time
Deng FK, Kim Y, Leong HS
Division of Urology

Poster Category: Basic Science

Introduction: Extravasation is one of the key steps of cancer metastasis. Using intravital imaging, we have determined that cancer microparticles (CMPs), intact phospholipid vesicles that range from 100-1000nm in diameter, are consistently released from extravasating cancer cells. A significant amount of literature suggests that CMPs contribute to cancer invasiveness and metastasis and that MPs may be used as a biomarker for the early detection of malignancy. However, abundance and biophysical characteristics (size diameter range) of CMPs released during cancer cell extravasation has not been reported previously.

Materials and methods: We used the chick embryo model to visualize and image the process of extravasation. We also collected blood post-injection of prostate cancer cells and performed nanoscale flow cytometry to enumerate circulating CMPs.

Results: We observed an accumulation of CMPs larger than 800nm in diameter after intravenous injection of cancer cells, while the majority of CMPs detected in conditioned medium were less than 500nm in diameter. We also termed these larger sized MPs (>800nm) oncosomes and observed them to be the result of cancer cell extravasation. These findings represent the first biomarker for determining cancer cell extravasation events and the earliest onset of metastasis.

Discussion and Conclusions: Our results show that extravasating cancer cells release oncosomes, suggesting that metastatic risk of cancer patients can be clinically determined by “liquid biopsy” based on enumerating oncosomes in patient blood.
Poster #16

Evaluation of Chemotherapeutic Regimens in 3D Tissue Culture of Pancreatic Adenocarcinoma
Istl AC, Shrum B, McAlister VC
Division of General Surgery

Poster Category: Basic Science

Background: Chemotherapy can improve near-term mortality and morbidity in patients with pancreatic adenocarcinoma (PA). Currently there are multiple chemotherapy regimens being utilized for PA. Three-dimensional tissue culture (3DTC) is a validated in vitro model for measuring tumour growth and has been shown to be more reflective of in vivo conditions compared to 2DTC. We have used 3DTC to evaluate the effects of chemotherapeutic agents on PA.

Methods: Panc-1 cells were grown in 3DTC in supplemented Matrigel(R) media with Category 1 and 2a recommended chemotherapeutic regimens. The experiments were also performed in 2DTC. Growth was monitored over 3 days with measurements and digital micrographs. An acid phosphatase (AP) assay was conducted to evaluate cell viability at 72 hours. Tissue samples were processed for markers of cell cycle progression (Ki-67) and apoptosis (active caspase-3).

Results: There was a significant effect of culture type on outcome across treatments (p<0.001). Cell viability as measured by AP activity was significantly decreased in all 2D treatment groups compared with control (p<0.001). In 3DTC, cell viability was significantly decreased (p<0.01) in all treatment groups except Gemcitabine, Gemcitabine/Cisplatin, and FOLFIRINOX (p>0.05). The most appreciable difference was seen after treatment with Tacrolimus/5-FU (63.79%±6.7).

Conclusions: This pilot study demonstrates that Panc-1 spheroids can be grown in 3DTC for high through put screening of chemotherapeutic agents and may be used to investigate new agents or combined therapies. The response of Panc-1 cells to chemotherapeutics in 3DTC is less robust than those seen in 2DTC which better reflects in vivo conditions.
Poster #17

Creation of Iodine-Agar Phantom Tumours for Surgical Research

Escoto, A\textsuperscript{a}, Trejos A. L.\textsuperscript{a,b}, Naish, M. D.\textsuperscript{a,b,c}, Malthaner, R. A.\textsuperscript{d} and Patel R. V.\textsuperscript{a,b,d}

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Poster Category: Basic Science

Background: Surgical oncology and imaging research requires realistic tumour phantom models to assess new technologies and image guided techniques. An ideal phantom tumour does not exist. We sought to develop a phantom tumour that could be embedded within tissue (such as liver and lung) and consistently be identified by palpation, ultrasound and fluoroscopic techniques.

Materials and Methods: We injected a mixture of agar and iodine solutions into tissue to create solid objects that resembled real tumours. The phantoms were made by mixing 8 mL of agar solution (made using 6 g of agar substitute gelling agent diluted in 300 mL of water) with 2 mL of organically bound iodine. The mixture was injected into tissue once it presented a gelatinous consistency. To assess the effectiveness of this technique, two \textit{ex vivo} porcine livers and one \textit{in vivo} lung were injected at random locations four times each.

Results: Phantom tumours were created properly for 100\% of the experimental scenarios. The phantoms were fully embedded in the tissue, had unknown shapes, and their size depended on the amount of mixture injected. An expert in the field of thoracic surgery indicated that these phantoms were a good representation of real tumors and presented a similar hardness and shape. All of these phantoms were properly identified by palpation, ultrasound and fluoroscopic techniques.

Conclusions: This method allows clinicians to create safe, reliable, and realistic tumour phantom models for training and assessing surgical technologies.
Poster #18

Microparticle release during cancer extravasation: a novel anti-metastasis target
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2 Department of Surgery, Division of Urology, Western University
3 Translational Prostate Cancer Research, Lawson Health Research Institute

Poster Category: Basic Science

Background: For metastasis to occur, disseminated tumor cells must leave the bloodstream and enter into the adjacent stromal tissue by a process called extravasation. However, less than 1% of extravasating tumor cells proceed to form a metastatic colony. Intravital imaging studies show extravasating metastatic cancer cells consistently release microparticles resulting in cell volume loss after extravasating into the adjacent tissue. Substantial literature shows that microparticle release is a key feature of necroptosis. We hypothesize that necroptosis, programmed necrosis, is responsible for cancer cell microparticle release resulting in cell volume reduction.

