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- Cancer genetics and the surgeon - new frontiers
- Common bile duct stones and their management

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A culture of change - hospital safety check lists

The world over, hospitals are including safety of patients as a measure of surgical care and a requirement for accreditation. Operating rooms have come under the hammer of the World Health Organization (WHO) in a global attempt to reduce error. The WHO surgical safety checklist generic document aims to ensure that the correct patient is being operated upon, that the checklist prevents wrong site surgery, and focuses on appropriate and timely antibiotic prophylaxis – the omission of which creates a huge impact on healthcare economics and spread of hospital acquired infection. Secondary beneficial effects of operating room safety checks are thought to be, harnessing a team approach among operating room staff and to ensure that equipment is in good working order. The WHO recommends modifications to the checklist to suit local conditions which may vary widely within the country and from one operating room to the other.

The evidence

A study published in 2009 revealed that implementation of the WHO - 19 item check list resulted in reduction of surgical complications from 11 to 7 percent, and reduced hospital mortality from 1.5 to 0.8 percent [1]. This was a powerful effect from a simple intervention which led to many developed nations mandating the use of checklists in their hospitals as a mechanism to achieve zero error. Its effect, however, remains unclear; subsequent studies have failed to show reduction in morbidity and mortality of the kind shown by the original WHO study [2,3] and only studies which incorporated team training [4,5] and used multiple checklists, in a more comprehensive patient safety system, have shown results similar to the index WHO study [6]. In the most recent study of the value of a safety checklist in Ontario, Canada, Urbach et al [7] did not show the improvement in outcomes seen in previous studies, although these authors conceded that a greater effect of safety checklists may arise with intensive training of staff and better monitoring of compliance. Mere implementation of a safety checklist by filling in tick boxes may not achieve the aims of its pioneers, and requires the diligence and compliance of all team members to ensure that patient safety is taken way beyond the operating room into a safe environment of post-operative care on the wards, until the patient is finally discharged from hospital. And there are other matters that affect patient safety, such as, intra-operative surgical decision making, which ultimately affects patient outcomes in a manner that is far worse than the omission of surgical safety tick boxing - in a discussion focused on prevention of bile duct injury during laparoscopic cholecystectomy, it becomes apparent that better communication between the surgeon and the team in the operating room may have averted bile duct injury [8]. Up to now, the literature has not addressed the issue of safety check lists and “near misses” in the operating room. Near misses - which are defined as errors or malfunctions that might well have caused harm if they had not been intercepted, need to be audited closely, for, herein, may lie one of the greatest values of a safety check list.

Thus, while the jury is yet to make a decision on the value of surgical safety checklists, it makes common sense for hospitals and staff to embark upon the “paradigm shift” toward a safer surgical culture [9]. Most will agree that it will enhance communication and teamwork, and bring to the fore a culture in which patient safety becomes a priority. To achieve this, teams need to train and understand the nature of checklist exercises so that better compliance could be achieved.

Kemal I. Deen

References


Erratum


The authors names should be corrected as:

Kothari Reena, Thakur Dileep S, Kumar Vinod, Somashekar Uday, Sharma Dhananjaya

Department of Surgery, Government NSCB Medical College, Jabalpur, India
Surgery for the obese

N. Amjad
Professor of Surgery, Deputy Dean of Research, International Islamic University of Medicine
Kuantan, Malaysia.

Key words: Bariatric surgery; weight loss; malabsorptive; restrictive.

Abstract

This review focuses on the problem of obesity from an Asian perspective and the current evidence that supports the benefits of bariatric surgery over conventional treatment for sustained weight loss. The requirements for an effective bariatric surgical service are highlighted. Principles of peri-operative management and the currently practiced operative procedures are discussed briefly. Finally a short evaluation of the benefits and complication of the different procedures are presented.

Introduction

Obesity is a global epidemic and its increasing prevalence worldwide is a major public health issue. Although initially restricted to developed, high-income countries, with the advent of globalization it has engulfed the low and middle-income states as well. According to WHO estimates, by the year 2015, an estimated 700 million adults will be diagnosed as obese [1]. Most Asian countries too face this dilemma. Rapid economic growth in Asia over the last few decades has resulted in an increase in the prevalence of overweight individuals although wide differences exist between countries [2,3]. Mostly confined to urban populations, the improving socio-economic conditions in Asia have resulted in an increase in semi urban and rural areas now [4]. South Asians seem to have the highest prevalence of abdominal obesity [5]. In a study involving 4532 adults, the prevalence of overweight and obesity among Sri Lankan adults were 25.2 percent and 9.2 percent while central obesity was found in 26.2 percent [6]. According to Wijewardene et al, the prevalence of obesity related metabolic problems such as diabetes and hypertension among Sri Lankan adults were 14 and 19 percent respectively [7].

