**Sri Lanka Journal of Medicine** **SLJM**

**KSM Oration**

Citation: Dharmapala AD, 2022. Excellence in HPB Surgery: A journey towards fulfillment. Sri Lanka Journal of Medicine, pp 43-58

DOI: http://doi.org/10.4038/sljm.v31i2.403

# Excellence in HPB Surgery: A journey towards fulfillment

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## INTRODUCTION

In the seventeenth and eighteenth centuries, liver resections were carried out on trauma victims with a range of injuries as a result of military combat. The first liver resections in a non-emergency setting resulted in uncontrolled bleeding and death. The German surgeon Carl Johann August Langenbuch performed the first successful hepatic resection in 1888 (he was the first to perform cholecystectomy in 1882 (1). He respected a part of the left lobe of the liver after ligating the vascular pedicles. The first steps leading to modern liver surgery began in the late 1950s.

In 1952 Lortat Jacob of France, published a manuscript on his experiences of performing anatomical liver resections: right hepatectomy after vascular control of the right liver (2). In 1956, Claude Couinaud after studying casts of the liver described the proper segmental anatomy of the liver which paved the way for anatomical liver resections (3,4). Prior to this there were only a few recorded liver resections which were also haphazard.

Despite the anatomical discoveries of the 1950s, their application in surgical practice was limited. There were no clinical methods that could detect the existence of small liver tumors that might have required segmental resections.

The introduction of ultrasound techniques in the early 1980s into common clinical practice allowed the clinician to diagnose asymptomatic small liver tumors of 2 and 3 cm and paved the way to rapid development of liver surgery (5,6). In fact, modern liver surgery began when functional liver anatomy discovered 30 years earlier was applied, enabling the proper segmental liver surgery after discovery of ultrasonography.

More over pancreatic Surgery too posed similar obstacles due to its complexity in its physiology and anatomy.

This has always been a challenge for the surgeon, from the initial animal tests to pancreas transplantation. These difficulties have arisen due to the complexity of the various surgical techniques, including resection and the problems associated with the different anastomoses that must be performed for the subsequent reconstruction of the digestive system.

The world's first reported operation on the human pancreas involved a drainage of a large cysts and dates back to November 1841 when Friedrich Wilhelm Wandesleben, drained a pseudocyst secondary to a non-penetrating abdominal trauma in a previously healthy 28-year-old man with a





**Received: 2022-11-17** **Published: 2022-01-08**

two-week history of a palpable abdominal mass (7).

Resection techniques represent another rung on the complexity ladder of pancreatic surgery, particularly solid or cystic tumour surgery, as well as surgery for chronic pancreatitis. In addition to the difficulties faced with the resection techniques themselves, the problem of how to resolve the various anastomoses which required to restore digestive continuity in order to prevent certain complications such as different types of fistulae (pancreatic, biliary and enteric), must also be taken into account.

The first resection ever recorded dates back to 1867 when the George Albert Lücke (1829-1884) of Germany performed the first successful removal of a pancreatic cystic tumour in Bern (8).

Besides the technical difficulties that the various pancreatic diseases entail, other historical problems affecting surgery in general, not least pancreatic surgery, have been overcome with the discovery of anaesthesia, the implementation of aseptic measures, identification of the blood groups and the creation of blood banks, the significant blood loss that can arise from this type of surgery, vitamin K synthesis and the creation of intensive care units which have improved the poor post-operative outcomes of these patients.

Prior to the 15$^{th}$ century physicians were unfamiliar with gallbladder diseases. It was in that era that physicians started to recognize gallstone diseases, and they carried out excellent work, specifically in the field of hepatobiliary surgery research, recognizing obstructive jaundice and its clinical manifestations.

The first interaction of the gallstone and surgery was accidental. In 1687, Stalpert von der Wiel opened a purulent upper abdominal abscess in a patient with a long history of abdominal pain and found gallstones.

Jean-Louis Petit was the founder of gallbladder surgery, in 1733. This Parisian surgeon noted gallstone abscesses and suggested that when a reddening of the abdominal skin occurred in association with biliary colic, the surgeon should lance the area, remove the gallstones, and leave a gall fistula (9).

Theodore Kocher (1841–1915) was a pioneer in abdominal surgery, and he advocated the use of a subcostal incision. He published a procedure for sphincteroplasty and standardized a technique in 1903 for mobilization of the duodenum. The latter method, known as Kocher's maneuver, was originally developed to expedite gastroduodenostomy but has since been used for biliary and pancreatic operative procedures as well (10-13).

Ludwig Courvoisier's, Jean-Francois Calot, Ruggero Oddi (1864–1913), James Rutherford Morison and William S. Halsted were some of the surgeons who did pioneering work in biliary surgery.

While others were pursuing the construction of gallbladder fistulas and direct removal of gallstones, Carl Langenbuch of Berlin was preparing himself to completely remove the organ, the gall bladder. At the age of 27, Langenbuch at Lazarus Hospital in Berlin, developed the technique for cholecystectomy and on July 15, 1882, he successfully removed the gallbladder of a 43-year-old man who had suffered from biliary colic for 16 years, thereby performing the first successful cholecystectomy.

Veteran archaeologist Prof. Leelananda Prematilleke, describes how in 12th Century over 800 years ago, we had in Polonnaruwa not only fully-functional hospital but also had both medical equipment and surgical instruments. The ruins of this hospital still be seen in Polonnaruwa.

