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9. Based on internal test report #RC00018701, EEA™ circular stapler with Tri-Staple™ technology design verification report, Dec. 2, 2014.
10. Based on internal test report #RC00018701, Tactile feedback test report.
11. Based on internal test report #2128-003, EEA™ circular stapler with Tri-Staple™ technology design verification report, Dec. 2, 2014.

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**JOURNAL OF THE
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COVER DESIGN

The cover design for the Journal of the Caribbean College of Surgeons depicts a satellite image of the Caribbean region taken from space. The image shows the tranquil beauty of the region on the background of the aqua blue Caribbean Sea.

Although, the Caribbean is relatively small, it casts a large footprint that can be seen far and wide.

The cover also shows the surgical main and satellite lights that we use on a daily basis to illuminate the work that surgeons do. The emblem of the Caribbean College of Surgeons is featured in the top left hand corner, bringing together the qualities of the Caribbean and the work of the surgeons.

The cover was designed by our President, Dr. Cameron Wilkinson, and medical students from the Windsor Medical School, Omair Janjua and Shruti Patel.



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PRESIDENT'S MESSAGE



The global pandemic has wreaked havoc on our world. It has changed, probably irreversibly, the way we practice surgery and deliver surgical education. This is the second year that the College has not been able to host our annual symposium in the traditional manner where we meet in one of the beautiful Caribbean territories.

Despite that, the College has adapted to the new virtual world, by hosting several webinars, encouraging social media interactions and publishing electronic copies of the Journal of the Caribbean College of Surgeons. The College continues to push forward with these as we see these as the new normal for some time to come.

I am pleased that, despite all of the challenges, we were able to produce the fifth edition of the Journal of the Caribbean College of Surgeons. This edition contains contributions from across the region, demonstrating that Caribbean remains a rich source of knowledge, data and expertise.

The surgeons in Barbados have been prolific in their writing, covering a variety of topics including internal carotid artery aneurysms, fellowship training, complex hemodialysis access and a rare case of encapsulated peritoneal sclerosis. From Trinidad & Tobago, a comprehensive review of minimally invasive gastrectomy and a rare case of intra-myocardial shotgun injury have been presented.

We take this opportunity to thank the authors who have spent many hours preparing manuscripts to contribute to this issue of the journal, peer reviewers who have given their invaluable time and expertise as well as the members of the publication and steering committees. Your collective efforts have contributed to the advancement of knowledge and surgical practice in the Caribbean.

Best regards,

Professor Shamir Cawich
Editor in Chief
Journal of the Caribbean College of Surgeons

**The Caribbean College of Surgeons'
Digital Response to the COVID pandemic
Shamir O. Cawich**

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ORIGINAL RESEARCH CONTRIBUTION

Peritoneal dialysis and the relatively unknown silent killer- Encapsulated peritoneal sclerosis

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ABSTRACT

Encapsulating peritoneal sclerosis is a rare but highly lethal complication of peritoneal dialysis (PD). We report the first known documented case at our institution and discuss the pitfalls and successes in management.

Keywords: Peritoneal dialysis, Children, Encapsulated peritoneal sclerosis

BACKGROUND

Encapsulating peritoneal sclerosis (EPS) is a rare, but highly lethal complication of peritoneal dialysis (PD). The incidence, however, is increasing worldwide. We report, to the best of our knowledge, the first documented case at our institution.

A high index of suspicion is needed to identify patients most at risk, including those on prolonged PD, previous episodes of peritonitis and ultrafiltration failure. The mainstay of management is discontinuation of PD, with the patient being either transferred to hemodialysis (HD) or being transplanted.

CASE REPORT

A 12-year-old boy was referred to the paediatric surgical clinic with a history of severe abdominal distension. He was relatively asymptomatic - complaining only of abdominal discomfort. He was known to have end-stage renal failure secondary to focal segmental glomerulosclerosis and had been receiving peritoneal dialysis (PD) for the past six years. During these six years, he had two documented episodes of peritonitis with *Klebsiella Pneumonia* and another with *Staphylococcus Aureus*. On these occasions his PD catheter was removed, he received culture-directed intravenous antibiotics (Ceftriaxone- for the first two episodes, Vancomycin- for the third episode) and underwent catheter replacement once the peritonitis had resolved. Resolution of peritonitis was confirmed by repeat peritoneal cultures. Six months prior to this presentation, he had been switched to haemodialysis (HD) after developing ultrafiltration failure.

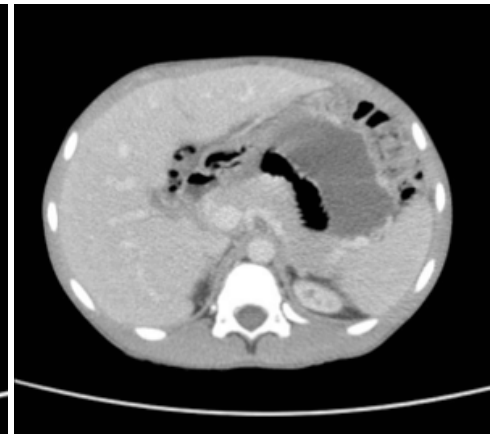
He had also been evaluated radiologically with a CT scan of his abdomen, which revealed a large, well-encapsulated, left-sided cystic collection in the anterior abdomen. This collection measured approximately 18.4 x 12.3 cm on axial imaging (Figure 1). In addition, smaller cystic collections were noted in the pelvis and the lesser sac (Figure 2).



Figure 1: Axial view of large left-sided cystic collection



Figure 2: Cystic collection in the pelvis and in upper abdomen- the lesser sac



The large left-sided collection was drained percutaneously on two occasions (two weeks apart), returning 1 litre of heavily blood-stained fluid on the first occasion, and subsequently 750 mls of similar fluid. On both occasions after percutaneous drainage, the child had reported relief of his abdominal discomfort and there was a significant decrease in the abdomen girth.

On examination in clinic the boy was comfortable, afebrile and acyanotic. Significant findings were confined to his abdomen where an obvious left-sided abdominal protuberance was noted. On palpation, a large mass arising from the pelvis was appreciated, extending to the left upper quadrant. He was non-tender and had no features of peritonism.

Review of previous CT imaging done 4 months prior to the last, also revealed features of EPS, including peritoneal thickening, ascites and radiological features of ‘cocooning’ of the bowel or bowel tethering (Figure 3).

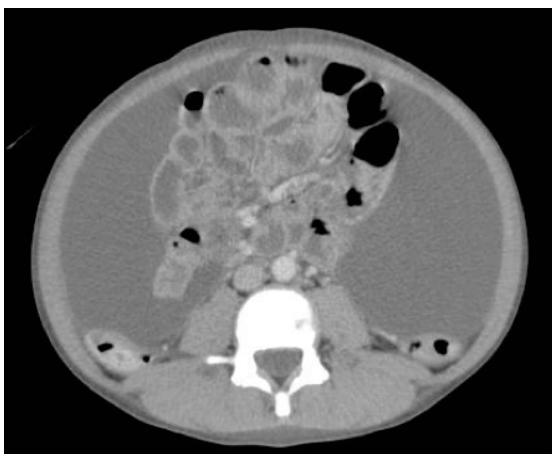


Fig. 3: CT imaging showing ascites, bowel wall thickening and centralization of bowel - “cocooning”

He was diagnosed with EPS. His persistent left-sided cystic collection was managed expectantly since he was no longer on PD and was completely asymptomatic. At interval follow up he remained asymptomatic, with gradual resolution of his abdominal distension. At his 6-month follow-up, the abdominal distension had completely resolved. Two years later, the patient remains on HD and has had no recurrent episodes of EPS, as he awaits renal transplant at our institution.

DISCUSSION

Complications of PD are commonly encountered, with infectious complications such as tunnel site infections being most common.^{1,2} Non-infectious complications, though less common, still account for approximately 40% of the complications. These include hemoperitoneum, peritoneal thickening, peritoneal adhesions, peritoneal calcifications, intraperitoneal fluid collections, abdominal hernias (incisional, umbilical, inguinal and ventral), atherosclerosis, acute pancreatitis and EPS.¹⁻⁶

Many of these non-infectious complications are frequently noted in patients with previous episodes of peritonitis.¹ Others may be inflammatory in nature, initiated by thickening of the peritoneal membrane, with associated increased vasculopathy.⁴

Encapsulating peritoneal sclerosis (previously referred to as sclerosing encapsulated peritonitis) is a relatively rare, but highly lethal, complication of PD first reported by Ghandi⁷ in 1980. The condition is marked by fibrosis and thickening of the peritoneum.^{2,3,4,8,9} Factors linked to its development include prolonged PD^{3,4,8,9,10,11,12} and previous episodes of peritonitis.^{3,4,9,12,13} In fact, while the overall incidence of EPS averages 2.5 %, the incidence significantly rises from 0.7% in patients on PD for less than 5 years to 17.2% in patients on PD for more than 15 years.^{8,14} Mortality approaches 60-100% in patients receiving PD in excess of 10 years.¹¹ In addition, EPS can develop after cessation of PD in over 50% of patients with a history of prolonged (>8 years) use. Hence routine long-term follow-up is recommended.^{9, 11}

Peritoneal dialysis solutions do not have a physiological composition (low pH and high osmolality). As a result, they may stimulate thickening of the peritoneal interstitium and basement membrane duplication in the mesothelium and capillaries, from as early as 3-4 months after starting PD.^{3,4,9} In addition, the glucose present in these solutions induce glycosylation end product-related changes in the peritoneal basement membrane, some of which are diabetiform in nature. This can lead to alterations of the peritoneal micro-vessels, including neovascularization.^{4,15} The end result is chronic peritoneal injury, which forms the 'first hit' behind the presently held 'two-hit theory' for the pathogenesis of EPS. The second hit refers to repeated episodes of peritonitis, as well as a possible genetic predisposition.³

This disease has a spectrum of clinical presentations. In mild cases, patients are relatively asymptomatic, having only radiological features of the disease: peritoneal thickening, peritoneal calcifications, ascites, intra-abdominal fluid collections, bowel wall thickening, bowel tethering and/or bowel dilatation.^{12,3,4,8,9,14}

In advanced cases, the patients develop symptoms of intestinal obstruction coupled with the above-mentioned radiological features of the disease and a worsening fibrotic process marked by the intra-operative finding of intestinal cocooning.^{9,11,14} Progressive intestinal dilatation and mural ischaemia may eventually lead to bacterial translocation, systemic inflammatory response syndrome, sepsis and death.^{4,9}

Management is disease-spectrum directed. In early cases, the PD is discontinued to reduce the risk of disease progression.^{4,8} These patients should be maintained on HD or undergo renal transplantation if possible. Enteric rest with the provision of total parenteral nutrition is recommended in those with clinical or radiological evidence of partial or complete intestinal obstruction. In severe cases with intestinal obstruction, once a trial of conservative management (PD catheter removal and enteric rest) fails, surgical intervention is mandated. Surgical intervention mainly involves exploratory laparotomy with extensive adhesiolysis.^{4,16,17}

In one of the largest literature reports on the surgical management of EPS, Kawanishi¹⁶ reported on 50 patients with advanced EPS. They described careful peeling away of the thick cocoon membrane, which resulted in the resolution of obstructive bowel symptoms in all but 2 patients (96% surgical success). These 2 patients had small bowel perforations diagnosed postoperatively and subsequently died of ongoing septic complications. Of note, the operating time for this series of patients averaged 6.9 hours.¹⁶ In a smaller report on the surgical management of advanced EPS in 13 patients, Ryu et al¹⁷ reported early postoperative deaths in 5 patients due to infectious complications, with another 5 mortalities occurring after re-operation. These later 5 patients eventually succumbed to persistent infection, fistula formation or recurrent adhesive bowel obstruction. This highlights the need for meticulous adhesiolysis to avoid unintentional enterotomies, which is the major cause of surgical morbidity and mortality in these patients.^{4,16,17}

Prior to his referral, our patient underwent percutaneous drainage of his collections on two occasions. Though this has not been specifically outlined as a treatment option for patients with EPS, our patient did experience relief from his abdominal discomfort after the procedure on both occasions. It is also possible that such an intervention may have decreased the time to complete resolution of his collection.