Materials and Methods: To test my hypothesis, we quantitated the number of microparticles released by metastatic cancer cells undergoing extravasation in chicken embryo plasmas by nanoscale flow cytometry. We also measured cancer cell volume change due to extravasation by confocal intravital microscopy. Next, we measured extravasation rates of cancer cells and subsequent metastatic colony formation rates. Finally, we measured amounts of microparticle release and extravasation rates of dimethyl fumarate (DMF, necroptosis inducer)/necrostatin-1 (Nec-1, necroptosis inhibitor)/vehicle treated cancer cells.

Results: Our results show that cancer cells released the most microparticles and lost the most cell volume in Day 18 animals. Those cancer cells in Day 18 animals exhibited the lowest extravasation rates and metastatic colony formation rates. DMF treated cancer cells also showed the most microparticle release and the lowest extravasation rates whereas Nec-1 treated cancer cells showed the lowest microparticle release but highest extravasation rates.

Conclusions: Our findings show that an increase in microparticle release is correlated with a decrease in their metastatic efficiency due to excessive cell volume loss. Also an increase in microparticle release past a threshold due to necroptosis inversely affects cancer cell extravasation rates. Our results suggest necroptosis may be a novel therapeutic target to inhibit metastatic spread at the key step of cancer cell extravasation.
Poster #19

PDXovo: Ultra-Fast In Vivo Drug Sensitivity Matrices for Renal Cell Carcinoma Patients Prior to Administration of Targeted Therapy
Matthew R. Lowerison,1,2 Hon S. Leong,3 Yaroslav Fedyshyn,3 Ann F. Chambers,2,4,6 James C. Lacefield,1,2,5 and Nicholas E. Power3

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6London Regional Cancer Program, London, Ontario, Canada

Poster Category: Basic Science

Our next generation patient derived xenograft (PDX) model of renal cell carcinoma (RCC) offers the ability to pre-determine de novo drug resistance in fresh patient tumor samples prior to targeted therapy. Implantation of tumor specimens into the chorioallantoic membrane (CAM) of the chicken embryo results in high engraftment efficiencies within two days permitting large scale “tumor avatar” studies due to its angiogenic microenvironment. Functional tumor heterogeneity studies can be performed in context of drug resistance within two weeks, an approach that could guide the selection of drugs and anticipate outcomes for RCC patients. This ultrafast PDX model is mirrored by high-frequency ultrasound imaging that permits quantification of tumor volume and tumor vascularity in a high-throughput manner. Using this “tumor avatar” model paired with a prospective RCC patient cohort, we observe intratumoral functional heterogeneity in the context of Sunitinib treatment as determined by high-frequency ultrasound imaging, highlighting its interventional potential in the clinic.
FACULTY ABSTRACTS
Poster #20

IDO2-silenced DC vaccine reduces T cell exhaustion in anti-breast cancer immunotherapy
Hongmei Wang, Xiufen Zheng, Qing Li, Nathan Johnston, Xusheng Zhang, Suimik Biswas, Yixing Zhang, James Koropatnick, Weiping Min
Departments of Surgery, Oncology and Pathology, Western University; Multi-Organ Transplant Program, Lawson Health Research Institute.

Background: The use of tumour antigen-loaded DCs (tumour vaccines) for cancer immunotherapy is an area of considerable interest and progress. Unfortunately, outcomes from clinical trials of DC vaccines have been disappointing. Indoleamine 2,3-dioxygenase 2 (IDO2), a newly discovered IDO1 paralogue enzyme, is an immunosuppressive molecule expressed in human cancers and dendritic cells (DCs). The role of IDO2 in DC-mediated breast cancer immunotherapy is not clear.

Materials and Methods: Bone marrow derived DCs were cultured from BALB/c mice and transfected with IDO2 siRNA (siIDO2 DCs). Murine breast cancer (4T1) borne mice were treated with siIDO2 DC vaccine.

Results: Transfection with IDO2 siRNA decreased IDO2 expression in DC, but increased CD80 and CD86, indicating increased DC maturation. IDO siRNA also downregulated PD-L1, ICOS and Galectin-9 expression, which in turn decreased correspondent receptors PD-1, TIM3 and BTLA expression in T cells in an MLR. IDO2-silencing DCs decreased the generation of regulatory T cells (Treg) in vitro thus increased anti-tumour T cell responses. For in vivo studies, we found that siIDO2 DC vaccine delayed tumour formation and reduced tumour growth, which is associated with the decreased the number of Treg cells in draining lymph nodes, increased CD80 in spleen DCs, and enhanced cytotoxicity of CD8+ T cells. Moreover, siIDO2 DC downregulated the expression of T cells exhaustion inhibitory receptors PD-1, TIM3 and BTLA expression and of their correspondent ligands such as PD-L1, ICOS and Galectin-9 expression in splenocytes.

Conclusion: This study is the first to demonstrate the function of IDO2 in DC maturation, function, and prevent T cells exhaustion. Suppression of IDO2 enhances DC vaccine therapy in treating breast cancer.
Poster #21

Custom Simulator Development Using Computer Design and Rapid Prototyping
Mackenzie Quantz
Division of Cardiac Surgery

Background: Surgical education is becoming challenging with limitations in duty hours, increased scrutiny of outcomes, operating room restrictions and changes in training that will be brought about by Competency by Design.