The exact history of Hepato pancreatico biliary surgery is sparse and scattered. The first ever record relating to HPB is the documentation of liver absceses in early 1800s by Dr Henry Marshall in his book "Notes on the Medical Topography of interior of Ceylon".

A.J Chalmers writes about pancreatitis in 1914, in the *Journal of the Ceylon Branch of British Medical Association.*

Dr S. C Paul describes the first case of open cholecystectomy in 1907 and Dr K L Fernando performed the first laparoscopic cholecystectomy at Ragama on 10th of June 1992 nearly 9 years later. It must be mention here that he bought and brought all the equipment from UK from his personnel funds.

The first biliary surgery and common bile duct exploration in Sri Lanka was done by Dr P.R Anthonis. Dr Yoheswaran was also performing biliary surgery during that era.

Prof C Rathnathunga did lot of biliary and pancreatic work, and he was one of the few surgeons who carried liver surgery during 1980-2000. Prof Sheriffdeen during the same era introduce laparoscopic cholecystectomy to NHSL Colombo and did lot of pancreatic work.

By the 1980 s Dr. S.A.W Gunawardena introduced ERCP to Sri Lanka, but it was Prof Mohan de Silva who took endo-biliary procedures to a higher level. Minimal access HPB surgery beyond the lap cholecystectomy was pioneered by Prof Galketiya at Peradeniya, he was the only surgeon who was performing laparoscopic whipple's procedure in Sri Lanka. North Colombo with their Hepatology unit introduce Liver transplantation where Prof Rohan Siriwardena did lot of work into establishing liver transplantation in Sri Lanka.

Currently there are 4 recognised HPB surgical centres, NHSL Colombo, University surgical Unit of North Colombo Teaching hospital, University surgical Unit of South Colombo Teaching hospital and University Surgical unit, Teaching Hospital Peradeniya.

This is just a glimpse of world and Sri Lankan history of Hepato- pancreatico- Biliary surgery.

It's indeed a complex and an unforgiving area to perform surgery, posing an enormous number of challenges to surgeons. The challenge to achieve perfection required long hours of training, commitment, love and passion for HPB surgery.

The challenge itself and also seeing Prof C. Rathnathunga a legend of our times, who was one of the pioneering vascular surgeons in Sri Lanka, who took up HPB surgery, gave me the inspiration to take up HPB surgery. I like to dedicate this oration to all my teachers who encouraged and guided me through this Journey, a journey from 'the minimum' to 'the maximum' from 'scratch' to excellence.

**Training in HPB Surgery**

I was blessed to be trained under some of the best surgeons in Sri Lanka, the likes of Prof Arjuna Aluwihare, Prof C Rathnathunga, Prof M. D Lamawansa, Dr Walter Tissera Dr Gamini Buthpitiya who provided me the initial foundations of Surgery. I wish to mention what late Mr Laxman Kadiragamar said "the cake was baked in Sri Lanka and the icing was done in UK" which explains what I experienced in the field of surgery, where I established a solid and sound foundation in all specialties of surgery. I was exposed to General surgery, Vascular, colorectal, Paediatric surgery and plenty of pancreatic and biliary surgery at Peradeniya.

I had exposure of complex biliary and pancreatic surgery in Sri Lanka but the Specialised approach and real subspecialized HPB exposure was gained at Manchester Royal Infirmary with Prof Ajith Siriwardena for about 1 and half years and at Royal free London with Prof Brian Davidson, Prof Max Malago, Dr Dinesh Sharma and Mr S Rahman for about 2 years. These units were highly specialised HPB and Liver transplant centers with high volume of work. I learnt much that I had not experienced in Sri Lanka such as the surgical approach, use of energy devices in liver transection, segmental anatomical approach in liver surgery, extended hepatectomies, Minimal invasive approaches, organ retrievals, pancreatic surgery, and finally the exposure to liver transplantations.

The minimal blood loss and patient recovery after long hour surgeries bewildered me. With the sound foundation in General Surgery in Sri Lanka I was able to handle the pressure of learning new techniques and facing the challenges in a western country. On my return I was determined to bring in new knowledge and new culture to Sri Lanka in HPB Surgery.

**Inception**

Once I joined Peradeniya as a HPB surgeon I needed a mentor, a beacon in my carrier. I was so fortunate to meet Prof Galketiya. This was the first time I saw him work and gave me the courage to take up more complex HPB work as I knew that I have help at hand. He gave me the strength and guidance and was a savior, whenever I was in need. He was carrying out a lot of HPB work and has

developed the unit in to a well-established HPB center on my arrival. He had introduced ERCP which is an integral part of HPB and also revolutionized the unit by introducing minimal access surgery and especially minimal access HPB surgery.

He helped me to smoothen the process of acquiring some of the basic equipment which we required to perform liver resection, the energy devices for transection, argon coagulation, intra operative USS, and consumables. I must thank the Director, Teaching Hospital Peradeniya, for the helped rendered to acquiring this equipment. Special thanks go to Dr Lal silva for the donation of Ultra sound scanner which we use as intra operative ultra sound scanner (IOUS). The special retractor that we use in liver surgery. The Thompson retractor was one of my personnel donations which I got from USA.

I am proud to announce that with the new equipment we were able to establish a Unit on par with the western world.

The spectrum of surgery we have been offering and the outcomes are similar to any HPB center in the world. There were few short comings but, in a resource, poor setting, still we were still able to reach the expected targets. This was team work at its best. I must specially mention Anaesthetists, Radiologist and the physicians who helped us in numerous ways and actively participating in patients' care.