Medical management is also now being reported. This includes the use of Tamoxifen and immunosuppression therapy including steroids, azathioprine, sirolimus, colchicine and cyclosporine. Although early data are encouraging, there have only been a small number of cases reported to date.^{4,9,14,18,19}

REFERENCES

1. Prakash J, Singh LKS, Shreeniwas S, Ghosh B, Singh TB. Non-infectious complications of continuous ambulatory peritoneal dialysis and their impact on technique survival. **Indian Journal of Nephrology**. 2011; 21: 112-115.
2. Cakir B, Kirbas I, Cevik B, Ulu EM, Bayrak A, Coskun M. Complications of continuous ambulatory peritoneal dialysis: evaluation with CT. **Diagnostic and Interventional Radiology**. 2008; 14: 212-220.
3. Moinuddin Z, Summers A, Van Dellen D, Augustine T, Herrick S. Encapsulating peritoneal sclerosis - a rare but devastating peritoneal disease. **Frontiers in Physiology**. 2015; 5: 470.
4. Summers AM, Clancy MJ, Syed F, Harwood N, Brenchley PEC, Augustine T et al. Single-center experience of encapsulating peritoneal sclerosis in patients on peritoneal dialysis for end-stage renal failure. **Kidney International**. 2005; 68: 2381-2388.
5. Tse KC, Yip PS, Lam MF, Choy BY, Chan TM, Lai KN. Recurrent hemoperitoneum complicating continuous ambulatory peritoneal dialysis. **Peritoneal Dialysis International**. 2002; 22: 488-491.
6. Quraishi ER, Goel S, Gupta M, Catanzaro A, Zasuwa G, Divine G. Acute pancreatitis in patients on chronic peritoneal dialysis: an increased risk? **American Journal of Gastroenterology**. 2005; 100: 2288-2293.
7. Ghandi VC, Humayan HM, Ing TS, Daugirdas JT, Jablokow VR, Iwatsuki S et al. Sclerotic thickening of the peritoneal membrane in maintenance peritoneal dialysis patients. **Archives of Internal Medicine**. 1980; 140: 1201-3.
8. Honda M, Warady B. Long-term peritoneal dialysis and encapsulating peritoneal sclerosis in children. **Pediatric Nephrology**. 2010; 25: 75-81.
9. Shroff R, Stefanidis CJ, Askiti V, Edefonti A, Testa S, Ekim M et al. Encapsulated peritoneal sclerosis in children on chronic PD: a survey from the European Paediatric Dialysis Working Group. **Nephrology Dialysis and Transplantation**. 2013; 28: 1908-14.
10. Rigby RJ, Hawley CM. Sclerosing peritonitis: The experience in Australia. **Nephrology Dialysis and Transplantation**. 1998; 13:154-9.
11. Kawanishi H, Moriishi M. Epidemiology of encapsulating peritoneal sclerosis in Japan. **Peritoneal Dialysis International**. 2005; 25(S4): 14-18.
12. Hsu HJ, Yang SY, Wu IW, Hsu KH, Sun CY, Chen CY et al. Encapsulating peritoneal sclerosis in long-termed peritoneal dialysis patients. **Biomedical Research International**. 2018; 8250589: 1-4.
13. Kawaguchi Y, Kawanishi H, Mujais S, Topley N, Oreopoulos DG. Encapsulating peritoneal sclerosis: definition, etiology, diagnosis, and treatment. International Society for Peritoneal Dialysis Ad Hoc Committee on Ultrafiltration Management in Peritoneal Dialysis. **Peritoneal Dialysis International**. 2000; 20(S4): 43-55.
14. Hong K, Bae JH, Jang Y, Jung H, Cho J, Choi J et al. Encapsulating peritoneal sclerosis: case series from a university centre. **Korean Journal of Internal Medicine**. 2013; 28: 587-93.
15. Gillerot G, Devuyst O. Molecular mechanisms modifying the peritoneal membrane exposed to peritoneal dialysis. **Clinics in Nephrology**. 2003; 60: 1-6.
16. Kawanishi H, Watanabe H, Moriishi M, Tsuchiya S. Successful surgical management of encapsulating peritoneal sclerosis. **Peritoneal Dialysis International**. 2005; 25(S4): 39-47.
17. Ryu J, Lee K, Koo T, Kim D, Oh K, Yang J et al. Outcomes of the surgical management of encapsulated peritoneal sclerosis: A case series from a single center in Korea. **Kidney Research and Clinical Practice**. 2019; 31:499-508
18. Eltoun MA, Wright S, Atchley J, Mason JC. Four consecutive cases of peritoneal dialysis-related encapsulating peritoneal sclerosis treated successfully with tamoxifen. **Peritoneal Dialysis International**. 2006; 26: 203-6.
19. Lafrance JP, Letourneau I, Ouimet D, Bonnardeaux A, Leblanc M, Mathieu N et al. Successful treatment of encapsulating peritoneal sclerosis with immunosuppressive therapy. **American Journal of Kidney Diseases**. 2008; 51: 7-10.

ORIGINAL RESEARCH CONTRIBUTION
Axillary-Axillary Inter-Arterial Loop Bypass Graft for Haemodialysis Access
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ABSTRACT

As the population of patients on haemodialysis in Barbados continues to increase with few renal transplants being performed, access for haemodialysis in long term patients is becoming a problem. Repeated placement of central catheters contributes to central venous stenosis, and some patients have exhausted their sites for venous access and arterio-venous fistula creation. We present a case of such a patient in which a surgical technique for gaining haemodialysis access using only arterial access was successfully performed. To the best of our knowledge, this is the first case of an axillary-axillary inter-arterial loop bypass graft performed in the English-speaking Caribbean.

Keywords: dialysis, graft, axillary, fistula, hemodialysis

BACKGROUND

As the population of patients on haemodialysis in Barbados continues many patients require long-term haemodialysis access. This may become problematic if repeated placement of central catheters cause central venous stenosis, and some patients may exhaust their sites for venous access and arterio-venous (AV) fistula creation.

We present a case of such a patient in which a surgical technique for gaining haemodialysis access using only arterial access was successfully performed. This is the first case of an axillary-axillary inter-arterial loop bypass graft performed at our institution and, to the best of our knowledge, in the English-speaking Caribbean.

CASE REPORT

A 46-year-old gentleman was referred for consideration for an axillary-axillary inter-arterial loop graft for haemodialysis access, as he was thought to be approaching the end of venous access. He had been on dialysis for 15 years due to renal disease secondary to hypertensive nephrosclerosis. He had multiple venous catheters placed in both internal jugular veins and both femoral veins, but had suffered with multiple bouts of central line associated blood stream infection (CLABSI) and vein occlusions.

He had attempts at creation of a native right radio-cephalic AV fistula, bilateral brachio-cephalic AV fistulas and a left femoral PTFE loop arterio-venous graft, but all failed primarily. This was followed by a period of continuous ambulatory peritoneal dialysis, but this failed after one year. He then had multiple temporary and permanent vascular accesses placed, but each one failed over time.

Finally, three years prior to his referral, a CT venogram revealed superior vena cava stenosis. At this point a trans-lumbar inferior vena cava tunneled catheter was placed by the interventional radiologist. The catheter had to be changed within three months due to cuff migration. At this point he was referred for placement of an axillary-axillary inter-arterial loop graft.

The patient delayed for three years, until his lumbar catheter was thought to be near end of life. On April 1st 2021, the patient underwent the procedure under general anaesthesia with an arterial line. He had been dialysed one day prior to surgery. With the patient supine, an 8cm infraclavicular incision was made, and dissection carried down through the clavicular fibres of pectoralis major. The first part of the axillary artery was dissected out and controlled proximally and distally. A 6mm ringed PTFE graft was tunneled subcutaneously on the right chest using a "C" shaped metal tunneller. There was no bleeding encountered from the chest wall veins after the tunnelling was completed. Intravenous heparin was given and the axillary artery was clamped proximally and distally, and then divided. The graft was anastomosed to the proximal end of the axillary artery first, and then to the distal end. (Figure 1).



Figure 1: Intra-operative photograph showing the completed graft anastomosis.



Figure 2: Appearance of the axillary-axillary graft in situ post-procedure

Both anastomoses were performed with a 7/0 Prolene continuous suture. The graft was de-aired, clamps removed, and haemostasis secured. He was extubated on the table. Handheld doppler demonstrated flow in the graft, and the right radial pulse was palpable at the wrist post operatively. He was kept overnight, dialysed on post-operative day one and discharged on post-operative day one on Aspirin and Clopidogrel.

He was seen in the outpatient clinic one week later and was noted to have a haematoma over the graft, but the graft remained patent with flow again demonstrated by handheld doppler. The graft was first cannulated on April 28th 2021 for dialysis and graft flows of 300ml/min were obtained.

DISCUSSION

Arteriovenous fistulas are the access of choice for long term haemodialysis, but repeated failure of these fistulas leads to multiple AV fistula sites. If this is coupled with multiple venous dialysis catheters, a situation in which there is no suitable long term venous access can result. The axillary-axillary inter-arterial loop graft was first reported in 2005 by Bunker et al.¹ In their series of 20 patients they reported 5% 30-day mortality, 5% early graft thrombosis rate, 15% late graft thrombosis rate and 5% late graft infection rate. The infected graft required removal. There were no cases of limb loss. The solitary case of early graft thrombosis resulted in hand ischaemia, which resolved with graft thrombectomy. The sole mortality was unrelated to the surgical procedure. They had a primary patency rate of 90% and a secondary patency rate of 93% at 6 months. There was a 100% technical success rate.

Fareed et al.² published a series of 15 cases in 2017, with similar results. In this series they achieved primary and secondary patency rates of 73.3% and 86.6% at 1 year, and 53.3% and 63.7% at 3 years respectively. Graft thrombosis occurred in 7 patients (46.7%), pseudoaneurysms in 2 (13.3%), graft infection in 3 (20%) and there was one death at 6 months unrelated to the graft. There was 100% technical success rate.

This procedure is not technically difficult and can safely be performed by cardiovascular surgeons. In our setting where renal transplants are not yet a frequent procedure, this procedure offers an alternative for long term access, with low short-term complications, and no reported cases of limb loss. The ideal strategy for anticoagulation or antiplatelet therapy post placement of these grafts has not been elucidated, and until this is studied will be at the discretion of the physician. In this patient, I chose dual antiplatelet therapy instead of anticoagulation as this is a high flow graft and the patient has no known pro-coagulable tendencies. In this particular case, with no usable venous access, other extra-anatomical options such as a necklace cross chest AV graft, a brachio-jugular graft or an axillo-femoral AV graft were not options.³ The only other possibility would have been an arterial-right atrial AV graft, which would be technically more challenging and a more morbid procedure³.

CONCLUSION

The axillary-axillary inter-arterial loop graft is an alternative for haemodialysis access in patients with exhausted arterio-venous fistula sites and central vein stenosis. The procedure is not technically difficult with good mid-term outcomes. This case represents the first of its kind in the English-speaking Caribbean, and we will have to see what the long-term durability of this access is.

REFERENCES

1. Bünge CM, Kröger J, Kock L, MD, Henning A, Klar E, Schareck W. Axillary-axillary inter-arterial chest loop conduit as an alternative for chronic hemodialysis access. **Journal of Vascular Surgery**. 2005; 42: 290-295.
2. Fareed A, Zaid N, Alkhateep YN. Axillary artery loop interposition graft (AALG) as unusual access for hemodialysis. **International Surgery Journal**. 2017; 4(12): 3853-3857.
3. Lazarides MK, Georgakarakos EI, Schoretsanitis N. Extra- and intrathoracic access. **Journal of Vascular Access**. 2014; 7: S125-129.

ORIGINAL RESEARCH CONTRIBUTION

Minimally Invasive Surgery for Gastric Cancer: A Literature Review

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INTRODUCTION:

The role of minimally invasive surgery (MIS) has evolved in recent years with regards to its application for the management of malignant disease. While the short-term benefits of MIS (decreased pain, smaller incision, shorter length of hospital stay and faster return to normal function) have been clearly established in various cancers, its oncological adequacy continues to be a topic of debate.¹

Although radical surgery remains the mainstay of treatment for resectable gastric cancer, trends in management may differ depending on the evidence available in different regions of the globe.² The implementation of MIS for gastric cancer is currently under investigation, with a variety of existing and ongoing trials that may provide clarity regarding its feasibility, radicality, and long-term outcomes. Due to limited case volumes in the West, much of the data for management of gastric cancer originate from East Asian countries, such as Japan, Korea, and China. Presently, there is a growing body of evidence supporting MIS for gastric cancers, but the equivalence with respect to both lymph node dissection and margin status is important for it to be on par with open surgery.

In the past decade, the role of laparoscopic surgery in the Caribbean has been expanded greatly to encompass a wide variety of abdominal procedures of varying complexity. Its role in the management of gastric cancer, however, is limited due to the comparatively low case numbers in our region. This literature review will seek to discuss the role of MIS in the management of gastric cancer by providing a summary and comparison of the available and emerging literature globally to help determine its role and feasibility.

A PubMed search was conducted using the key words: laparoscopic gastrectomy and laparoscopic gastric cancer surgery producing over 9000 articles. Articles chosen for inclusion in this review were randomized controlled trials, systematic review and meta-analyses published in recent years, several of which have been cited by current guidelines for gastric cancer treatment.³

HISTORICAL PERSPECTIVE:

Gastric cancer is the 5th most commonly diagnosed cancer in the world, and is ranked third in the number of cancer related deaths. The highest incidence is seen in east Asia, notably Japan, Korea, and Mongolia.⁴ The first recorded distal gastrectomy was performed by Billroth in 1881, and was successfully mirrored over a decade later by Professor Kondo a professor from the First Department of Surgery of Tokyo University Hospital in Japan.⁵⁻⁶ The first case of total gastrectomy in Japan was reported by Miyake *et al.* in 1918. Based on the fact that nodal metastasis was the most frequent type of spread, surgeons in Japan gradually focused on lymphadenectomy from around 1940, with the aim of eliminating any possible nodal metastasis and thus improving survival. Kuru *et al.* first stressed the use of systematic radical lymphadenectomy in 1935.⁷ Kajitani *et al.* in 1944 emphasized the importance of wide lymphadenectomy to eliminate any possible nodal metastasis.⁷

Jinnai *et al.* advocated the theory of systematic, radical lymphadenectomy and stressed the use of extended lymphadenectomy in 1961.⁷ Ohashi *et al.* reported 5-year survivors of gastric cancer treated with para-aortic nodal dissection in 1976 and Kajitani *et al.* introduced left upper abdominal quadrant evisceration for proximal advanced cancer in 1981.⁸⁻⁹ In 1989, Ohta *et al.* stressed the value of total gastrectomy combined with pancreaticosplenectomy for middle gastric cancer.¹⁰⁻¹¹ Near to the end of the 20th century, Japan would eventually become the first country to describe a laparoscopic approach to distal gastrectomy, performed by Kitano using a Billroth I reconstruction technique.¹² Peter Goh performed the first ever totally laparoscopic distal gastrectomy with a Billroth II reconstruction in 1992 for a patient with a chronic gastric ulcer.¹³⁻¹⁴

Since then, laparoscopic gastrectomy (LG) flourished among Eastern countries such as Japan, Korea, and China, gaining wide acceptance and popularity. The significantly higher prevalence of gastric cancer in these countries has allowed for the procedure to be refined over time, and facilitated the propagation of extensively accumulated experience. Standardization of the surgical technique in these regions has helped to ensure mastery of what is considered to be a technically demanding procedure.