Materials and Methods: Simulation, when incorporated as part of a structured curriculum, has been shown to allow the successful acquisition of skills in a low stress environment without concern of patient outcomes.
While an increasing variety of simulators are becoming available, their utility may be limited by price, lack of faithful tissue characteristics or do not accurately fulfill the requirements of the scenario.

Results: The “in house” development of simulators leads to the production of custom designs that have similar physical properties to the structures that they are mimicking. The workflow includes development of the model using CAD software, rapid prototyping using 3D printers and final production utilizing either commercially available or proprietary polymers.

Conclusion: Simulators produced thus far include the aorta, saphenous vein, internal jugular vein, aortic root, mitral valve, aortic dissection, bladder-urethra and pyloric stenosis.

The utilization of CAD and rapid prototyping can provide trainees, educators and researchers with scenario specific models produced rapidly and at an economic cost.
Poster #22

Detecting *Propionibacterium acnes* in the shoulder
Divisions of Orthopedics, Urology and Plastic Surgery

**Background:** *Propionibacterium acnes* (*P. acnes*) is a common cause of infection after shoulder surgeries. These infections are difficult to diagnose, as symptoms often present weeks after surgery. Treatment options are limited to removal of the infected implants/tissues and antibiotic therapy. External contamination of the surgical site is the presumed cause, however *P. acnes* can be a commensal of the sebaceous follicles of the skin and may be a component of the shoulder microbiome in some patients. The aim of this project was to determine if *P. acnes* is present in the shoulder microbiome.

**Methods:** Skin, subcutaneous fat, supraspinatus tendon, glenohumeral ligament and humeral head tissues were collected from 23 patients (14M, 9F, 39-83 yrs) undergoing surgeries at the St. Joseph’s Hospital. An “open air” control was used to detect microbial dispersal into the air of the ORs. Samples were de-identified prior to DNA extraction and 16S rRNA gene sequencing with the Illumina MiSeq platform.

**Results:** The five most abundant bacterial genera identified in the shoulder were *Enterococcus, Morganella, Ralstonia, Staphylococcus* and *Pseudomonadaceae*. *Propionibacterium* was detected in one skin sample, however this genus was not detected in the majority of samples. Analyses to confirm the *Propionibacterium* species detected in the skin are underway.

**Conclusions:** To our knowledge, this is the first report of the microbiome of the human shoulder. *Propionibacterium* does not appear to be a common component of this microbiome, however its presence in the skin of one patient is consistent with the potential for cutaneous contamination of shoulder surgeries.
ABSTRACTS FOR AWARD WINNING RESIDENT/FELLOW RESEARCH PAPERS
Presentation #01  
Presenter: Dr. Caitlin Symonette  
Division: Plastic & Reconstructive Surgery  

Can we identify a threshold for acceptable radiographic parameters of distal radius fractures in the elderly?  

Symonette CJ, MacDermid J, Grewal R  

Introduction: The purpose of this study was to characterize the acceptable threshold of radiographic parameters following distal radius fractures (DRF) in an elderly cohort according to a patient-rated pain and disability outcome measure.  

Methods: A prospective cohort of 190 elderly (aged ≥ 65 years) patients with DRF were recruited from a tertiary care referral center. The influence of specific radiographic parameters (ulnar variance (UV), radial inclination (RI), and volar/dorsal tilt) on final Patient-Rated Wrist Evaluation (PRWE) was investigated. The relative risk (RR) of a poor PRWE outcome at various alignment thresholds was calculated and a number need to harm (NNH) was subsequently derived from this data.  

Results: The majority of the cohort (n=158, 83%) had a good PRWE outcome despite malalignment on radiographs. Average radiographic parameters for our cohort were an UV of 1.9mm +/- 1.9mm (+/-SD), RI of 18.7° +/- 5.9° (+/-SD) and dorsal tilt of 4.5° +/- 11.9° (+/-SD). The RR of a poor PRWE outcome was significant for UV ≥ 5mm (p = 0.026, NNH 4), RI ≤ 20° (p=0.007, NNH 6), dorsal tilt ≥ 15° (p=0.009, NNH 3).  

Conclusion: Our study provides new discrete thresholds for acceptable radiographic parameters following DRF in an elderly cohort according to a validated patient-rated outcome measure.
Presentation #02
Presenter: Dr. Christopher Del Balso
Division: Orthopaedic Surgery

Trunnionosis: Does Head Size Affect Fretting and Corrosion in Total Hip Arthroplasty?
Author: Dr Christopher Del Balso (PGY-4)
Co-Authors: MG Teeter, SC Tan, JL Howard, BA Lanting

Introduction: Wear and tribocorrosion at the head-neck taper interface of modular total hip arthroplasty (THA) implant designs may be a cause of THA failure. At present, little is known about the variables that may lead to “trunnionosis” in metal-on-polyethylene (MoP) THA. The purpose of the present investigation is to elucidate the effect of femoral head diameter on fretting and corrosion in retrieved head-neck tapers.

Methods: A retrieval analysis of MoP THA prostheses in vivo for a minimum 1 year was performed. Twenty-three femoral heads of 32mm diameter with 13 accompanying femoral stems were matched with 28mm heads and 10 accompanying stems based on time in vivo and head length (-3mm to +8mm). All included implants featured a single taper design from a single manufacturer. Demographic data were obtained from chart review. Fretting and corrosion damage scoring was completed for three horizontally oriented concentric zones of the femoral head and stem tapers under stereomicroscopic visualization resulting in summed total fretting and corrosion damage scores for each implant.