**Liver surgery**.

I wish to mention one of my first experiences of major hepatectomies was on an elderly lady, my neighbors' mother! who had a large SOL in the liver and later found out to be a Colorectal liver metastasis, on whom I managed to perform a Right hepatectomy and later a colectomy. I am so happy to find that she is still going strong at 80 and hopefully will attend this oration.

We perform the full spectrum of liver surgery. These are the Data from Sept 2016- November 2021.

| Type of resection | Number | Peri operative Mortality |
|---|---|---|
| Non anatomical wedge resection (NAR) | 11 | 00 |
| Segmentectomies (Seg)/ Central Hepatectomy (CH) | 09 | 00 |
| Right Hepatectomy (RH) | 11 | 02 |
| Right Extended Hepatectomy (REH) | 05 | 01 |
| Left Hepatectomy (LH) | 07 | 00 |
| Left Extended Hepatectomy (LEH) | 01 | 01 |
| Radical Cholecystectomy | 05 | 00 |
| Laparoscopic Resections /NAR/LLS/ LH | 04 | |
| Total | 53 | 4 (7.5%) |

The histology of the resected specimens.

| | | | | |
|---|---|---|---|---|
| Hepato cellular Carcinoma (HCC) | 09 | Metastasis | CRLM | 07 |
| | | | Mucinous CA | 01 |
| | | | NET | 02 |
| | | | Breast | 02 |
| | | | GIST | 01 |
| Fibrolamellar HCC | 04 | | Adeno Ca | 04 |
| Gall bladder CA | 05 | Benign Disease | Abscess | 02 |
| | | | SCC | 02 |
| | | | FNH | 01 |
| | | | Heamangioma | 03 |
| | | | Cyst | 03 |
| | | | Angiofibroma | 01 |
| Intra Hepatic Cholangio Carcinoma (IHCC) | 07 | | | |
| Hilar Cholangio Carcinoma (Klastskin T) | 08 | | | |

We have presented and published some of our data.

*BK Dassanayake, AD Dharmapala, KB Galketiya, WGP Kanchana, D Karunasagara, DC Dhanuksha, HMSS De Silva, I Niyas.* Annual audit of neoplastic liver lesions and their management in a single tertiary center. *The annual sessions of the college of surgeons of Sri Lanka 2021*

*Wickramaratne EK, Dharmapala A, Wijetunge S. Combined hepatocellular-cholangiocarcinoma: a diagnostic challenge. Journal of Diagnostic Pathology. 2016;11(2): 33-37*

*Karunasagara DD, Dharmapala A, Dassanayake B, Samarasinghe B, Galketiya KB, Kanchana P, Warnasooriya WMSM.Hepatic artery aneurysm repair in COVID-19 crisis, Sharing experience. 43rd Annual academic sessions of The Kandy Society of Medicine 2021.*

*Wickramaratne EKDM, Ratnatunga NVI, Dharmapala AD, Siriweera EH. Primary hepatic small cell neuroendocrine carcinoma: a rare tumor. ICON 2020, Virtual conference on lymphoid, dermatopatholgy and cytopathology Organized by The College of Pathologists of Sri Lanka &The Sri Lankan British School of Pathology 2020.*

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I was involved in writing up of guidelines for SLHPB association with the IHPBA and publish this article

on Sri Lanka Journal of Surgery (SLJS) and a commentary on disappearing colorectal Mets again published in SLJS.

*Dharmapala AD, R C S, Chan A, Adair A, Shrikhande S, Jeyarajah R, Jegatheeswaran S, Jagannath P, Siriwardhane M, Sivaganesh S, Pathirana AA. Sri Lanka guidelines for the management of hepatic metastases from colorectal cancer. Sri Lanka Journal of Surgery. 2018;36(4):20-24.*

*Dharmapala A. Commentary on surgical management of disappearing colorectal liver metastases. Sri Lanka journal of surgery 2013;31: 66-69.*

We also made some educational videos on selecting patients for resection in metastatic disease of the liver. This was based on the presentation I made at the CSSL jubilee scientific conference 2020.

***Selecting a patient with liver metastasis for liver resection***

An audio video lecture for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/R0RkHdE5CMo

**Laparoscopic liver resection**

Laparoscopic liver resections (LLR) have been the most impressive development in the field of liver surgery in recent two decades. Technical innovations and experience accumulation have made LLR a safe and effective procedure with faster postoperative recovery. Despite the fast spreading of the procedure, details regarding the indications, oncological outcomes and technical essentials were still disputable. The initial development of LLR was slow, only sporadic cases with local resection were reported. Left lateral sectionectomy was first reported in 1996, which inspired the interests of surgeons on LLR worldwide (14-17). Then the first international experts' consensus conference was held in 2008 to summarize and assess the feasibility and safety of the LLR and a consensus of case selection came out as the '*Louisville Statement'* which was a remarkable development (18).

With the guidance of prof KB Galketiya we started the minimal invasive liver resections at Teaching hospital Peradeniya. We carried out wedge resections and left lateral sectionectomies and some klatskin tumours through the scope and some surgeries were carried out as hybrid cases.

We publish two cases we did in the newsletter of Sri Lanka Association of minimal access surgeons and Digital surgeons (SLAMADS) and also made some educational videos. We have so far done 7 laparoscopic liver resections with zero perioperative mortality.