Conversely, the lower incidence of gastric cancer in Western countries has resulted in significant variation with regard to the management of gastric cancer, largely due to paucity of studies and randomized data. Hence, the utilization of LG for gastric cancer surgery has been limited in the West, undertaken only by highly skilled gastric and laparoscopic surgeons in high volume centres.

LAPAROSCOPIC DISTAL GASTRECTOMY (LDG):

EARLY GASTRIC CANCER

There have been several randomized-controlled trials (RCTs) and meta-analyses that have investigated the safety, feasibility, and outcomes associated with LDG for early gastric cancer when compared to open gastrectomy (OG). One of the larger Japanese studies (1300 patients) found LDG to have acceptable perioperative outcomes (0% mortality and 15% morbidity) with impressive 5-year survival rates in Stage IA (99.8%) and Stage II (85%) gastric cancers.¹⁵

Another Japanese cohort study (LOC 1) included total, subtotal (61.3%), and proximal gastrectomies with 1848 patients (924 each for LDG and OG), and showed comparable 5-year survival (97.1% versus 96.3%), 3-year recurrence-free survival (97.7% versus 97.4%), and local recurrence rate (2.3% versus 2.4%), respectively.¹⁶ A non-inferiority randomised trial by the Japan Clinical Oncology Group (JCOG0912) involving 921 patients found no significant difference in short-term outcomes, and showed non-inferiority of LDG as compared to OG for 5-year relapse-free survival (95.1% versus 94%).¹⁷ Conversion to open was required in 16 patients (3.5%). Bowel obstruction was the most common adverse event seen in both the groups without any reported deaths.¹⁷

Amongst the Korean trials, the KLASS-1 randomised trial, involving 1400 patients with Stage I gastric cancer compared LDG and OG.¹⁸ The LDG group showed lower overall complications (13% vs 20%) and lower incidence of wound complications (3.6% vs 7%), without any difference in perioperative mortality. However, the number of lymph nodes retrieved in the LDG group was significantly less than that of the OG group. When observing long-term outcomes, 5-year survival (94.2% and 93.3%) and overall survival (97.1% and 97.2 %) were found to be identical in both LDG and OG respectively.¹⁸

The meta-analysis by Zhang *et al.*²¹ evaluated 1665 patients from 5 randomized trials and 11 case control studies over a 20-year period. Whereas the short-term outcomes were found to be superior compared to their open counterparts, no differences were observed in long term outcomes. Similar outcomes were noted previously by Huscher *et al.*¹⁹ in 2005 and by Vinuela *et al.*²⁰ in 2012.

Table 1 – Studies Investigating the Role of Minimally Invasive Distal Gastrectomy for Early Gastric Cancer

	Kitano et al	LOC – 1 trial	JCOG 0912 trial	KLASS – 01 trial	Zhang et al
Type of Study	Retrospective non-randomized Multi-centre	Cohort	Non-inferiority RCT Multi-centre	Prospective RCT	Meta-analysis 5 RCTs 11 Case Control
Intervention	LADG (91.5%) LATG (4.2%) LAPG (4.3%)	LAG (924) ODG (924)	LADG (462) ODG (459)	LADG (405) ODG (411)	LADG – 919 ODG - 746
Sample Size	1294	1848	921	1416	1665
Endpoints	Intra-op/Post-op Complications Conversion rate Recurrence 5-year Survival	3 – year recurrence Overall Survival	Primary Endpoint 5 - year RFS Secondary Endpoints Short term clinical outcomes	Primary Endpoint 5 - year OS Secondary Endpoints Disease free survival, morbidity and mortality, quality of life, inflammatory and immune response, and cost-effectiveness	Operative time, incision length, blood loss, harvested lymph nodes, time to flatus postoperatively, time to first oral intake postoperatively, use of analgesics, complications, duration of hospital stay, recurrence, and mortality
Conclusion	LAG is safe for EGC, with an oncologic outcome as good as that of conventional open surgery.	Strong enough evidence to suggest that LG is oncologically comparable to OG for gastric cancer.	5 – year RFS 94 % (ODG) 95.1% (LADG) Confirming non-inferiority of LADG	Similar overall and cancer-specific survival rates between laparoscopic and open distal gastrectomy	LADG associated with less trauma, blood loss, postoperative pain, serious complications, faster bowel recovery and shorter hospital stay. Longer operative times fewer harvested lymph nodes There was no difference in recurrence rates and mortality.

LOCALLY ADVANCED GASTRIC CANCER

Whereas data for LDG in early gastric cancers is much more robust, data regarding its application in locally advanced gastric cancer (LAGC) is still emerging. Laparoscopic surgery for LAGC differs in that it is a technically demanding procedure and should be performed in high volume centres that already have expertise in laparoscopic surgery for early gastric cancers. In these cases, oncological adequacy, especially with respect to sufficient lymph node clearance and margin adequacy, is of paramount importance. Increasing use of neoadjuvant perioperative chemotherapy in LAGC, has led to significant debulking of the primary disease and lymph nodes, making it amenable for minimally invasive approach.

A Chinese study investigating a small number of cases from a single centre observed 44 patients that had undergone surgery for LAGC following neoadjuvant chemotherapy.²² Although non-randomized, this study was able to demonstrate similar outcomes between LG and OG when comparing blood loss, operating time, lymph node retrieval, and margin status. Another retrospective study from China suggested that recurrence and survival rates for patients who have had LDG may correlate to the initial disease stage.²²

A publication by Kim et al.²³ sought to analyse the long-term outcomes of LG for LAGC in population of 3000 patients from multiple institutions over 7 years, half of them having laparoscopic and the other half open gastrectomy. While morbidity and mortality rates were similar in both groups, patients with stage IA disease exhibited better overall survival in the laparoscopic arm. Interestingly, disease free survival and recurrence rate were similar, thereby reinforcing the need for prospective randomized trials.²³

Several trials have demonstrated equivocal short-term and long-term outcomes with non-inferiority for laparoscopic vs open D2 dissections. The randomised (CLASS-01) trial which included 1000 patients with LAGC in China over 3 years was able to provide further clarity to the issue. D2 lymphadenectomy could be performed in more than 99% of study patients with comparable morbidity (15% vs 13%) and mortality (0.4% vs 0) in both groups. At three years, LG and OG resulted in similar overall survival (83% versus 85%), disease-free survival (77% versus 78%), and recurrence rates (19% versus 17%).²⁴⁻²⁸

A metanalysis by Choi et al.²⁹ sought to establish the oncological efficiency of laparoscopic gastrectomy for LAGC by looking at long-term outcomes as its primary endpoint. A total of 10 studies comprising one randomized control trial and several retrospective studies discovered 1816 patients who were included in this analysis. Among these, 859 had LG and 960 had open surgery. The authors showed that there was no statistical difference in the overall and disease-free survival between the two groups.²⁹

Another meta-analysis by Chen et al.³⁰ attempted to analyse survival rates, recurrence rates, surgical outcomes, and surgical complications. Two randomized controlled trials and 13 observational studies consisting of 2519 patients were appraised.³⁰ Laparoscopic gastrectomy was performed on 52% of patients and the remainder underwent OG. While there was longer operating time in the LG group, there was less blood loss, earlier return of bowel activity, shorter post-operative stay, and lower complications than OG. There was no significant difference in the number of lymph nodes harvested, margin distance, mortality, cancer recurrence and long-term survival rate when the two groups were compared. This led to the conclusion that LG is a safe and oncologically efficient approach for LAGC, with a lower complication rate and improved postoperative length of stay as compared to OG.³⁰

A systematic review and meta-analysis of randomized controlled studies by Beyer et al.³¹ attempted to determine the value of LG with D2 lymphadenectomy for LAGC compared to OG. Five randomized controlled trials, containing a collective total of 2157 patients, were included. They showed that LG for LAGC had similar short-term mortality and morbidity compared to OG.³¹ Regarding intraoperative outcomes, operative time was longer for LG, whereas the estimated intraoperative blood loss tended to be less. There was no statistical difference between length of stay, and passage of flatus. The number of nodes harvested and compliance with D2 lymphadenectomy did not significantly differ between the two groups, indicating that both approaches were oncologically equivalent.³¹ Long-term oncological outcomes were lacking in this review due to limited relevant data provided by the examined trials. Hence, although LG with D2 lymphadenectomy for LAGC was shown to be equivalent with respect to overall short-term morbidity and mortality, assessment of long-term outcomes requires further prospective randomized controlled trials.

Another large, randomized, non-inferiority trial (KLASS-02) compared LDG with D2 lymphadenectomy and OG in 1050 patients with LAGC using 3-year relapse-free survival rate as the primary end point.³² The secondary end-points were 3-year overall survival, morbidity and mortality, postoperative recovery index, and quality of life.³² Patients who underwent LG had significantly lower early morbidity (16.6%), postoperative analgesic, earlier passage of flatus (3.5 vs 3.7 days) and shorter postoperative hospital stay (8.1 vs 9.3 days). The mean number of harvested nodes and ninety-day mortality was similar in both groups (0.4% for LDG vs 0.6% for ODG). The results on long-term outcomes of this trial are currently still being analyzed and outcomes are awaited.

The Korean COACT trial compared non-compliance for lymph node dissection between LG and OG in 204 patients.³² They did not find any difference in the overall non-compliance node dissection rates in LG (47.0%) compared to OG (43.2%), but node harvest was significantly higher in LG group for clinical stage III disease (52% vs 25%). Despite this, there was no differences in 3-year DFS at all clinical stages.³² They also reported that dissection of enlarged nodes, particularly those that were supra pancreatic, and complete omentectomy technically demanding via the laparoscopic technique.³²

The Japanese multi-institutional, randomized, controlled trial, JLSSG0901, included 507 patients (252 in LG and 255 in OG arm) with LAGC recruited over a 7-year period.³³ These surgeries were performed by surgeons qualified in both procedures from 37 Japanese institutions.³³ The primary endpoint was 5-year relapse-free survival and secondary endpoints were 5-year overall survival, adverse events, and short-term clinical outcomes. Similar to the KLASS 02 trial, long-term endpoints for this study have yet to be analysed. In the short-term, LG brought lower estimated blood loss (30 vs. 150 ml), lower analgesic requirement (38.3% vs 53.6%), and faster return of flatus (2 vs 3 days), although operative times (291 min vs. 205 min) were longer.³³ There were no significant differences in overall intra-operative complications (LG 0.9% vs. OG 2.6%) or grade 3 or higher post-operative complications (LG 3.1% vs. OG 4.7%).³³

Table 2 – Studies Investigating the Role of Minimally Invasive Distal Gastrectomy for Locally Advanced Gastric Cancer

	Kim et al	Class-01	KLASS – 02 trial	JLSSG0901 trial	COACT 1001 trial	Chen et al	Beyer et al
Type of Study	Case Control Multi-centre	Non-inferiority Multi-centre RCT	Prospective RCT	Prospective RCT	Prospective Multi-centre RCT	Meta-analysis 8 RCTs 22 NRCTs	Systematic Review and Meta-analysis 5 RCTs
Intervention	LG (1477) OG (1499)	LADG (519) ODG (520)	LADG (526) ODG (524)	LADG (89) OG (91)	LADG (100) ODG (96)	LADG (7864) ODG (8165)	LADG (1079) ODG (1072)
Sample Size	2976	1056	1050	180	196	16029	2151
Endpoints	Long Term Oncological Outcomes 5-year OS/ DFS/RFS	Primary end point 3-year DFS with a noninferiority margin of -10% Secondary end 3-year OS and recurrence	Primary End- point 3-year relapse free survival Secondary Endpoint 3-year overall survival, morbidity and mortality, postoperative recovery index, and quality of life	Technical Safety and Short term surgi- cal outcomes	Primary endpoint Noncompliance rate of lymph node dissection Secondary endpoints 3-year DFS 5-year overall survival Surgical complica- tions Surgical stress response	Primary End- points Post-op complica- tions, anastomotic leak, length of stay Secondary End- points Operative time, blood loss, intra-op compli- cations, time to flatus, number of harvested nodes	Long Term Outcomes 3-year DFS 3-year OS 5-year OS Short Term Outcomes Postoperative com- plications: blood loss, hospital stay, time to first flatus, time to first liquid diet. Number of lymph nodes, mortality, intraoperative complications, intraoper- ative blood transfusion, time to ambulation
Conclusion	No statistical significance in long term oncological outcomes	Similar primary and secondary outcomes achieving non-inferiority criteria	Comparable 3-year RFS Better short -term outcomes in LADG group	Safety and feasi- bility of LADG established for short term out- comes	No significant differ- ence in primary or secondary endpoints	Overall short-term mortality and morbidity and D2 lymphadenectomy not impaired by a minimally inva- sive approach for locally advanced gastric cancer.	Long term outcomes comparable for LADG vs OGD LADG associated with longer surgical time and comparable node retrieval with OGD. All other short-term out- comes showed benefit with LADG