Results: Head diameter was observed to affect fretting (p=0.01), with 32mm femoral heads exhibiting greater total fretting scores than 28mm heads. Fretting damage was greatest (p=0.01) in the central concentric zone of the femoral head bore tapers, regardless of head diameter, length or stem offset. No significant effect on total corrosion scores was observed for any head or stem variable. Retrieved implant total corrosion scores were positively correlated (p=0.51, p<0.001) with implantation time.

Discussion/Conclusions: Increased femoral head diameter in MoP THA may produce greater fretting damage owing to an increased head-neck moment arm. There is no associated increase in corrosion with 28mm and 32mm heads of this taper design. The longer a MoP THA prosthesis is implanted, the greater the risk of damage due to corrosion. Further investigation is required to determine the effect on fretting and corrosion of head diameters greater than 32mm, and variations in head-neck taper design.

Funding Sources/Disclosures: Institutional research support; DePuy, Smith and Nephew, Stryker.
Synoptic versus free-form CT reporting for determination of resectability in periampullary malignancy.

Jeff Hawel, Harry Marshall, Michael Meschino, Esther Lau, Heather Emmerton-Coughlin, Catherine Yoshy, Daniele Wiseman, Amol Mujoomdar, Roberto Hernandez-Alejandro, Ken Leslie

Introduction: Despite advances in pre-operative imaging for periampullary malignancies (PAMs), up to 25% of patients brought to the OR for pancreaticoduodenectomy (PD) are found to be unresectable. This study aimed to determine if synoptic reporting of staging CT scans better describes resectability status than free-form reporting.

Methods: We retrospectively identified 135 patients who had unresectable disease found at laparotomy or who had a margin positive (R1) PD at our institution from 2007 to 2015. Staging CT scans were retroactively re-reported using a synoptic reporting template and resectability was determined using NCCN guidelines. Eight-nine (66%) patients were excluded from analysis due to inadequate protocol for PAM staging (50%) or delay between imaging and operative date greater than 90 days (16%). The standardized reporting was compared on a case-by-case basis to the original free-form reports. We then retrospectively compared the pre-operative resectability status to surgical outcomes.

Results: Of the 46 patients who met inclusion criteria, 6 were deemed resectable, 7 borderline, and 33 unresectable. Of the 40 scans flagged as borderline or unresectable, 25 (62.5%) were not identified in the original free-form reports. The most commonly "missed" determinants of resectability in the original free-form reports were as follows: SMA = 8/12 (67%), CHA = 4/5 (80%), PV = 21/21 (100%), SMV = 18/21 (85.7%). Furthermore, only 50% of patients excluded from analysis went on to have further imaging (eg. MRI). Overall, only 11/135 (8%) were reviewed at Multidisciplinary Tumour Boards.

Conclusion: Communication between radiologists and surgeons is vital to the appropriate selection of surgical candidates in PAM. Free-form reports are more likely to omit details important in determining resectability. Formal radiology review in high volume centers, including assurance of proper imaging protocols, should be considered for all operative candidates with PAMs.
Presentation #04  
Presenter: Dr. Matthew Valdis  
Division: Cardiac Surgery

Evaluation of robotic cardiac surgery simulation training: A randomized controlled trial.  
Valdis M¹, Chu MW², Schlachta C³, Kiaii B².

Objective: To compare the currently available simulation training modalities used to teach robotic surgery.

Methods: Forty surgical trainees completed a standardized robotic 10-cm dissection of the internal thoracic artery and placed 3 sutures of a mitral valve annuloplasty in porcine models and were then randomized to a wet lab, a dry lab, a virtual reality lab, or a control group that received no additional training. All groups trained to a level of proficiency determined by 2 expert robotic cardiac surgeons. All assessments were evaluated using the Global Evaluative Assessment of Robotic Skills in a blinded fashion.

Results: Wet lab trainees showed the greatest improvement in time-based scoring and the objective scoring tool compared with the experts (mean, 24.9 ± 1.7 vs 24.9 ± 2.6; P = .704). The virtual reality lab improved their scores and met the level of proficiency set by our experts for all primary outcomes (mean, 24.9 ± 1.7 vs 22.8 ± 3.7; P = .103). Only the control group trainees were not able to meet the expert level of proficiency for both time-based scores and the objective scoring tool (mean, 24.9 ± 1.7 vs 11.0 ± 4.5; P < .001). The average duration of training was shortest for the dry lab and longest for the virtual reality simulation (1.6 hours vs 9.3 hours; P < .001).

Conclusions: We have completed the first randomized controlled trial to objectively compare the different training modalities of robotic surgery. Our data demonstrate the significant benefits of wet lab and virtual reality robotic simulation training and highlight key differences in current training methods. This study can help guide training programs in investing resources in cost-effective, high-yield simulation exercises.
The Impact of Steroid Use on Artificial Urinary Sphincter Reoperation
R Clark, J Winick-Ng, A McClure, B Welk

Introduction and Objectives: Artificial urinary sphincters (AUS) are used to treat male stress incontinence, often following radical prostatectomy. Previous research has suggested that 1 in 4 men require a second AUS-related operation after 5 years, due to AUS complications or recurrent incontinence. Corticosteroids are associated with impaired wound healing and infections in the surgical setting, and are commonly used in the treatment of metastatic prostate cancer, and for various inflammatory diseases. The objective of this study was to determine if oral corticosteroid use was associated with an increased risk of AUS related reoperation.

Methods: We used administrative data from the province of Ontario, Canada to conduct a retrospective cohort study. Our population was men >65 years of age, who underwent implantation of an incident AUS between April 1st 2002 and December 31st 2013. Our primary outcome was the first reoperation on the AUS for any reason. Our primary exposure was defined as a filled prescription for an oral corticosteroid at the time of AUS implantation, or during follow-up (but prior to any AUS reoperation); we considered men to be exposed from the first day of the prescription to 180 days after the last day of medication. Our primary analysis was a cox proportional hazards model with steroid usage as a time varying covariate.