1. Sri Lanka association of minimal access and digital surgeons- Vol 1:issue 04 Two case reports on laparoscopic liver resections

2. Sri Lanka association of minimal access and digital surgeons- Vol 2:issue 04April 2021- Laparoscopic assisted right hepatectomy.

3. Sri Lanka association of minimal access and digital surgeons- Vol 2:issue 04April 2021- Transjugular stenting of right hepatic vein.

**Laparoscopic hilar dissection of a klatskin tumour**

A video demonstration for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/JSr93lpm0AY

**Biliary Surgery**

In the early years of the twentieth century, biliary operations were hazardous. There was a very high mortality was observed even for cholecystectomy. This was around 20 %, presently we hardly have mortality for cholecystectomies. This may be due to improvement of the surgery, anaesthesia and also general improvement in technologies and medicine. No specific diagnostic tests for biliary tract disease were available in the past, and prominent clear-cut clinical signs, such as tender mass in the right upper quadrant with fever, and commonly jaundice, had to be present before the

idea of an operation on the gallbladder could be entertained (19).

**Gall bladder surgery**

In 1882, Carl Langebuch (1846-1901) of Germany performed the first cholecystectomy. In 1985 (103 years later), Prof Dr Erich Mühe of Germany performed the first laparoscopic cholecystectomy (LC). He performed 94 such procedures before another surgeon, Phillipe Mouret of Lyon, France, performed his first laparoscopic cholecystectomy in 1987 (20). In 1987, Philip Mouret, a French surgeon in Lyon, performed the first video-laparoscopic cholecystectomy. During the period 1989–1991 it is estimated that approximately 20,000 American general surgeons received training in laparoscopic techniques. (21,22). The laparoscopic cholecystectomy was taken up by surgeons and grew exponentially during this period.

First report of laparoscopic cholecystectomy from Sri Lanka was in 1992 by Dr KL Fernando. By mid-nineties it became available in few centers of Colombo and at beginning of millennium in Matara, Kandy and Galle. The pioneers Specially Prof Mohan De silva, Prof Galketiya faced many challenges, with especially getting down very expensive equipment, they themselves had to learn and at the same time had to teach while learning. This has a long learning curve. The advantages of laparoscopic cholecystectomy over open cholecystectomy were immediately appreciated, including earlier return of bowel function, less postoperative pain, improved cosmesis, shorter length of hospital stay, earlier return to full activity, and decreased overall cost to the health care.

One of the commonest surgeries that we carry out is cholecystectomies and most of the time it is for symptomatic gall stone disease and laparoscopic approach is the standard in our unit. We have carried out laparoscopic surgery even in more complicated cases where patients presents late with acute cholecystitis, pyocoel , and with portal hypertension. Our mortality rates being zero for last 4 years.

We also do radical cholecystectomy for gall bladder cancer and our perioperative mortality have been zero, which is a very good outcome, when you compare the complexity of the surgery. This involves complete dissection of the porta hepatis and removal of the lymphatics and part of the liver seg V of the liver along with the gall bladder.

We have analysed our gall bladder data and presented at KSM which we got the Surgical best paper award this was on polypoidal lesions of the gall bladder and the histopathological changes that are seen and our data also demonstrated that dysplastic changes and gall bladder cancer occurs in around 55-60 age group, which is a significant finding and these findings were presented at CSSL annual Academic sessions.

*Bowala DNK, Dharmapala AD, Waduge R. A descriptive study on clinicopathological profile of polypoid lesions of the gall bladder. 37th Annual academic sessions of the The Kandy Society of Medicine 2015. (Best Surgical Research paper)*

*Dharmapala AD, Waduge RN, Premathilake N, Jayasundara LCK, Samarasinghe BN. Retrospective analysis of histopathological changes seen in gall bladder specimens in patients with symptomatic gall stone disease and the risk of gall bladder carcinoma. The 43rd annual sessions of the college of surgeons of Sri Lanka and joint meeting with the royal college of surgeons of Edinburgh 2014*.

We also reported a rare case of typhoid perforation of the gall bladder in SLJS.

*M Mathyvatheniey, NB Parahitiyawa, A,D Dharmapala .Acute acalculous typhoid cholecystitis. Sri Lanka journal of* surgery2006;31:

We were able to perform colloborative research with Prof Rohana Chandrajith, Dept of Geology, regarding the structure and constituents of gall stones, this again as a research component for BSc in geology and able to Present the findings in University of Peradeniya research sessions and in

publish the findings in elemental science journal. Prof K. B Galketiya and Prof Shirani Ranasinghe too conducted similar study for a Mphil which they publish.

*Jayasoma, K., Koralegedara, N.H., Dharmapala, A. Rohana Chandrajith. Microstructural and Geochemical Characterization of Gallstones: Implication for Biomineralization. Biol Trace Elem Res* https://doi.org/10.1007/s12011-021-03076-4.

*Weerakoon H, Navaratne A, Ranasinghe S, Sivakanesan R, Galketiya KB, Rosairo S. Chemical characterization of gallstones: an approach to explore the aetiopathogenesis of gallstone disease in Sri Lanka. PLoS One. 2015 Apr 8;10(4): e0121537.*

**Biliary tract surgery**

Ludwig Courvoisier's was the first to describe the removal of a stone from the common bile duct [16, 17]. In his monograph published in 1890 he discussed different types of ductal obstruction, and in a review of 187 cases he described that in the presence of an enlarged gallbladder which is nontender and accompanied with mild jaundice, the cause of the enlargement is unlikely to be gallstones. From this article arose the eponym Courvoisier's gallbladder or Courvoisier's law (23-26). Dr P.R Anthonis is the first Sri Lankan surgeon to report a case of stone removal from common Hepatic duct.