LAPAROSCOPIC TOTAL GASTRECTOMY (LTG):

Total gastrectomy is usually performed for tumours of the proximal stomach. It is considered to be a much more technically challenging procedure than distal gastrectomy for two main reasons, viz. the need for extended lymphadenectomy involving the distal splenic artery and splenic hilar nodes, and secondly, the reconstruction with an oesophagojejunostomy.³⁴ The extent of lymphadenectomy required to meet the criteria of D2 dissection in LTG includes stations 11d and 10 which are not routinely harvested for distal gastrectomy.³⁴

LYMPHADENECTOMY:

Traditionally, total gastrectomy with splenectomy was performed for proximal gastric cancers, or advanced cancers of the greater curvature of the stomach, to facilitate retrieval of splenic hilar nodes. Although splenectomy can be performed safely and efficiently in the laparoscopic setting, several studies have concluded that splenectomy increases postoperative morbidity and mortality without any consequent survival benefit.³⁵⁻⁴⁰

Alternatively, spleen-preserving hilar dissection has been advocated to provide appropriate staging and prognostic benefit.⁴¹ The rationale has been demonstrated in reports by Son et al⁴² which assessed the long-term therapeutic outcomes of spleen-preserving hilar dissection compared to traditional splenectomy. The trend toward splenic preservation has led to an understandable escalation in the degree of difficulty when performing LTG.

The difficulty of lymphadenectomy in this region is due to anatomical variation of the splenic hilar vessels, limited visibility and access. Hilar lymph node dissection, in particular, increases the risks of operative morbidity, especially with regard to pancreatic complications. A meta-analysis by Guerra et al⁴³ demonstrated a trend toward increased pancreas-related complications when performing LG compared to OG. Although several other studies have managed to demonstrate equivocal results,⁴³⁻⁴⁶ this is likely a reflection of technical expertise developed at high volume institutions.

RECONSTRUCTION:

Reconstruction after LTG can be performed by oesophagojejunostomy (OJS) facilitated by a limited laparotomy incision. There are currently several techniques available to perform intracorporeal anastomosis in LTG; use of a circular stapler tends to be favoured in view of its concurrent success in open procedures, especially in cases of limited intra-abdominal oesophageal length. In LTG, however, this may be challenging to perform, as fixing the anvil head into the oesophageal stump may prove tedious in a narrow and deep operative field, where access and adequate vision may be lacking. In addition, safe and secure apposition of the intestinal ends may be hindered by intervention of surrounding tissues. Unless performed by sufficiently experienced surgeons, there is the potential for anastomotic leakage and stenosis, especially when a circular stapling method is employed.^{47,48,49}

Due to these challenges, laparoscopic total gastrectomy (LTG) is seldom performed, despite several reports in favour of its appropriateness and safety. A survey of the Japan Society of Endoscopic Surgery in 2015 revealed that LTG accounts for a quarter performed (1556/6183) of all total gastrectomies, while LDG is performed for >50% (6884/12722) of distal gastrectomies.⁵⁰ However, a more recent report from the National Clinical Database has determined that LTG constitutes only 18% of all total gastrectomy procedures.⁵¹

A recent meta-analysis conducted by Chen et al.²⁹ comprised an analysis of fifteen trials. Compared to open gastrectomy (OG), LG involved a longer operating time, less blood loss, earlier time to flatus, shorter hospitalization and reduced complications. There was no significant difference in the number of harvested lymph nodes, margin distance, mortality, cancer recurrence rate or long-term survival rate between the AGC patients treated with LG vs OG.

Haverkamp et al⁵² compared the short-term outcomes of gastric cancer treatment in a meta-analysis of eight studies comparing LTG (n = 314) and OTG (n = 384). In this comparison, LTG was associated with a significant reduction of intraoperative blood loss, postoperative complications and hospitalization. The operating time was longer, but in-hospital mortality rates were comparable for LTG (0.9 %) and OTG (1.8 %).⁵²

Despite favourable results observed on retrospective review and cases series, LTG for both proximal EGC and LAGC is still being investigated in ongoing randomized controlled trials. The KLASS 03 trial⁵³ is a multicentre prospective randomized study of LTG that will evaluate the safety and feasibility of laparoscopy-assisted total gastrectomy for early upper gastric cancer compared with open total gastrectomy.⁵³ This will include assess surgical outcomes depending on the method of reconstruction used. The KLASS 06 randomized controlled trial⁵⁴ is also in progress and is designed to verify the efficacy of LTG with D2 node dissection compared with open surgery. The primary endpoint of this study is to determine non-inferiority to LTG for advanced gastric cancer in terms of 3-year relapse free survival. Secondary endpoints will consist of overall survival at 3 years, 5-year relapse free and overall survival, morbidity, mortality, and quality of life after LTG compared to OG.⁵⁴

LAPAROSCOPIC PROXIMAL GASTRECTOMY:

Laparoscopic proximal gastrectomy has been proposed as a possible alternative for proximal gastric cancer due to its potential functional superiority. Despite several theoretical advantages, its benefit over TG has not yet been proven in randomized controlled trials. According to the meta-analysis by Toshiro et al,⁵⁵ laparoscopic proximal gastrectomy is associated with similar short-term surgical outcomes, but there documented benefits that included smaller reduction in body weight, albumin, haemoglobin, total protein, and lymphocyte counts.⁵⁵

Many surgeons are reluctant to perform this operation, citing concerns about oncological safety and risk of reflux oesophagitis. Recently, Park et al⁵⁶ reported the use of a double tract reconstruction for proximal gastrectomy. This resulted in similar frequency of reflux symptoms when compared to total gastrectomy with conventional oesophagojejunostomy. This study was also able to demonstrate improved nutritional outcomes with proximal gastrectomy, such as prevention of anaemia and Vitamin B12 deficiency.⁵⁶ We await results of the KLASS 05 randomized controlled trial which will compare nutritional outcomes, severity of oesophagitis, and surgical outcomes.⁵⁷

Table 3 – Studies Investigating the Role of Minimally Invasive Total/Proximal Gastrectomy for Gastric Cancer

	Haverkamp et al	Chen et al	KLASS – 03 trial	KLASS – 05 trial	KLASS – 06 trial
Type of Study	Systematic Review and Meta-analysis 8 original Studies	Meta-analysis 2 RCTs 13 observational studies	Single-arm prospective Multi-center study	Multicentre, Prospective, RCT with superiority design.	Multicenter, Prospective, Phase III trial
Intervention	LTG (314) OG (384)	LTG (1327) OG (1192)	LTG (170)	LPG (62) LTG (62)	LTG D2 OTG D2
Sample Size	698	2519	168	138	772
Endpoints	Short-term outcomes of LTG vs OG	Operating time, blood loss, number of retrieved lymph nodes, proximal and distal margin distance, time to flatus, time to oral intake, length of hospital stays, morbidity and mortality, tumour recurrence and survival rate.	Primary Endpoint Morbidity and mortality Secondary Endpoint The surgical outcomes according to several methods of reconstruction and the postoperative course	Primary co-endpoints are haemoglobin change and vitamin B12 cumulative supplement quantity after 2 years of operation. Secondary endpoints are prevalence rate of postoperative reflux esophagitis, morbidity and mortality, quality of life 2-year after operations, relapse-free survival, and overall survival.	Primary endpoint: 3 year relapse free survival
Conclusion	LTG associated with significant reduction of intraoperative blood loss, reduced risk of postoperative complications and shorter hospital stay. These benefits were at the cost of longer operative time. In-hospital mortality rates were comparable for LTG	LG for AGC is safe and feasible, characterized by such advantages as less pain, fewer postoperative complications, and rapid recovery. LG to this group results in adequate lymphadenectomy and similar recurrence and survival rates as OG.	LTG performed by experienced surgeons showed acceptable postoperative morbidity and mortality for patients with clinical stage I gastric cancer.	Results pending	Primary Completion date: Dec 2022

ROBOTIC GASTRECTOMY:

Compared with conventional LG, robotic gastric surgery has the advantages of three-dimensional high-definition visualization, wristed and articulated movements, and improved ergonomics. To date, however, robotic gastric surgery has not yet been compared with LG in randomized trials.

In one of the few studies on robotic gastric surgery with long-term follow-up, 98 patients underwent robotic gastric resection including a D2 lymphadenectomy. The five-year overall survival was comparable to reported survival rates of gastric cancer treated with OG or LG.⁵⁹ Conversion to open surgery was required in 7.1% of patients, and postoperative complications occurred in 12.1%. Disease recurrence was recorded in 24.5% of patients, including 18% local recurrences.⁵⁹

There is currently an ongoing study in Japan - a single-institution phase III trial that opened in April 2018 - that randomizes patients with resectable gastric cancer to either LG or robotic gastrectomy. Endpoints include postoperative complications, surgical outcomes, and oncologic outcomes. The results are eagerly awaited after patient accrual ends in 2023.⁶⁰

WESTERN DATA:

The lower prevalence of GC in Western countries has resulted in fewer studies and no randomized trials. Many authorities express concern about the reproducibility of results from Asian studies, in view of the fundamental differences in the aetiology and treatment of GC in the Western World. Indeed, various reports have demonstrated better cancer-related survival in countries such as Japan and South Korea when compared to the rest of the world.⁶¹

This has been attributed to differences in tumour biology (diffuse vs intestinal), location (proximal vs distal), environmental exposure, dietary factors, and *Helicobacter Pylori* status. In addition, many nations in the East have established screening programs and detect disease at earlier stages. Differences in surgical treatment, particularly the use of extended lymphadenectomy that is routinely performed in Asian countries, are believed to be possible causes for these variations in outcomes.⁶²

In a study of 87 LGs and 87 matched OGs from the Memorial Sloan Kettering Cancer Centre, LG required longer operating time. However, this was balanced by a shorter length of stay (by 1 day), greater node yield (OR 1.16 to have ≥ 15 nodes), and fewer complications.⁶³ Both techniques resulted in comparable margin clearance and mortality rates.⁶³

The LOGICA Trial ⁶⁴ was prospective randomized multi-centre trial of LG versus OG in patients with resectable gastric adenocarcinoma from the Netherlands. In the LOGICA trial, LG was reported to have lower intra-operative blood loss, less postoperative complications and shorter hospital stay. Resection margin, lymph node retrieval and 5-year survival rate were comparable, although operative time was longer.

The Surgical Technique, Open versus Minimally Invasive Gastrectomy after Chemotherapy (STOMACH) trial is currently ongoing.⁶⁵ This study will randomize patients in a double-blind fashion to OG or LG and evaluate the quality of oncological resection, postoperative complications, mortality, and quality of life.⁶⁵

A review of European literature by Chevallay et al.⁶⁶ compared OG and LG for gastric cancer across 1 randomized trial and 13 cohort studies over 16 years. They reported longer operating times for LG, but similar node harvest, short-term, and long-term results. Based on these results, Chevallay et al.⁶⁶ suggested that laparoscopic surgery could be utilized safely in the European population.

Table 4 – Studies Investigating the Role of Minimally Invasive Surgery for Gastric Cancer in Western Countries

	LOGICA trial	STOMACH trial	Chevallay et al
Type of Study	Prospective, Randomized, clinical multicenter trial	Prospective, Randomized, clinical multicenter trial	Systematic review 1 RCT 13 Cohort studies
Intervention	cT1-4a, N0-3b, M0 LG OG	T1-3 N0-1 M0 Post neoadjuvant Chemo LTG OTG	LG TG
Sample Size	210	168	
Endpoints	Primary outcome is postoperative hospital stay (days). Secondary outcomes: postoperative morbidity and mortality, oncologic outcomes, readmissions, quality of life and cost-effectiveness.	Primary endpoint is quality of oncological resection, measured by radicality of surgery and number of retrieved lymph nodes. Secondary outcomes include patient-reported outcomes measures (PROMs) regarding quality of life, postoperative complications and cost-effectiveness.	

CONCLUSION:

Despite the unquestionable benefits of laparoscopic surgery in experienced hands, several aspects of gastric cancer surgery have limited its application, compared to other gastrointestinal malignancies. Firstly, the extent of resection required is associated with varying levels of difficulty depending on the location and nature of the disease. While subtotal or distal gastrectomy are relatively simple to perform, total and proximal gastrectomy have a steeper learning curve and mount significant challenge to achieve oncological clearance and reconstruction.