Results: We identified 747 men, (median age 71, IQR 68-75), of which 592 (79.3%) had a prior radical prostatectomy, and 29 (3.9%) had prior primary radiation therapy for prostate cancer. The median cohort follow-up was 3.2 (IQR 1.3-5.9) years. 175/747 (23.4%) were exposed to corticosteroids during the study period (median duration of prescription was 22.0 days, IQR 5.0-133.0). We identified an initial AUS reoperation in 176/747 men (23.5%) a median of 1.4 years (IQR 0.4-3.0) after implantation. In our primary analysis, with adjustment for age, radiation exposure, and year of implantation, the hazard ratio for subsequent reoperation on the AUS among steroid users was 1.75 (95% CI 1.08-2.84, p=0.02).

Conclusions: To our knowledge this is the first observational study to demonstrate the significant increased risk in reoperation among men taking oral corticosteroid. This risk factor should be considered in patient counselling, and further studies evaluating the specific utilization patterns of steroids and their association with AUS complications may be warranted. Given the potential cost and morbidity associated with AUS reoperation, potential strategies for reducing the harmful effects of steroids on wound healing (such as retinoid supplementation) could be further studied among AUS patients on corticosteroid therapy.
Presentation #06  
Presenter: Dr. Kevin Lee  
Division: Vascular Surgery  

Randomized Control Trial of Negative Pressure Wound Therapy for High Risk Groin Wounds in Lower Extremity Revascularization  
Kevin Lee, MD, Patrick Murphy MD, Matthew V. Ingves MD, Luc Dubois MD, MSc, Audra Duncan, MD, Guy DeRose, MD, Thomas Forbes, MD, Adam Power MD, MPhil  
Division of Vascular Surgery, Western University, London, ON, Canada  

Objective: Revascularization of the lower extremity requiring groin incision is associated with a high rate of surgical site infection (SSI). The objective of this study was to assess the effect of negative pressure wound therapy (NPWT) on rates of infection following primary closure of high risk groin wounds in vascular surgery patients undergoing lower limb revascularization.  

Methods: We performed a randomized controlled trial at an academic tertiary medical center. High risk groin wounds were defined as having previous femoral artery cut down, body mass index (BMI) greater than 30 kg/m² or major or minor ischemic tissue loss. We randomized patients to NPWT or standard group once the surgical incision was primarily closed. The primary outcome of the study was overall 30 day groin SSI. Our secondary outcomes were length of stay, readmissions, reoperations, amputations and mortality.  

Results: A total of 101 patients were randomized during 13 months. Criteria for inclusion was previous femoral artery cut down in 24%, greater than 30 kg/m² BMI in 36%, and ischemic tissue loss in 40%. The most common revascularization procedure performed was femoral to distal bypass (51%), followed by femoral to femoral artery bypass (20%), and other (29%). Primary outcome of 30 day SSI showed a lower trend but was nonsignificant in NPWT group (11%) compared to the standard dressing group (19%) (p=0.24). There was one in hospital SSI in both groups (p=0.96). Length of hospital stay was significantly shorter for the NPWT group compared to the standard group (6.4days vs 8.9days, p=0.01).  

Conclusion: We found a trend towards lower groin surgical site infection in high risk vascular surgery patients treated with negative pressure wound therapy compared to standard dressing. The NPWT group had significantly shorter length of hospital stay than standard group. Our study was underpowered due to lower than expected infection rates.
Presentation #07
Presenter: Dr. Supriya Singh
Division: Paediatric Surgery

Evaluation of primary caregivers’ perceptions on home trampoline use

Supriya Singh, Dr. Debra Bartley, Dr. Megan Cashin, Dr. Timothy Carey, and Dr. Kamary Coriolano DaSilva

Background: Trampolines account for up to 15% of pediatric orthopedic injuries, 40% of these injuries are classified as severe. Despite the well documented risk of injury, the use of trampolines has remained the same. The objectives of this study are to ascertain primary caregivers’ understanding of risks associated with home trampoline use; to educate caregivers in regard to documented literature based risks associated with home trampoline use; and to evaluate if this information will have any influence on their future regulation of home trampoline use for their children.

Methods: One hundred primary caregivers of patients treated in the pediatric orthopedic surgery outpatient clinic at London Health Sciences center were surveyed. Caregivers’ baseline perceptions on the risks associated with home trampoline use were assessed using a questionnaire. Caregivers then received an information pamphlet outlining documented trampoline safety data. They were then sent the same questionnaire to complete within one week of reading the pamphlet.

Results: Providing education to primary caregivers significantly changed their perceptions on all trampoline safety questions, indicating effective comprehension. Despite caregivers’ understanding of the risks associated with home trampoline use, approximately half of the study population permit this activity for their children.

Conclusion: Education in the form of a pamphlet has a role in effectively disseminating safety information to caregivers and changing their perceptions on injury risk. There is potential to reduce pediatric orthopedic injuries associated with home trampoline use if safer trampoline related practices are implemented based on information provided.
PRESENTATION BY AWARD WINNING MSc STUDENT
COLLOQUIUM PRESENTATION
MSc in Surgery Student: Sohrab Naushad Ali

The Development of Novel Drosophila Melanogaster Models for Human Nephrolithiasis

Sohrab Naushad Ali, Jihye Kim, Dajung Kim, Thomas Tailly, Hassan Razvi, Hon Sing Leong
Division of Urology, Department of Surgery, Western University

Background: Nephrolithiasis is a common urological disorder, however, research is limited due to lack of viable preclinical models. Recently, Drosophila Melanogaster (DM), has emerged as a powerful translational model. Here, we describe the development of novel DM models for calcium oxalate, uric acid and cystine nephrolithiasis including innovative applications such as intravital imaging and large scale high throughput drug screening.