This is one of the commonest surgeries we perform. Biliary tract obstruction and surgical jaundice is one of the major areas we deal with. This involves biliary stone disease, malignancies of the biliary tract cholangio carcinoma, peri ampullary carcinoma and congenital anaormalies like choledochal cyst.

I have written a review article for the SLJS about the management of Common bile duct stones.

*Dharmapala A. Common bile duct stones and their management. Sri Lanka Journal of Surgery. 2014; 32:20-25.*

Obstructive jaundice itself can cause various changes in the homeostasis of our bodies. Bleeding diathesis, renal dysfunction, sepsis liver failure are some of these issues that we when managing these patients.

Since chronic renal impairment is a one of the common problems in Sri Lanka some of the patients with obstructive jaundice too may be having renal impairment, which is not detected prior to surgery and can cause some major issues during the peri operative period. We did a study to see how the serum creatinine level gets affected with the raised bilirubin levels and showed that it can give rise to false results in creatinine levels. This was done as undergraduate research for BSc in Faculty of allied health science. Prof Dammika Dissanayake guided this project. We presented our results in the Peradeniya University research sessions.

*Wickramarathne WRS, Dharmapala AD, Dissanayake AMSDM. Interference of elevated serum bilirubin in serum creatinine estimation by Jaffe method and enzymatic method. Peradeniya University international research sessions 2019.*

It has been shown in many instances that very high levels of bilirubin or obstructed biliary system can give rise to increased morbidity and mortality in biliary surgery. Therefore, preoperative drainage sometimes become prudent and at our unit we have the ERCP facility as well as the support from our interventional radiologist in achieving this. With these pre operative preparations we were able to bring down our morbidity and mortality drastically. We have presented our findings in numerous conferences and published our findings in some international and local surgical journals.

*Common bile duct (CBD) stenting as a bridge to increase complete CBD clearance with ERCP (endoscopic retrograde* cholangiopancreatography*), experience from a tertiary care …WGP Kanchana, BK Dassanayake, AD Dharmapala, KB Galketiya. JOURNAL OF GASTROENTEROLOGY AND HEPATOLOGY 36, 179-179*

*Udupihilla J, Dharmapala A, Galketiya KB.* Anatomical *landmarks for Percutaneous Transhepatic External Biliary Drainage (PTBD). Sri Lanka Anatomy Journal. 2020;4(1): 38-41*

Common bile duct surgical issues which are benign or malignant can pose significant challenge to the surgeons. In our unit we have almost all the armamentarium to manage these issues. We do about 200 ERCP procedures for a year, and we do minimal access surgery in addition to bulk of our open surgical procedures. We are equipped with choledocoscopes, Side viewing endoscopes, C-Arm and other energy devices to handle these issues.

There are congenital anormalies, in HPB we deal with and choledochal cysts are such examples where we have done quite a few. Our findings are being published and presented in various forums.

*Dharmapala A, Dassananyake BK, Athanospolous PG, Galketiya KB, Malago M. Isolated jejunal loop hepaticoduodenostomy following* excision *of type VI-A choledochal cyst. Sri Lanka Journal of Surgery. 2021;39(1):57-60*

*Karunasagara DD, Kanchana* WGP*, Jayasinghaarachchi T, Indrajith ABU, Dassanayake B, Dharmapala A, Udupihille J, Pinto V, Galketiya KB. Laparoscopic common bile duct exploration and choledochoduodenostomy - A case report. Rajarata University Journal 2020;5 (2);124-125*

*Ratnaweera WS, Jameel MR,* Nirmalasingham *GR, Dharmapala A, Pinto V, Galketiya KB. A review of choledochal cyst exicison. The annual sessions of the college of surgeons of Sri Lanka 2018*

One of the biggest challenges in biliary surgery is the management of Hilar cholangiocarcinoma. This involves extensive dissections incorporating hemi-hepatectomies or extended hepatectomies before the reconstruction of the biliary tree. Reconstruction is another challenge to the surgeon especially with bile ducts. We undertake these resections in our unit and has had good outcomes. This involves lot of preoperative planning with the radiologist, exact identification of vessels (Artery Portal vein, Hepatic veins) and the involvement of the tumour, looking at the anatomy of the hilar which can have lot of variations. We need to discuss with the anaesthetist regarding the long hour surgeries, pringle times, blood loss, metabolic derangements specially with liver ischeamia, operative recovery and long ICU stays.

We presented some these findings as abstract presentations and articles

*Jayathilake AB, Dharmapala A, Dasanayake B, Agalawatta AS, Madushanka UD, Udupihilla J, Pinto V, Galketiya KB. Laparoscopic resection and Roux-en-Y reconstruction of a hilar cholangiocarcinoma. Galle Medical Journal 2020;25(4):150-152*

*Laparoscopic hilar dissection of a klatskin tumour*
*A video demonstration for medical undergraduates and surgical trainees for distant learning purposes.*
*https://youtu.be/JSr93lpm0AY*

**Pancreatic surgery**

Pancreas is a retroperitoneal structure lying across the lumbar 1 vertebra extending from the right side of the body in the concavity of the duodenum

to the left of the body and the tail extending in to the splenic hilum. It has a head body and a tail in anatomical description and there are very important vessels namely portal vein and superior mesenteric artery and bile duct intricately related to the head of the pancreas. It has a very profuse blood supply from coeliac axis, SMA and splenic artery which makes it a very vascular organ. Most of its blood drain to the portal vein. This is a very important organ which has one of the key endocrine functions of secreting insulin and other hormones and exocrine functions of secreting digestive enzymes. These secretions are mainly controlled by hormones namely cholecystokinin and secretin. Because of its anatomical relations and functions the diseases in pancreas makes it very complex organ to reckon with.