While laparoscopic gastrectomy for early gastric cancer has shown to be feasible, there remains controversy surrounding its use for locally advanced gastric cancer due to difficulty achieving appropriate margins node harvest. The lack of large, prospectively designed studies evaluating long-term survival has limited its adoption, particularly in western countries.

Currently, the existing data suggests that laparoscopic gastric cancer surgery be limited to use for early gastric cancer, preferably in the setting of a high-volume centre, performed by appropriately skilled surgeons. Within the confines of limited case numbers and resources in the Caribbean, a cautious approach to this modality should be undertaken, with involvement of individuals who possess the required expertise to ensure optimal outcomes.

REFERENCES:

1. Angst E, Hiatt JR, Gloor B, Reber HA, Hines OJ. Laparoscopic surgery for cancer: A systematic review and a way forward. **Journal of the American College of Surgeons**. 2010; 211: 412–23.
2. Bhandare MS, Chaudhari V, Shrikhande S V. Surgery for Gastric Cancer: State of the Art. **Indian Journal of Surgery**. 2020;1–11.
3. Rawla P, Barsouk A. Epidemiology of gastric cancer: Global trends, risk factors and prevention. **Przegląd Gastroenterologiczny**. 2019; 14: 26–38.
4. Jamieson GG, Debas HT. Partial gastrectomy (and antrectomy) with a gastroduodenal anastomosis: Billroth I gastrectomy. In: *Surgery of the Upper Gastrointestinal Tract*. Springer US; 1994. p. 414–9.
5. Zhang C-D, Yamashita H, Seto Y. Gastric cancer surgery: historical background and perspective in Western countries versus Japan. **Annals of Translational Medicine**. 2019;7(18):493–493.
6. Zhang C-D, Yamashita H, Seto Y. Gastric cancer surgery: historical background and perspective in Western countries versus Japan. **Annals of Translational Medicine**. 2019; 7(18):70–70.
7. Furukawa H, Hiratsuka M, et al. Total gastrectomy with dissection of lymph nodes along the splenic artery: a pancreas-preserving method. *Annals of Surgical Oncology*. 2000; 7(9): 669–73.
8. Maruyama K, Sasako M, et al. Pancreas-preserving total gastrectomy for proximal gastric cancer. **World Journal of Surgery**. 1995; 19(4): 532–536.
9. Otsuji E, Yamaguchi T, Sawai K, Okamoto K, Takahashi T. Total gastrectomy with simultaneous pancreatico-splenectomy or splenectomy in patients with advanced gastric carcinoma. **British Journal of Cancer**. 1999; 79(11–12): 1789–93.
10. Ohta K, Nishi M, Nakajima T, Kajitani T. Indications for total gastrectomy combined with pancreaticosplenectomy in the treatment of middle gastric cancer. **Nihon Geka Gakkai Zasshi**. 1989; 90 (9): 1326–1330.
11. Kitano S, Iso Y, Moriyama M, Sugimachi K. Laparoscopy-assisted Billroth I gastrectomy. **Surgical Laparoscopy, Endoscopy and Percutaneous Techniques**. 1994; 4(2): 146–148.
12. Song KY, Yoo HM, Lee HH, Shim JH, Jeon HM, Park CH. Laproscopic Surgery for Gastric Cancer. **Management of Gastric Cancer**. 2011. Chapter 16465. DOI: 10.5772/17495
13. Goh P, Tekant Y, Isaac J, Kum CK, Ngoi SS. The technique of laparoscopic Billroth II gastrectomy. **Surgical Laparoscopy, Endoscopy and Percutaneous Techniques**. 1992; 2(3): 258–260.
14. Kitano S, Shiraishi N, Uyama I, Sugihara K, Tanigawa N, Inomata M, et al. A multicenter study on oncologic outcome of laparoscopic gastrectomy for early cancer in Japan. **Annals of Surgery**. 2007; 245(1): 68–72.
15. Honda M, Hiki N, Kinoshita T, Yabusaki H, Abe T, Nunobe S, et al. Long-term Outcomes of Laparoscopic Versus Open Surgery for Clinical Stage I Gastric Cancer: The LOC-1 Study. **Annals of Surgery**. 2016; 264(2): 214–222.
16. Katai H, Mizusawa J, Katayama H, Takagi M, Yoshikawa T, Fukagawa T, et al. Short-term surgical outcomes from a phase III study of laparoscopy-assisted versus open distal gastrectomy with nodal dissection for clinical stage IA/IB gastric cancer: Japan Clinical Oncology Group Study JCOG0912. **Gastric Cancer**. 2017; 20(4): 699–708.
17. Kim HH, Han SU, Kim MC, Kim W, Lee HJ, Ryu SW, et al. Effect of Laparoscopic Distal Gastrectomy vs Open Distal Gastrectomy on Long-term Survival among Patients with Stage i Gastric Cancer: The KLASS-01 Randomized Clinical Trial. **JAMA Oncology**. 2019; 5(4): 506–513.
18. Huscher CGS, Mingoli A, Sgarzini G, Sansonetti A, Di Paola M, Recher A, et al. Laparoscopic versus open subtotal gastrectomy for distal gastric cancer: Five-year results of a randomized prospective trial. **Annals of Surgery**. 2005; 241(2): 232–237.
19. Viñuela EF, Gonen M, Brennan MF, Coit DG, Strong VE. Laparoscopic versus open distal gastrectomy for gastric cancer: A meta-analysis of randomized controlled trials and high-quality nonrandomized studies. **Annals of Surgery**. 2012; 255: 446–456.
20. Zhang CD, Chen SC, Feng ZF, Zhao ZM, Wang JN, Dai DQ. Laparoscopic versus open gastrectomy for early gastric cancer in Asia: A meta-analysis. **Surgical Laparoscopy, Endoscopy and Percutaneous Techniques**. 2013; 23: 365–377.

21. Li Z, Shan F, Wang Y, Li S, Jia Y, Zhang L, et al. Laparoscopic versus open distal gastrectomy for locally advanced gastric cancer after neoadjuvant chemotherapy: safety and short-term oncologic results. **Surgical Endoscopy**. 2016; 30(10): 4265–4271.
22. Kim HH, Han SU, Kim MC, Hyung WJ, Kim W, Lee HJ, et al. Long-term results of laparoscopic gastrectomy for gastric cancer: A large-scale case-control and case-matched Korean multicenter study. **Journal of Clinical Oncology**. 2014; 32(7): 627–633.
23. Yu J, Huang C, Sun Y, Su X, Cao H, Hu J, et al. Effect of Laparoscopic vs Open Distal Gastrectomy on 3-Year Disease-Free Survival in Patients with Locally Advanced Gastric Cancer: The CLASS-01 Randomized Clinical Trial. **Journal of the American Medical Association**. 2019; 321(20): 1983–1992.
24. Chen X, Feng X, Wang M, Yao X. Laparoscopic versus open distal gastrectomy for advanced gastric cancer: A meta-analysis of randomized controlled trials and high-quality nonrandomized comparative studies. **European Journal of Surgical Oncology**. 2020; 46: 1998–2010.
25. Lu C, Zhou S, Peng Z, Chen L. Quality of D2 lymphadenectomy for advanced gastric cancer: is laparoscopic-assisted distal gastrectomy as effective as open distal gastrectomy? **Surgical Endoscopy**. 2015; 29(6): 1537–4154.
26. Quan Y, Huang A, Ye M, Xu M, Zhuang B, Zhang P, et al. Comparison of laparoscopic versus open gastrectomy for advanced gastric cancer: an updated meta-analysis. **Gastric Cancer**. 2016; 19(3): 939–950.
27. Huang YL, Lin HG, Yang JW, Jiang FQ, Zhang T, Yang HM, et al. Laparoscopy-assisted versus open gastrectomy with D2 lymph node dissection for advanced gastric cancer: A meta-analysis. **Internet Journal of Clinical and Experimental Medicine** 2014; 7(6): 1490–1499.
28. Choi YY, Bae JM, An JY, Hyung WJ, Noh SH. Laparoscopic gastrectomy for advanced gastric cancer: Are the long-term results comparable with conventional open gastrectomy? A systematic review and meta-analysis. **Journal of Surgical Oncology**. 2013; 108(8): 550–556.
29. Chen K, Xu XW, Mou YP, Pan Y, Zhou YC, Zhang RC, et al. Systematic review and meta-analysis of laparoscopic and open gastrectomy for advanced gastric cancer. **World Journal of Surgical Oncology**. 2013; 11(1): 182.
30. Beyer K, Baukloh AK, Kamphues C, Seeliger H, Heidecke CD, Kreis ME, et al. Laparoscopic versus open gastrectomy for locally advanced gastric cancer: A systematic review and meta-analysis of randomized controlled studies. **World Journal of Surgical Oncology**. 2019; 17(1): 1–19.
31. Hur H, Lee HY, Lee HJ, Kim MC, Hyung WJ, Park YK, et al. Efficacy of laparoscopic subtotal gastrectomy with D2 lymphadenectomy for locally advanced gastric cancer: The protocol of the KLASS-02 multicenter randomized controlled clinical trial. **BMC Cancer**. 2015;15(1): 354–355.
32. Inaki N, Etoh T, Ohyama T, Uchiyama K, Katada N, Koeda K, et al. A Multi-institutional, Prospective, Phase II Feasibility Study of Laparoscopy-Assisted Distal Gastrectomy with D2 Lymph Node Dissection for Locally Advanced Gastric Cancer (JLSSG0901). **World Journal of Surgery**. 2015; 39(11): 2734–2741.
33. Japanese Gastric Cancer Association. Japanese gastric cancer treatment guidelines 2014 (ver. 4). **Gastric Cancer**. 2017;20(1):1–19.
34. Csendes A, Burdiles P, Rojas J, Braghetto I, Diaz JC, Maluenda F. A prospective randomized study comparing D2 total gastrectomy versus D2 total gastrectomy plus splenectomy in 187 patients with gastric carcinoma. **Surgery**. 2002; 131(4): 401–407.
35. Nakata K, Nagai E, Ohuchida K, Shimizu S, Tanaka M. Technical feasibility of laparoscopic total gastrectomy with splenectomy for gastric cancer: clinical short-term and long-term outcomes. **Surgical Endoscopy**. 2015; 29(7): 1817–1822.
36. Yu W, Choi GS, Chung HY. Randomized clinical trial of splenectomy versus splenic preservation in patients with proximal gastric cancer. **British Journal of Surgery**. 2006; 93(5): 559–563.
37. Oh SJ, Hyung WJ, Li C, Song J, Kang W, Rha SY, et al. The effect of spleen-preserving lymphadenectomy on surgical outcomes of locally advanced proximal gastric cancer. **Journal of Surgical Oncology**. 2009; 99(5): 275–280.
38. Yang K, Chen XZ, Hu JK, Zhang B, Chen ZX, Chen JP. Effectiveness and safety of splenectomy for gastric carcinoma: A meta-analysis. **World Journal of Gastroenterology**. 2009; 15(42): 5352–5359.
39. Sano T, Sasako M, Mizusawa J, Yamamoto S, Katai H, Yoshikawa T, et al. Randomized controlled trial to evaluate splenectomy in total gastrectomy for proximal gastric carcinoma. **Annals of Surgery**. 2017; 265(2): 277–283.