Materials & Methods: DM models for calcium oxalate, uric acid and cystine were developed using simple dietary manipulation, genetic knockdown of uricase enzyme and SLC7A9 cotransporter respectively. Survival analyses, SEM/EDX to characterize stone morphology and composition plus intravital imaging studies were carried out using confocal microscopy in all DM models. Each model was subjected to high throughput drug screening with an experimental library of 360 using a novel indirect platform.

Results: We have successfully developed DM models for calcium oxalate, uric acid and cystine nephrolithiasis. All models have been verified via survival and SEM/EDX analysis. Ex vivo and in vivo visualization of stone formation was successful in the calcium oxalate, uric acid and cystine models. 7 drug candidates that reduce calcium oxalate stone formation in DM have been identified.

Conclusions: DM is a viable model for human nephrolithiasis. All developed models are robust and reproducible. We describe unique imaging modalities to study stone formation both ex vivo and in vivo. We have also developed an innovative high throughput platform for large scale library drug screening and demonstrate the potential for translational research in this unique model.
PRESENTATIONS BY OUTSTANDING RESEARCHERS IN THE DEPARTMENT OF SURGERY
Abstract #01
Presenter: Dr. Stephen Pautler
Division: Urology

The impact of infectious complications after prostate biopsy on radical prostatectomy surgical outcomes: A population-based analysis

Olvera-Posada D, Welk B, McClure JA, Winick-Ng J, Izawa JI, Pautler SE
Division of Urology and ICES Western Surgery Interest Group

Background: Transrectal ultrasound-guided prostate biopsies (TRUS-Bx) are performed to diagnose prostate cancer and during Active Surveillance protocols. Infectious complications secondary to TRUS-Bx are increasing. We aimed to determine if infectious complications after TRUS-Bx affects surgical outcomes of patients treated by radical prostatectomy (RP).

Methods: We designed a population-based cohort study to compare surgical outcomes after RP in patients who did or did not suffer infectious complications after TRUS-Bx. Administrative databases were used to identify all RP performed in the province of Ontario from April 1, 2002 to March 31, 2013. Infectious complication was defined as hospitalization with evidence of a urinary tract infection (UTI) or sepsis within 30-days of a prior prostate biopsy. The primary endpoint was a composite of surgical complications. Secondary outcomes comprised oncological, functional and hospital related events. Follow-up time for all outcomes ranged from 12 to 24 months after RP.

Results: A total of 27,637 patients had a RP performed and only 530 (1.9%) had an infection-related diagnosis within 30 days of the biopsy date. Patients with an infectious event after TRUS-Bx had a similar rate of the composite primary outcome (1.7% vs 1.1%; OR 1.61, 95% CI 0.82-3.14, p=0.16). The 30-day hospital readmission rate (6.6% vs 3.3%; OR 2.06, 95% CI 1.45-2.93, p<0.0001), blood transfusion rate (19.6% vs 13.1%; OR 1.61, 95% CI 1.30-2.01, p<0.0001) and length of hospital stay (4.9 vs 4.6 mean days, p=0.006) were significantly higher in patients with an infectious complication compared to those without. No differences were found in the proportion of patients who required adjuvant radiation, hormonal treatment, incontinence or erectile dysfunction invasive therapies, or 30-day mortality rate.

Conclusion: This population-based study demonstrated that a TRUS-Bx related infectious event is associated with a significantly higher risk of blood transfusion and postoperative readmission rate. Our results indicate that infectious episodes after TRUS-Bx may only impact hospital related outcomes.
Abstract #02  
Presenter: Dr. Jamie Howard  
Division: Orthopaedics  

Variations in physiological and psychological responses of orthopaedic surgeons and clinical fellows during surgical practice  


Division of Orthopaedic Surgery, University of Western Ontario  

**Background** - Performing surgical procedures can increase the physiological stress and mental strain experienced by practicing surgeons and their trainees. This may negatively affect surgical performance, learning capacity, and quality of patient care secondary to burnout, sleep disorders, fatigue, and substance abuse. The purpose of this study was to compare the physiological and psychological responses of orthopaedic surgeons and their clinical fellows to operative and clinic stimuli.

**Material and Methods** - Heart rate, breathing rate, and self-reported anxiety were recorded in 3 fellowship trained orthopaedic surgeons and 5 clinical fellows using a wearable Equivital EQUO2 physiological monitor and the state-trait anxiety inventory (STAI). Heart rate variability (HRV) was calculated based on the data recorded. Data was recorded for days in surgery as well as clinic for 6-8 hours/day. This data was compared to baseline physiological stress tests.

**Results** - Fellows demonstrated less physiologic stress than attending surgeons during clinic days. All participants had increased heart rate, breathing rate and HRV increased during surgery days. During Primary THA, all participants showed greater increase in HRV while assisting compared to performing the surgery itself. During primary TKA, performing the surgical procedure had a greater effect on HRV than assisting, especially in fellows. Fellows had a greater variability compared to the surgeons overall.