I will be discussing some of the surgical issues of pancreas and how we have managed such conditions and some of our studies that we have published and the data we have on a Sri Lankan patient.

| Year | No of patients | | Moderate /Severe Pancreatitis | Mortality |
|---|---|---|---|---|
| | Male | Female | | |
| 2019 | 45 | 8 | 8 (15.1%) | 1 (1.88%) |
| 2020 | 62 | 32 | 20 (20%) | 3 (3%) |
| 2021 | 50 | 23 | 12 (16.43%) | 2 (2.73%) |

**Treatment of etiology**

An audit was carried out in our unit in finding the etiology in 44 consecutive admissions of acute pancreatitis patients to find out the aeitiology. They were diagnosed on patients with epigastric pain and raised serum amylase levels three times the normal value. Some of the patients who presented late but showed acute pancreatitis changes and necrosis in subsequent Contrast enhanced computed tomography (CECT) of the pancreas was also considered.

**Acute pancreatitis**

Acute pancreatitis is acute inflammation of the pancreas with a wide spectrum of disease intensity and a prognosis. This can be from self-limiting mild disease to severe disease where patients succumb to death. The diagnostic criteria is very simple and we use revised Atlanta classification 2012 for the diagnosis (27). The interesting thing about this is the severity doesn't really depend on the etiology or initial presentation. There for managing these patients is a problem, and to over-come these issues there are various criterion which are used to are used to predict the Severity (27).

Ransons, Glasgow, and Balthazar CT severity index (28) are some of these predictors.

We have audited acute pancreatitis patients for 3 years and the summary is given below.

| Aetiology | Number of patients | | Percentage |
|---|---|---|---|
| | Male | Female | |
| Gall stones | 5 | 13 | 40.9% |
| Alcohol | 15 | 0 | 34.09% |
| Idiopathic/Recurrent | 2 | 7 | 20.45% |
| Tumour | 2 | 0 | 4.5% |
| Metabolic | 0 | 0 | 0 |

This showed that there is a significant number of idiopathic cases. Most of them underwent metabolic screening for Serum calcium levels and also lipids. They underwent UGIE and a CECT scan during their stay in the hospital to rule out any anatomical abnormality or tumours. Two of the patients had tumours one with an ampullary carcinoma, and another patient with an IPNM. Both the patients underwent whipples procedure.

The necrosis and necrosectomy is a controversial area where surgeons get involved. Necrosis of the pancreas is one sequelae of acute pancreatitis. To call it necrotizing pancreatitis a clear definition is given in revised Atlanta classification. Depending on the amount of necrosis there is a CT severity index Blathazar Classification which is used quite frequently in clinical practice (28). The mortality of acute pancreatitis without necrosis is around 1% this for interstitial pancreatitis and for necrotizing pancreatitis this goes up dramatically to about 10-

28%. More life-threatening complications do occur in necrotizing pancreatitis group such as pseudocyst formation, Pseudoaneurysmal formation and infections. In about 40-70 % of this necrosis can get infected and raises the mortatlity to about 80%, in study has showed that necrosis was about 67% of patients who had 50% infected necrosis.

Initially there was a concept of necrosectomy even for sterile necrosis. The understanding at that time was that the severe inflow of cytokines due to inflammation is the initial reason for the mortality on that basis removing the necrotic tissue was considered a treatment option to reduce the mortality. But later it found out that necrosectomy in the early phase of pancreatitis carries very high mortality and this was dropped out eventually. These patients were managed expectantly.

The delaying of the necrosectomy allowed a demarcation of necrotic tissue and this made the necrosectomy a bloodless surgery and found to give good results. Mainly reduction in mortality and morbidity.

The mortality rose significantly when there is infection of the necrotic tissue and this required some sort of drainage procedure as the mortality was very high around 50-70% in undrained pancreatic necrosis. Usually, the infection sets in within the 2$^{nd}$ and 3$^{rd}$ week following acute attack specially when there is necrosis, and usually the second peak of mortality in acute pancreatitis was due to this reason. The surgical input was required at this juncture.

At Peradeniya we have done these drainage procedures around 16 and we have got data of 12 patients. We have presented this data CSSL annual sessions 2021. We have done endoscopic, laparoscopy and open surgical procedures to tackle this problem. The algorithm shown here clearly demonstrates our approach. We avoided doing laparotomies to drain infected necrotic tissue but used endoscopic laparoscopic and retroperitoneal approaches, thus minimizing the trauma.

We had zero mortality in these patients and we follow up 7 of these patients who are doing well. None of them developed exocrine failure and 2 of them are on insulin therapy.