40. Kosuga T, Ichikawa D, Okamoto K, Komatsu S, Shiozaki A, Fujiwara H, et al. Survival benefits from splenic hilar lymph node dissection by splenectomy in gastric cancer patients: Relative comparison of the benefits in subgroups of patients. *Gastric Cancer*. 2011; 14(2): 172–177.
41. Son T, Kwon IG, Lee JH, Choi YY, Kim H II, Cheong JH, et al. Impact of splenic hilar lymph node metastasis on prognosis in patients with advanced gastric cancer. *Oncotarget*. 2017; 8(48): 84515–28.
42. Guerra F, Giuliani G, Iacobone M, Bianchi P, Pietro, Coratti A. Pancreas-related complications following gastrectomy: systematic review and meta-analysis of open versus minimally invasive surgery. *Surgical Endoscopy*. 2017; 31: 4346–56.
43. Yu HW, Jung DH, Son SY, Lee CM, Lee JH, Ahn SH, et al. Risk factors of postoperative pancreatic fistula in curative gastric cancer surgery. *Journal of Gastric Cancer*. 2013; 13(3): 179–184.
44. Obama K, Okabe H, Hosogi H, Tanaka E, Itami A, Sakai Y. Feasibility of laparoscopic gastrectomy with radical lymph node dissection for gastric cancer: From a viewpoint of pancreas-related complications. *Surgery*. 2011; 149(1): 15–21.
45. Akateh C, Cloyd JM. Minimally invasive gastrectomy and the risk of pancreas-related morbidity. *Laparoscopic Surgery*. 2018; 2: 24–25.
46. Kawamura H, Ohno Y, Ichikawa N, Yoshida T, Homma S, Takahashi M, et al. Anastomotic complications after laparoscopic total gastrectomy with esophagojejunostomy constructed by circular stapler (OrViL™) versus linear stapler (overlap method). *Surgical Endoscopy*. 2017; 31(12): 5175–5182.
47. Inokuchi M, Otsuki S, Fujimori Y, Sato Y, Nakagawa M, Kojima K. Systematic review of anastomotic complications of esophagojejunostomy after laparoscopic total gastrectomy. *World Journal of Gastroenterology*. 2015; 21: 9656–9665.
48. Umemura A, Koeda K, Sasaki A, Fujiwara H, Kimura Y, Iwaya T, et al. Totally laparoscopic total gastrectomy for gastric cancer: Literature review and comparison of the procedure of esophagojejunostomy. *Asian Journal of Surgery*; 2015; 38: 102–112.
49. Inomata M, Shiroshta H, Uchida H, Bandoh T, Akira S, Yamaguchi S, et al. Current status of endoscopic surgery in Japan: The 14th National Survey of Endoscopic Surgery by the Japan Society for Endoscopic Surgery. *Asian Journal of Endoscopic Surgery*. 2020; 13(1): 7–18.
50. Kodera Y, Yoshida K, Kumamaru H, Kakeji Y, Hiki N, Etoh T, Honda M, Miyata H, Yamashita Y, Seto Y, Kitano S, Konno H. Introducing laparoscopic total gastrectomy for gastric cancer in general practice: a retrospective cohort study based on a nationwide registry database in Japan. *Gastric Cancer*. 2019; 22(1): 202–13.
51. Haverkamp L, Weijs TJ, Van Der Sluis PC, Van Der Tweel I, Ruurda JP, Van Hillegersberg R. Laparoscopic total gastrectomy versus open total gastrectomy for cancer: A systematic review and meta-analysis. Vol. 27, *Surgical Endoscopy*. 2013; 27: 1509–1520.
52. Cho GS. Laparoscopy-assisted Total Gastrectomy for Clinical Stage I Gastric Cancer (KLASS-03). *ClinicalTrials.gov*. 2014; Available at: <https://clinicaltrials.gov/ct2/show/NCT01584336>
53. Hyung WJ. Trial for Application of Laparoscopic Total Gastrectomy With Lymph Node Dissection for Gastric Cancer (KLASS-06). *ClinicalTrials.gov*. Available at: <https://clinicaltrials.gov/ct2/show/NCT03385018>
54. Tanioka T, Waratchanont R, Fukuyo R, Saito T, Umebayashi Y, Kanemoto E, et al. Surgical and nutritional outcomes of laparoscopic proximal gastrectomy versus total gastrectomy: a meta-analysis. *Surgical Endoscopy*. 2020; 34: 1061–1069.
55. Park JY, Park KB, Kwon OK, Yu W. Comparison of laparoscopic proximal gastrectomy with double-tract reconstruction and laparoscopic total gastrectomy in terms of nutritional status or quality of life in early gastric cancer patients. *European Journal of Surgical Oncology*. 2018; 44(12): 1963–1970.

56. Park DJ, Kim H-H, Han SU, Hyung WJ, Hwang S-H, Hur H, et al. Multicenter prospective randomized controlled trial of comparing laparoscopic proximal gastrectomy and laparoscopic total gastrectomy for upper third early gastric cancer (KLASS-05). *Journal of Clinical Oncology*. 2019; 37(4): S183–184.
57. Suda K, Man-i M, Ishida Y, Kawamura Y, Satoh S, Uyama I. Potential advantages of robotic radical gastrectomy for gastric adenocarcinoma in comparison with conventional laparoscopic approach: A single institutional retrospective comparative cohort study. *Surgical Endoscopy*. 2015; 29(3): 673–685.
58. Uyama I, Suda K, Nakauchi M, Kinoshita T, Noshiro H, Takiguchi S, et al. Clinical advantages of robotic gastrectomy for clinical stage I/II gastric cancer: a multi-institutional prospective single-arm study. *Gastric Cancer*. 2019; 22(2): 377–385.
59. Ojima T, Nakamura M, Nakamori M, Hayata K, Katsuda M, Kitadani J, et al. Robotic versus laparoscopic gastrectomy with lymph node dissection for gastric cancer: study protocol for a randomized controlled trial. *Trials*. 2018; 19(1): 409.
60. Bickenbach K, Strong VE. Comparisons of gastric cancer treatments: East vs. West *Journal of Gastric Cancer*. 2012; 12: 55–62.
61. Yamamoto M, Rashid OM, Wong J. Surgical management of gastric cancer: The East vs. West perspective. *Journal of Gastrointestinal Oncology*. 2015; 6: 79–88.
62. Novotny AR, Schuhmacher C, Busch R, Kattan MW, Brennan MF, Siewert JR. Predicting individual survival after gastric cancer resection: Validation of a U.S.-derived nomogram at a single high-volume center in Europe. *Annals of Surgery*. 2006; 243(1): 74–81.
63. van der Veen A, Brenkman HJF, Seesing MFJ, Haverkamp L, Luyer MDP, Nieuwenhuijzen GAP, et al. Laparoscopic Versus Open Gastrectomy for Gastric Cancer (LOGICA): A Multicenter Randomized Clinical Trial. *Journal of Clinical Oncology*. 2021; 39(9): 978–989.
64. Straatman J, van der Wielen N, Cuesta MA, Gisbertz SS, Hartemink KJ, Alonso Poza A, et al. Surgical techniques, open versus minimally invasive gastrectomy after chemotherapy (STOMACH trial): Study protocol for a randomized controlled trial. *Trials*. 2015; 16(1): 123–124.
65. Chevallay M, Jung M, Berth F, Seung-Hun C, Morel P, Mönig S. Laparoscopic Surgery for Gastric Cancer: The European Point of View. *Journal of Oncology*. 2019; 8738501: 1–5.

ORIGINAL RESEARCH CONTRIBUTION
Multiple Retained Intra-Myocardial and Aortic Root Shotgun Pellets: A Case Report
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ABSTRACT:

Introduction: The management of retained cardiac shotgun pellets and other missiles is controversial. This is largely due to the limited number of patients that survive such penetrating cardiac trauma. Currently, no standard clinical treatment protocol exists. This report illustrates successful non-operative management of the clinically asymptomatic patient with multiple retained intramyocardial and aortic root shotgun pellets.

Report of a Case: A 56-year-old male sustained a shotgun injury to the chest. At initial presentation, a left hemo-pneumothorax was diagnosed with multiple pellets scattered across the lung fields and mediastinum. A Computed Tomography scan showed four retained intramyocardial pellets with one pellet in close proximity to the right coronary sulcus. The patient remained hemodynamically stable and clinically asymptomatic throughout admission. Non-operative management was undertaken without surgical removal of the pellets and the patient was successfully discharged to outpatient follow-up.

Conclusion: There is no consensus for the treatment of retained cardiac shotgun pellets. However, this case showed that conservative management of retained cardiac shotgun pellets can sometimes be well tolerated. Close long-term follow-up should be instituted for possible late complications.

INTRODUCTION

The management of retained cardiac shotgun pellets and other missiles is still controversial. This is largely due to the limited number of patients that survive such penetrating cardiac trauma. Treatment options include conservative management, surgical removal, and pericardial drainage. This is individualized, and typically based on location of pellets and associated clinical status of the patient.

We report a case of successful conservative management of multiple pellets lodged in myocardium and aortic root following shotgun injury. To the best of our knowledge, this is first reported case of a pellet close to the origin of right coronary artery in association with multiple intramyocardial pellets.

REPORT OF A CASE

A 56-year-old man presented to the emergency department after sustaining shotgun wounds to multiple areas of the body. At initial presentation, he was hemodynamically stable, with a patent airway. However, chest examination revealed decreased breath sounds and dull percussion notes in left lung base. There were multiple sub-centimeter pellet entry wounds over the anterior chest wall and upper abdomen. His heart sounds were normal, with no murmurs, and his abdomen was soft and non-tender. Focused Assessment with Sonography for Trauma scan showed no pericardial fluid. Continuous ECG monitoring showed sinus rhythm with a pulse of 87 and no evidence of myocardial ischemia. A 32 French left intercostal drain was inserted and 300mls of blood was drained. The position of the intercostal drain placed was confirmed via chest radiograph (Figure 1). There were 14 pellets visible on radiographs: three at the sternal end of the left clavicle and nine overlying the cardiac silhouette and great vessels. In retrospect, a lateral chest radiograph would have been a useful investigation to provide further information on the pellet locations, while awaiting further imaging.

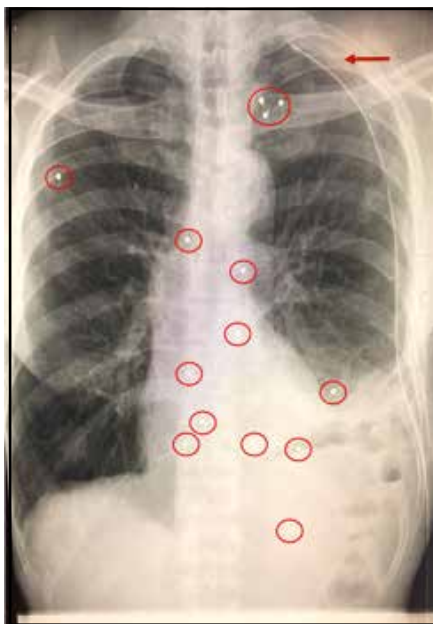


Figure 1: Plain erect chest radiograph showing multiple pellets scattered across lung fields and mediastinum (encircled in red). A left-sided intercostal drain is seen in-situ (arrow)

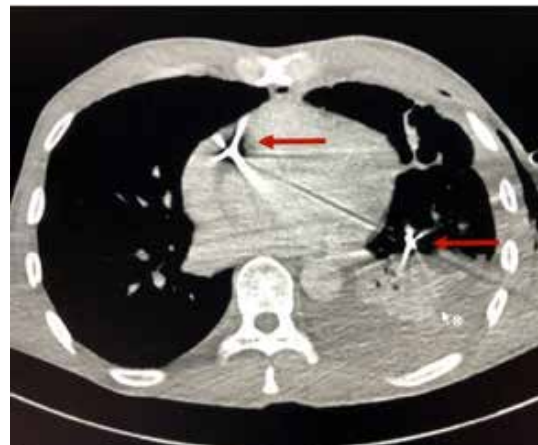
On admission, the patient's blood pressure was 144/87 mmHg, pulse rate was 110 beats per minute, respiratory rate was 22 breaths per minute and oxygen saturations were 92% on room air. These parameters improved after fluid resuscitation and adequate analgesia. Hemoglobin levels remained at 12g/dL throughout admission. Although Troponin levels were elevated at 590ng/L, there were no clinical symptoms or signs of cardiac ischemia.

A Computerized Tomography (CT) scan was obtained to evaluate the location of retained pellets and identify underlying injuries. Pellets were visualized within the left ventricle, left lower lobe of the lung and in close proximity to the proximal right coronary artery as illustrated by Figures 2a, 2b, 2c and 2d. There was also a pellet lodged in wall of stomach, but no other evidence of intraabdominal injury. The pellets seen on radiographs at medial end of left clavicle were actually subcutaneous.

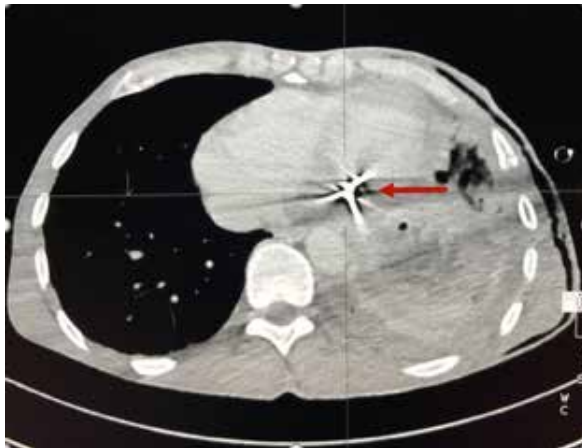
2a]



2b]



2c]



2d]

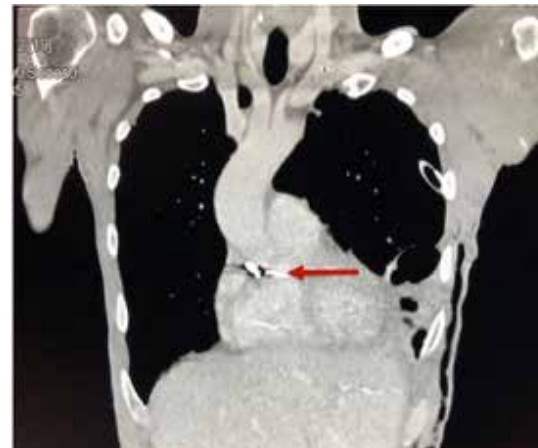


Figure 2: Axial slices of a CT scan demonstrating the location of retained pellets (arrows). Fig 2a demonstrates pellets in the left ventricular myocardium. Fig 2b demonstrates a myocardial pellet and one within the lower lobe of the left lung. Fig 2c demonstrates a pellet in the posterior wall of left ventricle and 2d demonstrates a pellet in close proximity of the right coronary artery.

A transthoracic echocardiogram was acquired and this showed one pellet in the apex of the left ventricle, one in inferior wall of left ventricle and two in the inferolateral wall of the left ventricle. The apical pellet is highlighted in figure 3. Left ventricular systolic function was preserved with an ejection fraction of 65%. A mildly dilated aortic root with no significant valvular pathology was noted and no pericardial fluid was seen.