**Conclusions** - Physiologic stress levels differed between attending surgeons and fellow trainees depending on their role. Attending surgeons demonstrated higher physiologic stress during clinic than trainees, and showed significantly different intra-operative stress profiles than trainees.
Abstract #03
Presenter: Dr. Hon Leong
Division: Urology

PDXovo: Rapid In Vivo Drug Sensitivity Evaluation via Ultrasound in a Patient Derived Xenograft Model for Renal Cell Carcinoma
Matthew R. Lowerison,1,2 Hon S. Leong,3 Yaroslav Fedysyhn,3 Ann F. Chambers,2,4,6 James C. Lacefield1,2,5, and Nicholas E. Power3,4,6
1Imaging Research Laboratories, Robarts Research Institute, Depts. of 2Medical Biophysics, 3Surgery, 4Oncology, and 5Electrical & Computer Engineering, Western University, 6London Regional Cancer Program

Introduction: Renal cell carcinoma (RCC) is the most lethal of all genitourinary cancers. It is a highly vascularized cancer and one of the few where antiangiogenic agents are employed as a first-line therapy. We have developed a high-throughput, rapid patient derived xenograft (PDX) model in the chicken chorioallantoic membrane (CAM) to evaluate treatment strategies for patients with metastatic RCC.

Materials & Methods: Tumor engraftment procedures were performed only on the ninth day of embryonic development (EDD-9) with at least 300 embryos per patient tumor. Biopsies were sectioned into ~2mm³ samples and implanted into the CAM immediately after scoring of the chorionic epithelium. Tumors were treated with 3µL (10 µM) of selected targeted therapy every two days until imaging on EDD-18. Anatomical (B-mode), vascular (power Doppler), and contrast-enhanced images were acquired using a Vevo 2100 ultrasound system (VisualSonics Inc.). MATLAB (The MathWorks Inc., Natick, MA) was used to determine blood perfusion metrics (blood volume, velocity, and flow).

Results: Implantation of tumor specimens into the CAM resulted in high engraftment efficiencies (take rate of 50-60%). We observed intratumoral functional heterogeneity both within untreated core biopsies, and in the response to antiangiogenic therapy. Preliminary results indicate that tumor pathology and drug resistant phenotype are conserved when patient biopsies are grown on the CAM.

Conclusion: This PDX model permits functional tumor heterogeneity studies to be completed within two weeks — making this an approach that could guide the selection of drugs, anticipate resistances, and predict patient outcomes in a clinically relevant time window.
Abstract #04
Presenter: Dr. Eric Frechette
Division: Thoracic Surgery

Reducing post-lobectomy air-leak with early hypertonic glucose pleurodesis.
Division of Thoracic Surgery

Background: Air-leak following lung resection is common, and usually treated with simple observation. However, prolonged chest drainage may lead to delayed hospital discharge, catheter-related pain and increased risk of postoperative complications. This study evaluates the feasibility of using a hypertonic glucose solution to shorten the post-lobectomy air leak duration present on the first postoperative day.

Materials and Methods: Ten patients with an air-leak on post-lobectomy day#1 underwent a 50% glucose pleurodesis, repeated 24 hours later if necessary. The air-leak rate on the third postoperative day was recorded, along with the duration of chest drainage, hospital stay and postoperative complications. A group of 97 patients treated by drainage only was used as control.

Results: On the third postoperative day, the air-leak rate was lower in the pleurodesis group than in the controls (20% vs 59%, p=0.0205). The pleurodesis group had also significantly shorter mean duration of air-leak (2.6 vs 6.5 days), chest drainage (4.3 vs 7.7 days) and hospital stay (5.4 vs 8.7 days). One patient developed a transient hyperglycemia following pleurodesis.

Conclusions: Early pleurodesis with 50% glucose is feasible and decreases the air-leak drainage following pulmonary lobectomy. The impact of this simple and inexpensive treatment on the duration of postoperative chest drainage and associated costs, length of hospital stay, and possible complications should be confirmed in larger comparative trials.
Abstract #05
Presenter: Weiping Min
Division: General Surgery

Preventing immune rejection in heart transplantation through engineered dendritic cells by GDF15
Yixin Zhang¹, Duo Zhao¹, Mary Wang¹, Suimik Biswas¹, Qi Li¹, Kexiang Liu⁵, Anthony Jevnikar¹,³,⁴, Patrick Luke²,³,⁴, Xiufen Zheng¹,³,⁴, Weiping Min¹,²,³,⁴
Departments of Pathology¹, Surgery², Western University; Lawson Health Research Institute³; London Health Sciences Centre³, Jilin University⁵

Introduction: Heart transplantation is the only available option for the end stage of heart diseases. However, long-term patient and graft survival remain suboptimal due to the toxic side effects associated with long-term use of immunosuppressive drugs. This study aims to investigate a new dendritic cell based therapy for preventing allograft immune rejection in heart transplantation.

Hypothesis: Increasing GDF15 expression in dendritic cells will induce immune tolerogenic DCs and treatment with GDF15-DCs will prevent immune rejection in heart transplantation.

Materials & Methods: Bone marrow-derived dendritic cells (DCs) were cultured from C57BL/6 mice and transduced with growth differential factor 15 (GDF15) expressing adenoviruses on day 2. The effect of GDF15 on DCs maturation and function was determined by flow cytometry, quantitative PCR and ELISA. To test the immunosuppression of GDF15 treated DCs, we performed an allogeneic murine heart transplantation. Recipients were treated with GDF15 treated DCs 7 days prior to transplantation. Allograft survival and immune response were observed and determined.