*A.D Dharmapala, B.K Dassanayake, Pulasthi, Dharshana, I. Niyaz, K.B Galketiya. The Management algorithm of Infected pancreatic Necrosis at Teaching Hospital Peradeniya. The annual sessions of the college of surgeons of Sri Lanka 2018*

*Kanchana WG, Dharmapala AD, Dassanayake BK, Wasala WM, Galketiya KB. Spontaneous Free Peritoneal Perforation of an Infected Pancreatic Fluid Collection Managed with Laparoscopic Drainage and Necrosectomy. Hindawi -Case Reports in Surgery. 2021; 202:1-4*

**Chronic Pancreatitis**

Chronic pancreatitis is a debilitating disease commonly seen among alcohol abuse patients. In Sri Lanka in addition to alcohol induce chronic pancreatitis there is a sub group of patients who suffers from a different entity called tropical pancreatitis. This entity is seen specially in the subcontinent and may co- exist with some of the patients who are having alcohol related chronic pancreatitis. This disease entity is seen among young and negatively affects their life style. We follow a corhort of such patients and we have managed their exocrine and endocrine failures.

| Year | Male | Female | Mean age | Mean - days in the hospital |
|---|---|---|---|---|
| 2017 | 12 | 02 | 55.28 | 5 |
| 2018 | 15 | 04 | 41.4 | 4 |
| 2019 | 30 | 06 | 42.5 | 4 |

We managed their endocrine failure with our medical colleagues. We managed to convince the director Teaching hospital Peradeniya to issue pancreazyme enzymes for these patients who suffered exocrine failure.

One of the debilitating symptoms in Chronic pancreatitis is the pain. We have dedicated pain team and the patients gets referred to the team and I am thankful DR Saman Nanayakkara and his team for looking after these patients who were at one time neglected as chronic alocoholics.

Splachnicectomy is a mode of treatment for intractable pain associated with chronic pancreatitis. This was first described many years ago and this was performed surgically and also under radiological guidance. In our unit we performed this as a minimal invasive procedure. We do thoracoscopic approach. The series we have done has good results, and patients really appreciate the pain relief they get. We have performed well over 25 cases so far.

**Endoscopic therapy**

Ductal fibrosis and pancreatic calculi are some of the complications of chronic pancreatitis. These complications are now managed endoscopically by performing ERCP and stenting. We have done also drained some abscesses through endoscopic means. For a year we do about 200-250 ERCP procedures.

We have presented some of our work on this aspect in the KSM and Journal of Gastro enterology.

**Drainage procedure**

We perform various drainage procedures in chronic pancreatitis. Specially in cases where there is pancreatic duct dilatation. In these patients we select the patients who are having recurrent attacks due to ductal obstruction or if there is persistent pain with duct dilatation. We perform Lateral pancreatico jejunostomies (Freys, procedure, Puestows procedure) for dilated ducts and if there is no duct dilatation specially with prominent or oedematous pancreatic head we do a head coring procedure which is known as Beger procedure (29-32).

Some of these patients are with additional complications. We have done by-pass procedures to bile duct and special case of pleural fistulation. Where we have managed all these patients with zero mortality and good outcome.

*WGP Kanchana, AD Dharmapala, KB Galketiya Pancreaticopleural fistula causing recurrent right-side pleural effusions treated with lateral pancreaticojejunostomy JOURNAL OF GASTROENTEROLOGY AND HEPATOLOGY 36, 141-141*

**Pancreatic neoplasm**

The pancreas has numerous benign and malignant lesions. There are two components in pancreas. One is the exocrine part of the pancreas and the other is the endocrine.

**Pancreato- Duodenectomy**

In 1935, Allen Oldfather Whipple performed a partial resection of the pancreas over two sessions in a patient with jaundice secondary to ampullary carcinoma at New York-Presbyterian Hospital. In 1940, Whipple was again the first to perform a pancreaticoduodenectomy with resection of the

pancreas in a single session, as the patient was not jaundiced (34,35).

In our unit we perform Pancreaticoduodenectomy (whipples procedure) and my personal data of these 37 patients with 1 peri operative death. The whipple's procedure is a very complex surgery involving an extensive dissection and a very precarious 3 anastomoses. Out of which pancreatic anastomosis is the most vulnerable with about 16-30% leak rate. In our data there was no bile leaks, there were 9 Pancreatic fistulae who were post operative pancreatic fistulae type A.

I have learnt a very safe Duct to mucosa technically demanding anastomotic technique and this was originally done by Blaumgarrt and was taught to me by my trainer in UK prof Ajith Siriwardena.

We have published this and some interesting cases in local and international journals.

*Dharmapala A, Galketiya KB, Siriwardena AK. Pancreatoduodenectomy with a novel pancreato-jejunal anastomosis by the single-layer long parenchymal traverse technique (Siriwardena technique): Early demonstration of safety in practice development in Sri Lanka. Sri Lanka Journal of Surgery. 2020;38(3):29-32*

*Herath K, Dharmapala A, Galketiya K, Wijethunge S. Solid pseudo papillary neoplasm of the pancreas. A case series. JOURNAL OF GASTROENTEROLOGY AND HEPATOLOGY 34, 393-393*

*Samarasinghe AKBBTB, Galketiya KB, Dharmapala AD, Waduge RN, Wijethunga S, Ratnatunga NVI, Dissanayake LAMT, Wijesuriya WMNK, Bandara WGDH, Rajapaksha MBTD, Theswa E. Demography and histology of Whipple surgery. 38th Annual academic sessions of The Kandy Society of Medicine 2016*

**Minimal invasive Pancreatic surgery**

The first laparoscopic procedure involving the pancreas was reported by Bertram M. Bernheim at John Hopkins University in 1911. In 1978, Albert Cuschieri of the University of Dundee (United Kingdom) published an article describing the role of laparoscopy in the diagnosis and treatment of pancreatic carcinoma. In 1996, he published the first series of five chronic pancreatitis patients with medically intractable pain who had undergone laparoscopic distal 70% pancreatectomy and splenectomy (36-37).

