Seminar 11

The Role of Robotic and Telemedicine in Clinical Practice

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Dr. Eric Lai is currently Consultant, and Division Chief of Hepato-biliary & pancreatic (HBP) surgery service in Pamela Youde Nethersole Eastern Hospital in Hong Kong. Dr. Lai's clinical research has focused on liver, bile duct, and gallbladder cancers, and minimally invasive therapy for HBP diseases. He has published more than 150 peer-reviewed publications and more than 20 book chapters. Outside of the hospital, he also currently serves as Scientific Committee member of the Asian-Pacific Hepato-Pancreato-Biliary Association (APHPBA), Finance Committee member of the International Hepato-Pancreato-Biliary Association (IHPBA) and editorial board members of several peer-reviewed journals. He has delivered over 100 lectures around the world.

Robotic Hepato-Biliary & Pancreatic Surgery: Is It Worthwhile?

The introduction of minimally invasive surgery (MIS) has revolutionized surgical practice in the past 3 decades. MIS benefits patients in terms of better pain control, shorter hospital stay, earlier recovery, and better cosmesis. Traditionally, hepato-biliary-pancreatic (HBP) surgery is considered as one of the most challenging surgeries among the abdominal procedures. Its MIS development is also lagging behind compared with MIS of other gastrointestinal organs. These advanced techniques also require highly experienced laparoscopic skills. The introduction of robotic surgical systems has given a new face of MIS. It was developed to overcome the disadvantages of conventional laparoscopic surgery. Well-known advantages of the robotic system such as improved vision via 3-dimensional view, magnification, tremor suppression, and the dexterity of the instruments. These features allow the surgeons to perform delicate tissue dissection and precise intra-corporeal suturing and anastomosis. The main drawback of robotic system is the associated cost. Currently, major hepatectomy, Whipple operation, distal pancreatectomy, biliary tree resection and reconstruction can be performed safely by robotic approach by experts. It should be emphasized that considering robotic HBP surgery requires 4 conditions: 1) appropriate selection of patients; 2) follow the principle of traditional open surgery; 3) specific expertise and training, in both open and laparoscopic HBP surgery; 4) familiarization with the robotic machine and paying precaution of its potential dangers, such as visceral injury by robotic arm and total loss of tactile feedback. Its future clinical value and cost-effectiveness will depend on the advantages that it can provide over conventional laparoscopy or open surgery.

Dr. Henry CH FU

MBBS(HK), MMedSc(HK), FRCS(Edin), FHKCOS, FHKAM(Orthopaedic Surgery)

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Dr. Henry Fu's special interest lies in robotic assisted arthroplasty and was the first user of both Mako and Navio robots in Hong Kong. He has received training at the Hospital for Special Surgery, New York, and Rothman Institute, Philadelphia, on robotic surgery.

Dr. Fu is now director of the Hong Kong Island Joint Replacement Centre where 350 arthroplasty operations are performed annually under ERAS(enhanced recovery after surgery) driven protocols.

Dr. Fu received the Hospital Authority Young Achiever Award in 2019 and was the team leader for the Hong Kong West Cluster Outstanding Team Award in 2018.

Robotic Joint Replacement Surgery: Accuracy, Precision and Longevity

Joint replacement surgery is becoming an increasing accepted operation in treating patients with arthritis. Accuracy of implant positioning and limb alignment are important prognostic variables affecting implant survival. Robotic technology enables precise bone cuts and guarantees implant placement accuracy.

Two robotic systems have gained widespread popularity in joint replacement. Both are semiactive systems where the robot provides realtime stereotactic guidance to the operating surgeon. The image guided robot utilizes preoperative CT scan(Mako) while the imageless robot relies on intraoperative registration(Navio) to create a patient-specific 3D virtual model. The surgeon plans the optimal sizing and alignment on registered 3D images. Bone resection is performed by the surgeon using the robotic arm which only works within the haptic windows. Once the predefined boundaries are violated, the robot will stop, minimizing the risk of periarticular soft tissue injury. Soft tissue tension is quantifiable with robotic software and aids ligament balancing. Implant placement can also be guided for total hip replacement.

Major advantages of robotic joint replacement are improved accuracy and alignment of implants, less soft tissue and ligament injury, reduced posteroperative pain and faster rehabilitation. Drawbacks include cost, operation time and pin tract related complications.

The image guided robotic system has FDA approval for primary total hip replacement, partial knee replacement and total knee replacement, while the imageless system can only perform partial or total knee replacement.

Hong Kong has adoped both two new robotic systems and early results are promising. Long term data is required to assess survivorship and cost effectiveness.

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Dr. Raymond KY TSANG

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Dr. Raymond KY TSANG, MS, MBChB, FRCSEd, FRCSEd(ORL), FHKCORL, FHKAM(Otorhinolaryngology), graduated from the Chinese University of Hong Kong in 1994 and received his training in otolaryngology in Prince of Wales Hospital, Chinese University of Hong Kong. He obtained his specialist qualification in otolaryngology and fellowship of the Royal College of Surgeons of Edinburgh in 2001 and then sub-specialized in the field of head and neck surgery.