Figure 3: Images obtained during trans-thoracic echocardiography demonstrating retained shotgun pellets (arrows) in left ventricle

This patient remained asymptomatic and clinically stable. Over the subsequent days, Troponins trended down to normal levels. The chest drain was removed four days post-admission, after resolution of the air leak. After a post drain-removal chest x-ray showed no evidence of retained hemothorax or pneumothorax, the patient was discharged for continued outpatient follow-up.

DISCUSSION

It is uncommon to encounter an asymptomatic survivor from this type of injury, given the high mortality of shotgun injuries to the heart.¹ A review of the literature from 1940 to 1988 by Symbas et al.¹ reported 7 patients with 18 retained cardiac pellets, of which one was intra-myocardial, four partially intra-myocardial and 13 intra-cavitary. The patient with an intra-myocardial pellet in that paper was also asymptomatic and had been managed conservatively.¹ In more contemporary literature, Filgueras-Rama et al.² in 2009 and Alfanzo et al.³ in 2007 each reported success with conservative management of a patient with a single retained pellet in myocardium of inter-ventricular septum. In 2012, Elbey et al.⁴ reported successful conservative management of a patient with a shotgun pellet lodged in right ventricle. And in 2016, Zhenghua Xiao et al.⁸ conservatively managed a clinically asymptomatic patient with a bullet lodged in the aortic root.

As the patient in our report remained asymptomatic, we made no attempt to surgically remove the five retained pellets. We managed him conservatively with surveillance imaging and ECG surveillance. We believe that ECG surveillance is important to rule out arrhythmias and ischemia, especially in the presence of penetrating injuries and elevated troponins. Also, imaging with echocardiography will elucidate any structural complications.

The literature suggests that patients with pellets embedded in myocardium usually remain symptom free, with no reported long-term complications for follow-up periods of as long as 15 years.⁵ We acknowledge that conservative management of cardiac foreign bodies does come with risks (systemic embolization, fistula formation and risk of infection), but operative removal may also bring associated complications (post-operative hemorrhage, pericarditis and arrhythmias). We agree, therefore, that management of these cases should be individually tailored to the individual, degree of symptoms and clinical setting.¹

In our case, preliminary CT imaging suggested that there was a pellet within close proximity of the right coronary artery. However, there was no pellet in this location when the patient was evaluated with trans-thoracic echocardiography. This illustrates the value of complimentary imaging with CT and trans-thoracic echocardiography when trans-esophageal echocardiography, the most accurate imaging modality,⁶ is not readily available.

We acknowledge that surveillance must continue for potential long-term complications involving the right coronary artery, such as pseudoaneurysm and intra-luminal pellet erosion / occlusion. One such case of pellet occlusion of the right coronary artery that caused an inferior myocardial infarction was reported by La Vecchia et al.⁹ in 2001.

CONCLUSION

Currently, there is no consensus for the treatment, but this case adds to the existing evidence that conservative management of retained cardiac shotgun pellets may be a viable option in a clinically asymptomatic and hemodynamically stable patient. However, we advocate that treatment should be tailored to the clinical presentation and close long-term surveillance is important to detect late complications.

REFERENCES

1. Symbas PN, Picone AL, Hatcher C R, Vlasits-Hale SE. Cardiac Missiles. A review of the literature and personal experience. *Annals of Surgery*. 1990; 211(5): 639-648.
2. Filgueras-Rama D, Moreno-Yanguela M, Ruiz-Cantador J, Martín-Reyes R, Navas-Lobato MA, López-Sendón JL. A lucky cardiac shotgun? *European Heart Journal*. 2009; 30(3): 462-463.
3. Cañas A, Almodóvar LL, Lima PP, Buendía JA. Cardiac Shotgun Pellet in the Interventricular Septum. *Revista Española de Cardiología*. 2007; 60(9): 994-995.
4. Elbey MA, Yavuz C, Cil H, Islamoglu Y. The medical approaching to a pellet injury of the heart. *European Review for Medical and Pharmacological Sciences*. 2012; 16(1): 68-70.
5. Kanyal R, Arshad W, Kurbaan A, Xiao HB. A Tale of Comet Tail: Multiple Pellets in the Heart. *British Medical Journal Case Reports*. 2014; bcr2014205012.
6. Hashimi MW, Jenkins DR, McGwier BW, Massey CV, Alpert MA. Comparative Efficacy of Transthoracic and Transoesophageal Echocardiography in Detection of an Intracardiac Bullet Fragment. *Chest*. 1994; 106(1): 299-300.
7. Yasim A, Tasdemir K, Kahraman C, Emirogullari N, Ceyran H. Penetrating cardiac injuries. *Turkish Journal of Thoracic and Cardiovascular Surgery*. 2018; 16(4): 228-231.
8. Xiao Z, Gu J, Qin C, Zhang E. Bullet incarcerated in aortic root. *European Heart Journal*. 2016; 37(8): 659.
9. LaVecchia, Rubboli A, Paccanaro M, Varotto L, Fontanelli A. Acute Total Occlusion of Right Coronary Artery by a Pellet. *Circulation*. 2001; 104(8): e40.

ORIGINAL RESEARCH CONTRIBUTION
Aneurysm of the Extracranial Internal Carotid Artery
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ABSTRACT

Although extra-cranial carotid artery aneurysms are rare, they are important because they carry a high risk of thrombo-embolic events and rupture. We report a case of a patient with an extra-cranial carotid artery aneurysm to highlight the clinical presentations.

Keywords: Aneurysm, carotid artery

INTRODUCTION

Extracranial carotid artery aneurysms (ECCA) are rare. Although rare, their importance lies with their high risk of thromboembolic events and rupture. We report a case of operative resection of an ECCA in a 70-year-old female with a right neck mass.

CASE REPORT

A 70-year-old female with hypercholesterolaemia noticed a lump on the right side of her neck for two years, that rapidly increased in size over a one month. There were no symptoms associated with the mass. She had no chronic illnesses, was on no medication, exercised regularly and never smoked.

On clinical examination significant findings were restricted to the neck where there was a 3cm hard, pulsatile, expansile mass immediately inferior to the angle of the right mandible. There was an audible bruit over the mass. Computed axial tomography (CT) scans confirmed the presence of a 3 cms aneurysm of an extremely tortuous extracranial portion of the right internal carotid artery. Given the large size of the aneurysm with its attendant risk of rupture and embolization, she was offered repair.

At the time of operation, an incision anterior to the border of the right sternocleidomastoid was made and the aneurysm exposed. Due to its tortuosity, the internal carotid artery proximal and distal to the aneurysm was easily controlled directly. The hypoglossal nerve, which was stretched over the aneurysm, was dissected off of the aneurysm sac and retracted out of the way. After Heparin 5000 IU was given intravenously, the internal carotid artery was clamped proximal and distal to the aneurysm sac. There was no shunt used in this case. The aneurysmal sac was excised and continuity of the internal carotid artery was restored by an end-to-end anastomosis using a 7/0 Prolene continuous suture (Figure 1).

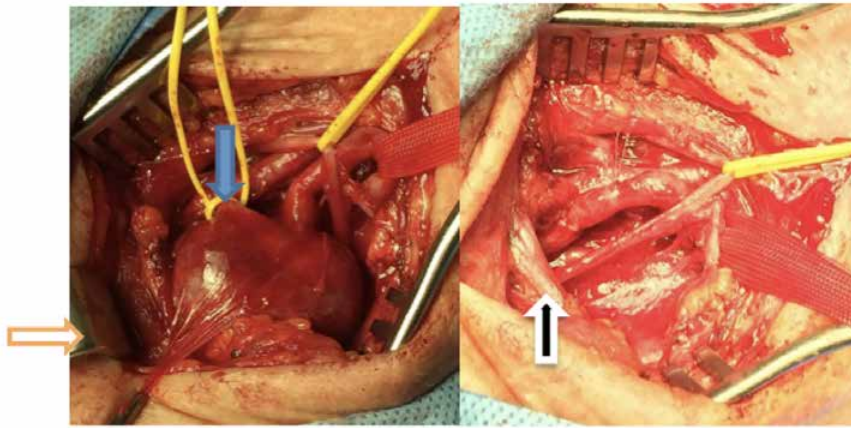


Figure 1: A view of the operative field. The hypoglossal nerve (blue arrow) has been dissected off the aneurysm sac (white arrow) and retracted. In the image on the right, the aneurysm has been excised and an end-to-end primary anastomosis (black arrow) has been created to restore continuity.

The patient was discharged on postoperative day one, but was readmitted on postoperative day two complaining of an inability to swallow. There were no neurological deficits on clinical examination. She was spitting up her saliva and was unable to swallow. She underwent a CT scan of her brain and neck on postoperative day three, which showed a small neck haematoma, but no evidence of an infarct. On postoperative day four a nasogastric tube was passed and enteral feeding commenced. A swallow study was performed with water soluble contrast, which showed micro-aspiration, but no other anatomical or functional defect. An indirect laryngoscopy was performed which was normal.

Her swallowing slowly improved, and she was discharged on day four post readmission, tolerating a soft diet. Histology was consistent with an atherosclerotic aneurysm. Her dysphagia resolved over the next six months. Five years post procedure she is asymptomatic and tolerating a normal diet.

DISCUSSION

Aneurysms of the extracranial carotid artery (ECCA) are rare. They account for <1% of all peripheral arterial aneurysms, with a reported incidence of 0.2-5% of all carotid surgeries.¹ The aetiology of ECCA aneurysms is multifactorial, but most are atherosclerotic. Other aetiologies include trauma, infection, dissection, and fibromuscular dysplasia. Younger patients presenting with ECCA aneurysms require investigation for infectious diseases such as tuberculosis, human immunodeficiency virus and syphilis.

Most ECCA aneurysms are asymptomatic. When symptomatic, they typically present as a pulsatile enlarging neck mass. Other presentations include exertional dyspnoea, rupture, or Horner's syndrome due to compression of the superior cervical ganglion.² Their clinical significance lies in the risk of thromboembolic events and rupture. Due to these catastrophic complications, elective repair of these aneurysms is indicated.

Several surgical options exist, including open surgical repair with primary anastomosis, interposition grafting, aneurysmectomy with patch closure of the wall defect for saccular aneurysms, and endovascular techniques. Ligation of the internal carotid artery (ICA) has been of historical interest since 1952 when Dimtza³ performed the first successful aneurysm excision and end-to-end anastomosis. McCann et al⁴ showed a stroke risk of 25% and a mortality rate of 20% following ligation of the ICA.

The choice of technique depends on the anatomy of the aneurysm, patient specific factors, and available expertise and resources. In our case the internal carotid artery provided enough length after resection of the aneurysm sac to allow for a primary anastomosis. Garg et al⁵ reporting their outcomes of surgically repaired carotid artery aneurysms and pseudoaneurysms found no 30-day mortality or strokes. An earlier surgical series of 24 cases reported by Faggioli et al⁶ revealed that elective repair had no mortality and a 4.5% stroke rate versus 50% mortality and 50% stroke rate for emergency repairs. Complications of surgical repair of ECCA aneurysms include cranial nerve defects, as seen in our patient, transient ischemic attacks, and stroke. Recurrence after surgical repair is highly unlikely.

Endovascular techniques have become attractive alternatives for specific cases, avoiding the need for extensive dissection and clamping of the internal carotid artery. A systematic review by Giannopoulos et al⁷ showed a 3.1% procedural stroke rate and a 4.3% mortality rate with endovascular stenting of ECCA.

CONCLUSION

Extracranial internal carotid artery aneurysms, although rare, can cause significant morbidity and mortality. Elective surgical repair is advocated. Elective repair of these extracranial internal carotid artery aneurysms is associated with better outcomes than emergency repairs. Individual patient factors and anatomy ultimately determine optimal intervention regarding open versus endovascular techniques.

REFERENCES

1. Liapis CD, Gugulakis A, Misiakos E, Verikokos C, Dousaitou B, Sechas M. Surgical treatment of extracranial carotid aneurysms. **International Angiology**. 1994; 13: 290-295
2. McCollum CH, Wheeler WG, Noon GP, DeBakey ME. Aneurysms of the extracranial carotid artery. Twenty-one years' experience. **American Journal of Surgery**. 1979; 137: 196–200
3. Dimtza A. Aneurysms of the carotid arteries; report of two cases. **Angiology**. 1956; 7: 218-227
4. McCann RL. Basic Data Related to Peripheral Artery Aneurysms. **Annals of Vascular Surgery** 1990; 4: 411-444
5. Garg K, Rockman CB, Lee V, Maldonado TS, Jacobowitz GR, Adelman MA, Mussa FF. Presentation and management of carotid artery aneurysms and pseudoaneurysms. **Journal of Vascular Surgery**. 2012; 55(6): 1618-1622
6. Faggioli G, Freyrie A, Stella A, Pedrini L, Gargiulo M, Tarantini S. Extracranial internal carotid artery aneurysms: Results of a surgical series with long-term follow-up. **Journal of Vascular Surgery**. 1996; 23(4): 587–595
7. Giannopoulos S, Trinidad E, Aronow H, Soukas P, Armstrong EJ. Endovascular Repair of Extracranial Carotid Artery Aneurysms: A Systematic Review. **Journal of Vascular and Endovascular Surgery**. 2020; 54(3): 254-263

CORRESPONDENCE

Fellowship Training in HPB Surgery: A DM Graduate's Perspective

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Dear Editor,

The Hepato-Pancreato-Biliary (HPB) surgical subspecialty matured in the 20th century, beginning with pioneers who were largely self-taught, developing techniques through much trial and error. The 21st Century has seen continued development of HPB surgery, with advances in peri-operative care, better energy devices, and organized fellowship training at high-volume institutions. Acquiring comfort and expertise in managing HPB diseases as a graduate of a general surgery training program requires further fellowship training in order to achieve the necessary competencies.