Our unit does minimal invasive pancreatic surgery specially whipples procedure, distal pancreatectomy under the guidance of Prof Galketiya. We have published some of our results.

*Indrajith, A.B.U., Darmapala, A.D., Kanchana, W.G.P., Karunasagara, D.D., Jayasingharachchi, T., Pinto, V. and Galketiya, K.B., 2021. Laparoscopic spleen preserving distal pancreatectomy. Sri Lanka Journal of Surgery, 39(3), pp.118–119*.

*D. C. Dhanuksha, S. De Silva, A. D. Dharmapala, B. K. Dassanayake, J. J. K. H. Udupihilla, F. Sitheeque, S. U. B. Tennakoon, K. B. Galketiya Distal pancreatectomy: Comparison of open and laparoscopic techniques. The Sri Lanka Journal of Surgery 2022; 40(1): 01-06*

**Pancreatic Trauma**

We have managed patients with complex pancreatic injuries and but the numbers are very few. We have most of the instances try to preserve the pancreatic parenchyma. We have pubished one of those interesting cases.

*A.Dharmapala, K. B. Galketiya. Parenchyma preserving surgery in pancreatic trauma. The Sri Lanka Journal of Surgery 2022; 40(1): 51-53*

**Training and Teaching**

Our unit is recognized as one of 4 units in Sri Lanka to train HPB surgeons. We have two slots one for me and Prof KB Galketiya. We get senior registrars specially to be trained in HPB. I have involved in HPB training and delivered some invited lectures in HPB surgery. Here are some of them.

- *SURG-AHEAD CSSL CPD program Participate in panel on Acute Pancreatitis on 15.10.2020*
- *Resource person on Essentials in HPB surgery-Hands on workshop on 29.11.2017 organized by SLHPBA at skill lab-Colombo South Teaching Hospital*

- *The Kandy Society Of Medicne CME lecture on Space occupying lessions in the Liver on 03.06.2020 at PMCK auditorium NH Kandy*
- *Certificate of participation for the contribution towards continuing Medical Education on Acute Pancreatitis on 22.01.2014 organized by Kandy society of Medicine*
- *Certificate of Appreciation as a resource person at pre-congress workshop on Microwave tumour ablation of the liver tumours, on 11th December 2018 at Teaching Hospital Peradeniya*
- *Certificate of Appreciation for conducting a Continuing Medical Education session on Gallstones: -Ancient problem, Modern solutions on 13.03.2019 organized by Kandy society of Medicine*
- *Sri Lanka surgical congress 2020-Virtual conference as a resource person on 04th-06th November 2020 – Selecting patients for liver resection in metastatic disease of the liver*
- *Certificate of Resource faculty as a trainer at Laparoscopic Cholecystectomy-Hands on workshop on 12th March 2021 at Teaching Hospital Peradeniya and faculty of Medicine, Peradeniya*
- *Certificate of Appreciation as a resource person The Nawalapitiya Clinical Society on 30th of September 2020: Unforgiving pancreas*
- *SARRC Surgical Society 2021 – Experts Case Based discussion on Acute Pancreatitis 2021*

I have also done educational videos and these are some of the videos pertaining to HPB surgery.

**Selecting a patient with liver metastasis for liver resection**

An audio video lecture for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/R0RkHdE5CMo

**Laparoscopic hilar dissection of a klatskin tumour**

A video demonstration for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/JSr93lpm0AY

**Laparoscopic CBD exploration**

A video demonstration for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/lN7LLaNlu98

**All you have to know about T –tubes**

A video demonstration for medical undergraduates and surgical trainees for distant learning purposes.
https://youtu.be/6-1XLkCgEVI

## Future - Liver Transplantation

We are striving hard to achieve standards and to be on par with the world standards in a resource poor setting, which in the recent past made a very bad hit on all of us in Sri Lanka. Yet we stood as a team with the Guidance and strength of Prof Lamawansa, Prof Galketiya and my colleagues. We also try to reach the pinnacle of hepatobiliary surgery to develop liver transplantation. This became a reality with our new members Dr Buddika Dassanayake a surgeon and Dr Senani Samarasinghe anaesthetist fulfilled the team which we required to get on to the next level. With my experience I was able to team up with them and start liver transplantation at Peradeniya. During my training in UK, we published an article on organ utilization

*Athanasopoulos PG, Hadjittofi C, Dharmapala AD, Orti-Rodriguez RJ, Ferro A, Nasralla D, Konstantinidou SK, Malagó M. Successful outflow reconstruction to salvage traumatic hepatic vein-caval avulsion of a normothermic machine ex-situ perfused liver graft: case report and management of organ pool challenges. Medicine. 2016;95(15):1-5*

This is culmination of hard work of our teachers Prof Arjuna Aluwihare, Prof Rathnathunga, Dr Buthpitiya, Prof Lamawasa, and Prof Galketiya in their own way helped to develop Paediatric

surgery vascular surgery, Peadiatric kidney transplant, HPB and minimal access surgery, which eventually with their blessings helped us to reach the pinnacle.

**I like to dedicate this oration to all my teachers, my colleagues, trainees and my patients.**

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