Dr. Tsang is currently the Associate Professor in the Department of Surgery, University of Hong Kong and Honorary Consultant ENT Surgeon of Queen Mary Hospital and Tung Wah Hospital. He is also the Division Chief of Ear Nose and Throat Surgery of the Department of Surgery, the University of Hong Kong-Shenzhen Hospital in Shenzhen, China.

His clinical research interests include application of robotic surgery in head and neck surgery, minimally invasive surgery in the head and neck region, endoscopic surgery for anterior skull base lesions and swallowing disorders in patients after head and neck cancer treatment. He is actively researching on the application of the next generation flexible robotic surgical system to be used in the head and neck area.

He has published more than 80 peer review papers and book chapters. He is currently the Executive Board Member of Asian Research Symposium in Rhinology and the International Guild of Robotic and Endoscopic Head and Neck Surgery. He is also the Vice President of the Hong Kong Society of Otorhinolarynology – Head and Neck Surgery, Chairman of the Head and Neck Subspecialty Board of the Hong Kong College of Otorhinolaryngologists and Member of the Education Committee of the Hong Kong College of Otorhinolaryngologists. He is also the founding council member of the Hong Kong Society of Robotic Surgery.

Robotic Surgery in Otorhinolaryngology and Head and Neck Surgery

Due to the anatomy and nature of the diseases, ENT surgeons has been one of the earliest advocates of natural orifice surgery. Endoscopic sinus surgeries, endoscopic resection of laryngeal cancers and endoscopic ear surgeries are all examples of natural orifice surgeries. The major limitations of endoscopic surgery include loss of degrees of movement and poor instrumentation. These limitations are also experienced in laparoscopic surgeries. The surgical robot was partly invented to circumvent these limitations.

Since 2005, the surgical robot, mainly the da Vinci robotic system (Intuitive Surgical Inc., Palo Alto, CA, USA) has been employed in endoscopic transoral resection of tumours in the upper aerodigestive tract. Through a series of preclinical trials, animal experiments and phase one clinical trials, the da Vinci Surgical Robot has been approved by the US FDA to perform resection of T1-2 cancers of the oropharynx, larynx and hypopharynx in 2009. The abbreviation TORS for TransOral Robotic Surgery was coined to describe the procedures. In the same period, the exponential increase in HPV related oropharyngeal cancers, which usually presented with small primary tumours, dramatically increased the application of TORS in treating head and neck cancer. In Hong Kong, we developed the use of the robot for resecting small recurrent tumour of the nasopharynx, improving the dexterity of surgeon in performing minimally invasive nasopharyngectomy.

Simultaneously, the robot was also used to resect benign lesions in the upper aerodigestive tract. One of the major application is resection of hypertrophic lingual lymphoid tissues in patients with obstructive sleep apnea. The US FDA subsequently in 2014 approved the da Vinci robot for use in benign conditions of the upper aerodigestive tract.

The surgical robot is also used in performing remote access resection of neck lesions, including thyroid nodules, neck masses and submandibular glands. With the special aesthetic needs of the population, South Korean ENT surgeons have been the pioneers in developing robotic neck surgeries. While these surgeries are not minimally invasive, the incisions can be placed in inconspicuous area like hairline or axilla, satisfying the aesthetic needs of the patients.

With the full development of robotic surgery in ENT, the limitations of adapting a robot mainly designed for abdominal surgeries become apparent. Specially designed robots focusing on deployment in natural orifices hit the market in the latter half of the 2010's. The Flex Robot (Medrobotics, MA, USA) was the first specially designed robot for TORS and was approved by US FDA in 2015. The single port da Vinci SP (Intuitive Inc.) had the first clinical trial for TORS in Hong Kong, ran by a team of ENT surgeons from both medical schools in Hong Kong. After completion of further clinical trials in US, the da Vinci SP robot was approved by US FDA for TORS in March 2019.

Applications of robotic surgery in the nose and ear area faces more challenges as the operative field and structures are smaller, miniaturization of the robots are required. Researches are on-going and we are expecting to see more applications of robot assisted surgeries in different areas in the near future.

Professor Jimmy SM LAI

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Prof. Jimmy Lai is the Clinical Professor and Acting Head of the Department of Ophthalmology, the University of Hong Kong; Chief of Service and Honorary Consultant Ophthalmologist of the Department of Ophthalmology, Queen Mary Hospital & Grantham Hospital; Chair of Specialty of the Department of Ophthalmology, Gleneagles Hospital and the Immediate Past-President of the College of Ophthalmologists of Hong Kong. He is also the Medical Director of Asian Foundation for the Prevention of Blindness. He has received the Hospital Authority Long Service Award; the Asian Pacific Academy of Ophthalmology Distinguished Service Award, DeOcampel Award and the Achievement Award.

Telemedicine in Ophthalmology

Telemedicine is the use of electronic information and communications technologies to provide and support health care to patients whose access to medical institutions is remote. Tele-ophthalmology supplements traditional health care delivery systems. With the introduction of advanced technology and tools in ocular imaging systems, it is possible to remote diagnose and monitor eye diseases like cataract, glaucoma, age-related macular degeneration and diabetic retinopathy. The lecture will discuss basic issues in applying tele-ophthalmology to public health. The use of tele-ophthalmology presents great opportunity to manage the steadily increasing demand for ophthalmic care. The application of tele-ophthalmology in the public health care system in Hong Kong may reduce the specialist clinic attendance.