Results: GDF15 expressing Adenoviruses increased the expression of GDF15, PD1-L and IL10 in DCs, inhibited the expression of CD40, CD80, IL2 and INF-γ, and impaired the capacity of DCs to activate allogeneic T cells maturation. Treatment with GDF15-DCs significantly prolonged allograft survival up to 100 days and enhanced the induction of immune tolerance as compared with untreated DCs. GDF15-DCs also enhanced Foxp3+ Treg generation and T cell exhaustion.

Discussion and Conclusion: GDF15 is able to induce immune tolerogenic DCs and GDF15-DCs can prevent alloimmune rejection in heart transplantation by facilitating T cell exhaustion and Treg generation.
THE ROBERT ZHONG LECTURE

We are very pleased to have Dr. W. Marston Linehan as our 2016 Dr. Robert Zhong Lecturer.

W. Marston Linehan, M.D. received his internship, residency and fellowship training Duke University Medical Center. He began his career at the National Cancer Institute in 1982 with positions as Senior Investigator and Urologist-in-Charge, NCI. He is currently Surgeon-in-Chief, National Institutes of Health and Chief of the Urologic Oncology Branch at the National Cancer Institute, National Institutes of Health, Bethesda, Maryland. He has had a long standing interest in identification of the genetic basis of cancer of the kidney. By studying patients and families with kidney cancer, he and his colleagues identified the VHL gene (von Hippel-Lindau and clear cell renal carcinoma), the gene for Hereditary Papillary Renal Carcinoma (MET oncogene, type I papillary renal carcinoma) the FLCN gene (Birt Hogg Dubé syndrome, chromophobe renal carcinoma), the gene for TFE3 kidney cancer and described the germline fumarate hydratase and succinate dehydrogenase B/C/D mutations in the North American families with hereditary leiomyomatosis renal cell carcinoma (HLRCC) and SDH-RCC and described five new diseases. This work has provided the basis for the development of new therapeutic strategies for the different types of kidney cancer based on understanding the molecular pathway of the specific cancer genes associated with the different types of kidney cancer. He and his colleagues have defined the methods for clinical management of kidney cancer associated with the hereditary forms of kidney cancer, von Hippel Lindau, Hereditary Papillary Renal Carcinoma and Birt Hogg Dubé syndrome and Hereditary Leiomyomatosis Renal Cell Carcinoma and Succinate Dehydrogenase Renal Cell Carcinoma.

Dr. Linehan is a member of the National Academy of Medicine of the National
Academies of Science. He has received the Joseph H. Burchenal Memorial Award for Outstanding Achievement in Clinical Cancer Research from the American Association of Cancer Research, the Dr. Nathan Davis Award from the American Medical Association, the Lila Gruber Award for Cancer Research from the American Association of Dermatology, the NIH Director’s Award for discovery of the VHL kidney cancer gene, the Barringer Medal from the American Association of Genitourinary Surgeons, the Gold Cystoscope Award and the Distinguished Contribution Award from the American Urological Association, the Huggins Medal and the SUO Medal from the Society of Urologic Oncology and the Andrew C. Novick Award from the Kidney Cancer Association. He is or has been on the editorial board of 14 journals.

Previous Robert Zhong Lecturers:

2015 Dr. Ivar Mendez MD, PhD, FRCSC, FACS, DSc(hon), FCAHS
2014 Dr. Jonathan Meakins, retired McGill Professor and Chair of McGill’s Department of Surgery, former surgeon-in-Chief of the MUHC and current director of the MUHC Heritage Centre
2013 Dr. Jeremy Nicholson, Head of the Department of Surgery & Cancer at Imperial College in London University, UK.
2012 Dr. Garth Warnock, C.N. Woodward Professor, Head of the Department of Surgery, University of British Columbia, Co-Director, Ike Barber Human Islet Transplant Laboratory and British Columbia Islet Transplant Program
2011 Dr. Amitai Ziv, Deputy Director, Chaim Sheba Medical Center; Director, Israel Center for Medical Simulation, Tel-Hashomer, Israel
2010 Dr. John Monson, Chief of Colorectal Surgery, Vice-chair, Department of Surgery The University of Rochester, Rochester, New York
2009 Dr. Anthony Atala, Professor and Chair of Urology, Director of Regenerative Medicine, Wake Forest University School of Medicine
2008 Dr. Richard M. Satava, Professor of Surgery, University of Washington
2007 Dr. James Shapiro, Wyeth-Ayerst Canada/CIHR Clinical Research Chair in Transplantation, Director, Clinical Islet Transplant Program, University of Alberta
Arthritis is a disease affecting millions of Canadians, and at its most advanced stages can only be treated by the implantation of artificial implants (arthroplasty). Arthroplasty procedures are among the most successful interventions in all of medicine, alleviating pain and restoring function to over 100,000 Canadians annually. While providing an overwhelmingly positive return for the cost, there are many aspects of arthroplasty implants and surgical procedures that can be further optimized, and newly introduced arthroplasty technologies requires thorough investigation to ensure that they are performing as expected. Imaging can provide critical data on implant performance in both preclinical and clinical testing. Examples of research in London will be described covering resources such as the Implant Retrieval Laboratory, the Radiostereometric Analysis Imaging Suite, and the new imaging tools at the Wolf Orthopaedic Biomechanics Lab. The role of technology in development including wearable sensors and 3D metal printing will also be outlined.
GROUP INTERACTIVE SESSION

DEBATE: Should We Use Black Boxes in the Operating Room – 
Dr. Brent Lanting, Division of Orthopaedics & Dr. Chris Schlachta, 
Division of General Surgery

**Moderator:** Dr. Neil Parry, Division of General Surgery
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