HISTORY OF HPB SURGERY

Any discussion around training in HPB must acknowledge the history of this subspecialty, including the early pioneers.

John Bobbs in Indiana described one of the first gallbladder surgeries in 1867.¹ He performed a cholecystotomy with stone extraction and primary suture close of the gallbladder in a symptomatic lady with a gallbladder filled with stones.¹ Then in 1878 in Paris, Marion Sims performed a cholecystotomy, extraction of 60 calculi and suturing of the gallbladder to the abdominal wall as an elective procedure for obstructive jaundice.² It was Langenbuch who was credited for the first cholecystectomy in 1882 as he observed a high rate of recurrence with stone removal only.²

The German surgeon, Hans Kehr, performed the first common bile duct exploration in 1897. He placed a rubber tube in-situ through the cystic duct and coined the name 'Kehr's tube', more popularly known as the 'T-tube'.³ He was also first to perform a biliary enteric anastomosis. Based on Courvoisier's observations and his exploits in removal of common bile duct stones, Kehr published the well quoted Courvoisier's Law.⁴ The French surgeon, Couinaud described the detailed liver anatomy in 1954. Hepp, Soupault and Couinaud in 1957 would later develop techniques for biliary enteric anastomoses, either to the left hepatic duct or to the segment III duct in the left liver.¹

Pancreatic surgery initially started on wartime injuries and was followed by cyst drainage procedures in 1881. Whipple began publishing his work in 1935 on two-staged cephalic duodenopancreatectomy for ampullary cancer.⁵ He eventually described the one-staged procedure in 1941. Similar to pancreatic surgery, liver surgery began with wartime injuries. Langenbuch performed the first planned liver resection in Germany in 1888, and Tiffany in the US performed one of the first liver resections for cancer in 1890.^{6,7} Rex in 1888 and Cantlie in 1897 contributed specifically to the art of controlled hepatic resections with their detailed anatomic studies. We must also highlight Pringle's 1900 seminal contribution describing the importance of portal inflow occlusion. Wendell performed the first major hepatectomy with hilar ligation in 1911.

FELLOWSHIP TRAINING

Navigating the options available for HPB sub-specialisation for a DM graduate can be daunting due to the different systems and competitive nature. The Caribbean Chapter of the Americas Hepato-pancreato-biliary Association (AHPBA) was formed in 2015 in The Bahamas with Dr. Wesley Francis being the inaugural president.⁸ The focus of the Chapter was to bring regional providers together to combine resources, increase awareness, and improve outcomes in Caribbean HPB practice. This unique group is comprised of surgeons trained from accredited institutions in Canada, United Kingdom and India. The group is comprised of surgeons from The Bahamas, Barbados, Belize, Cayman Islands, Jamaica and Trinidad & Tobago.⁸

One aim of the Caribbean Chapter of the AHPBA is to help DM graduates navigate fellowship training streams. In North America, HPB training is available through the AHPBA, the Complex General Surgical Oncology Board (CGSO) and the American Society of Transplant Surgeons (ASTS) fellowships.⁹ In collaboration with the Fellowship Council, the AHPBA offers 21 fellowship through USA and Canada.⁹ The Asia/Pacific region have a total of 15 fellowship programs registered with the International Hepato-Pancreato-Biliary Association (IHPBA) and another 26 programs registered in Europe, Africa and Middle East.¹⁰ In South America (Argentina and Brazil), there are 14 fellowship programs registered with the IHPBA.¹⁰ The Caribbean Chapter of the AHPBA can facilitate international opportunities. Additionally, there are opportunities for residents to be sponsored to attend the Canadian Association of General Surgeons (CAGS) meeting and the AHPBA meeting.

Accredited fellowships ensure that the fellow meets the certification requirements upon completion of the fellowship. Whether it is pure HPB, combined with transplant or combined with complex general surgical oncology, each fellow must meet the research requirements, minimal operative case load, intraoperative ultrasound use and mastery of the various HPB pathologies in a multidisciplinary setting.

As a DM graduate, the transition to fellowship training can be daunting, particularly adapting to a new health care system. It would be useful for future graduates to utilize all opportunities to be exposed to different health care systems during the DM training. One such opportunity is the elective period, during which, time can be spent in a prospective fellowship institution. This will allow the trainee to experience the chosen specialty first hand as well as provide an opportunity to leave a good impression at that institution prior to their fellowship application. Spending part of this time in other Caribbean campuses is also invaluable as this too allows for further exposure and guidance from those who have travelled similar paths before.

HPB fellowship brings new skills and exposure to new technologies which are transferable to the Caribbean setting. Mastering skills such as intra-operative ultrasound physics, scanning techniques, and ultrasound guided radiofrequency or microwave ablation of tumours are mandatory components of training. Additionally, HPB ultrasound certification is achieved at the completion of fellowship, with successful passing of the written and practical exam. The knowledge and training gained equips the graduate with the competency to: isolate intraoperative non-palpable liver tumours to facilitate parenchymal sparing liver resections; isolate segmental vascular inflow and outflow in complex resections such as central and trisegmentectomies; as well as, combine major resection with ablation of residual disease in the remaining liver thereby rendering a patient disease free in the case of bilobar liver metastasis. Further to this, common bile duct injury can be avoided with comprehensive intra-operative biliary ultrasound and safe enucleation of pancreatic neuroendocrine tumours. The use of ultrasound in this setting facilitates assessment of the relationship of the tumour to the main pancreatic duct and therefore permitting more precise resection and decreasing the likelihood of a post-op pancreatic fistula.

Exposure to new innovations including liver volumetric analysis and kinetic growth rate assessment are pre-operative cross sectional imaging techniques used to evaluate the future liver remnant in patients who undergo portal vein embolization for hypertrophy before a planned major resection. Some institutions may even combine hepatic vein embolization with portal vein embolization in scenarios where the kinetic growth rate is not optimal. These preoperative tools and various parenchymal transection energy devices such as the Aquamantys[®] and the CUSA[®], not only make liver surgery much more efficient but, together with close communication with the anaesthetist (who maintains a low central venous pressure), facilitates far less blood loss when compared to the earlier days.

Acquisition of these competencies ensures that HPB surgeons returning to the region can offer safe procedures regionally and thereby improving patient care and optimizing outcomes for these patients within the Caribbean. Continued exposure to advanced technologies such as liver transection devices, liver ablation and Robotic-Assist Technology continue to provide the necessary impetus for such technologies to be introduced in the Caribbean.

CONCLUSION:

Surgery is a specialty that requires sound theoretical and academic knowledge as well as technical skill, which is best achieved by apprenticeship. HPB fellowships at high volume centers, with their vast caseloads and much improved resources and support services, offer an excellent opportunity to acquire the necessary skills and experience to successfully manage complex cases. The knowledge and experience gained during fellowship along with the understanding of our resource limited settings, allows Caribbean HPB fellows to tailor their first world experience towards practical solutions for the management of HBP patients in Caribbean.

REFERENCES:

1. Blumgart's Surgery of the Liver, Biliary Tract and Pancreas, 6th Edition. Available from: <https://www.elsevier.com/books/blumgarts-surgery-of-the-liver-biliary-tract-and-pancreas-2-volume-set/jarnagin/978-0-323-34062-5>
2. De U. Evolution of cholecystectomy: A tribute to Carl August Langenbuch. *Indian Journal of Surgery*. 2004; 66(2): 4.
3. Morgenstern L. Hans Kehr: not first, but foremost. *Surgical Endoscopy*. 1993; 7(3): 152-154.
4. Ahrendt SA. A History of the Bilioenteric Anastomosis. *Archives of Surgery*. 1990; 125(11): 1493.
5. Are C, Dhir M, Ravipati L. History of pancreaticoduodenectomy: early misconceptions, initial milestones and the pioneers. *HPB*. 2011; 13(6): 377-384.
6. Bismuth H, Eshkenazy R, Arish A. Milestones in the Evolution of Hepatic Surgery. *Rambam Maimonides Medical Journal*. 2011; 2(1): e0021.
7. Blumgart LH. Resection of the Liver. *Journal of the American College of Surgeons*. 2005; 201(4): 492-494.
8. Francis W, Arra A, Bonadie KO, Cawich SO. Evolution of Liver and Pancreas Surgical Sub-Specialty in the Caribbean: Caribbean Chapter of the Americas Hepatopancreatobiliary Association. *Journal of the Caribbean College of Surgeons*. 2020; 1: 49-52.
9. Jeyarajah DR, Abouljoud M, Alseidi A, Berman R, D'Angelica M, Hagopian E, et al. Training Paradigms in Hepato-Pancreatico-Biliary Surgery: An Overview of the Different Fellowship Pathways. *Journal of Gastrointestinal Surgery*. 2021; doi.org/10.1007/s11605-021-05019-9
10. International Hepatopancreatobiliary Association. HPB Fellowship Registry. Available from: <https://www.ihpba.org/fellowship>
11. de Santibañes M, de Santibañes E, Pekolj J. Training in hepato-pancreato-biliary surgery during residency: past, present and future perspectives. *Journal of Hepato-Biliary-Pancreatic Sciences*. 2016; 23(12): 741-744.

BULLETIN:

PROFESSOR VIJAY NARAYNSINGH INDUCTED AS HONORARY FELLOW OF THE ASSOCIATION OF SURGEONS IN INDIA



The Caribbean College of Surgeons wishes to congratulate our Past President, Professor Vijay Naraynsingh, for being awarded Honorary Fellowship of the Association of Surgeons in India – an award he will receive on December 17, 2021. He was recently awarded the Honorary Fellowship of the American College of Surgeons in 2019.

Following graduation in 1974 with distinctions in Anatomy and Surgery, Professor Naraynsingh led a distinguished career that resulted in Fellowships with several International Colleges, Reader in Surgery (1990), Personal Chair (1997), and Departmental Chair (2002) at the University of the West Indies. He is the recipient of awards from 23 international and regional organizations for his contributions to medicine, community service and humanitarian work. At 42 years, he was one of the youngest recipients of The Chaconia Gold National Award for service in Medicine to Trinidad and Tobago.

In 1991, he was chosen by Medicine Sans Frontières (Nobel laureate) to be one of five surgeons worldwide to sit on an international panel on colon trauma surgery in Brussels, Belgium. He was chosen as the surgeon to the Pope when John Paul II visited Trinidad and Tobago in 1985.

Prof Naraynsingh served as President Caribbean College of Surgeons since 2007-2011 and was the Scientific Secretary of the Caribbean Health Research Council for 13 years. He has made an invaluable contribution, assisting in scientific, administrative and social programs since inception of the Caribbean College of Surgeons in 2002. He regularly delivers podium presentations at the Caribbean College meetings and has presented at numerous other scientific meetings.

In addition to his avid publishing of over 350 peer reviewed articles, Prof Naraynsingh has produced many YouTube videos for post-graduate and under-graduate education. (<https://youtube.com/channel/UCgewIJOz7s3Q3QxxtWGPdIQ>). It is clear that Prof. Naraynsingh remains an active member of the academic surgical community and continues to make invaluable contributions to Caribbean surgery. The Journal of the Caribbean College of Surgeons looks forward to his continuing contributions to Caribbean Surgery.

BULLETIN:

PROFESSOR SHAMIR CAWICH INDUCTED TO AMERICAN COLLEGE OF SURGEONS' EDUCATION COMMITTEE



The Caribbean College of Surgeons wishes to congratulate Professor Shamir Cawich on his nomination to serve a three-year term as a member of the American College of Surgeons' Video Education Committee. Prof. Cawich was selected based on his prior contributions, serving as an Expert Panelist at the American College of Surgeons' Annual Clinical Symposium in Boston in 2018, and again at the 2019 Annual Symposium in San Francisco.

As a member of the Video Education Committee, Prof Cawich will participate in planning the program for the American College of Surgeons' Annual Clinical Congress in San Diego in 2022. The Caribbean College of Surgeons wishes to congratulate Prof. Cawich for the distinction of being selected by the American College of Surgeons to serve as member of the Video Education Committee.



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The Journal is published by the Caribbean College of Surgeons to provide a forum through which surgical experiences and scientific research can be shared between practitioners across the Caribbean.

The Journal seeks to publish data aimed at clinical practice in the diverse Caribbean healthcare environments that often differs from those in Developed countries. Our aim is to make a meaningful impact in surgical practice for the Caribbean.

The Journal covers all medical disciplines and basic research to promote the understanding of the pathophysiologic basis, treatment and prevention of diseases in the region.

The Journal publishes original scientific research, reviews, commentaries, viewpoints, conference proceedings and case reports. All submissions are peer reviewed by two independent reviewers. Authors are given opportunities to respond to reviewers' comments and the final decisions are made by the Editor in Chief.

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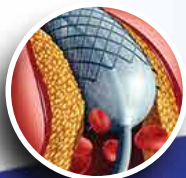
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