Role of bariatric surgery

The financial burden on a developing country like ours is immense with regard to the treatment of morbid obesity and its related co-morbidity. It is imperative that health professionals identify the most cost effective and sustainable mode of treatment. Non-surgical measures like dieting, exercise, and cognitive behavioural therapy achieve long-term weight loss in only a small minority of highly motivated individuals [8].

The ultimate objective in the management of morbid obesity is long-term weight loss and the current consensus on the most effective modality to achieve this goal is surgical management. A recent meta-analysis of 11 studies involving 796 obese patients with a body mass index (BMI) between 30 to 52 Kg/m2 showed that patients who underwent surgical treatment, on average, lost more weight than those who tried other means (95% CI. 21 to 31 kg lost; P<0.001). This was accompanied with significant improvement in their diabetes status and metabolic syndrome, (relative risk 22.1-3.2 to 154.3; P=0.002) and (relative risk 2.4-1.6 to 3.6; P<0.001) respectively [9]. Improvements were also noted in their lipid profiles and more importantly quality of life [9]. Mingrone et al also demonstrated a significantly better glucose control by surgery than medical management in the patient with severely obese type 2 diabetes [10]. The landmark Swedish Obese Subjects (SOS) study, the first long-term, prospective, controlled trial confirms bariatric surgery to be associated with significant long-term reduction in overall mortality (primary endpoint) and decreased incidences of diabetes, myocardial infarction, stroke and cancer. The diabetes remission rate was increased several fold at 2 years and 10 years [11]. Thus, current
evidence supports surgical treatment for obesity.

**Indications for surgery**

Available data do not indicate a clear BMI cut-off point which defines overweight in Asians and seem to vary from 22 to 25 in different Asian populations [12]. The currently accepted figures are 23, 27.5, 32.5, and 37.5 for overweight, obesity 1, obesity 2, and morbid obesity respectively. (Table 1)

**Preoperative preparation**

Obese patients are high risk surgical candidates and other modalities of management must be exhausted prior to offering surgery. The obesity multi disciplinary team (MDT) comprising of nutritionists, anaesthesiologists, cardiologist, respiratory physicians, orthopaedic surgeons, endocrinologists, psychiatrists and specialists in rehabilitation medicine must be involved in the decision making process. Once the choice is made to offer surgery, it is the role of the MDT to make the patient aware of the expected permanent changes to his or her lifestyle following these procedures. Major changes involving dietary habits, bowel symptoms and physical activity must be emphasized.

**Counseling**

Preoperative counseling is crucial and should be carried out by a counselor, psychologist, or psychiatrist who is familiar with current trends in the management of obesity. These patients tend to have higher levels of stress, anxiety, depression, food craving and lower levels of self-esteem and quality of life compared with controls with normal weight [15]. Pre-operative evaluation also helps to identify patients with latent psychiatric disorders (e.g. major depression, schizophrenia, antisocial personality disorder) so that necessary therapy could be instituted and the individual re-evaluated prior to surgery. Presence of psychological disorders is not a contraindication except in the case of serious disorders such as active suicidal ideation, hallucinations and/or delusions, or severe cognitive impairment. Psychiatric evaluation also determines, in an objective manner, the ability of the patient to make major lifestyle changes for a successful outcome.

**Anaesthetic assessment**

Preoperative anaesthetic evaluation must focus on both physical status of patients and comorbidity that could impact the course and outcome of the procedure. A complete history and physical examination is carried out to assess suitability for a major surgical operation. Adequate control of previously identified comorbidity like hypertension and diabetes mellitus and undiagnosed obesity related pathology such as obstructive sleep apnea (OSA) must be excluded. This is not uncommon as was demonstrated by Nepomnayshy et al in a study of 882 morbidly obese patients screened for sleep apnea prior to bariatric surgery, where they identified an additional 25 percent of patients with OSA [16]. Obese patients should be evaluated for predictors of both difficult mask ventilation and difficult intubation, as additional equipment and skilled personnel should be readily available if necessary. Studies show that BMI on its own is not a predictor of difficult tracheal intubation, whereas large neck circumference (>40 cm), Mallampati score ≥3 and thyromental distance <6 cm are more specific indicators of potential difficulty [17]. These patients tend to desaturate more quickly during periods of apnea than

<p>| Table 1: Recommended Indications for bariatric surgery in the asian population |
|---------------------------------|---------------------------------|</p>
<table>
<thead>
<tr>
<th>Indications based on BMI [13]</th>
<th>Other Indications [14]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. BMI more than 35 with or without co-morbidity</td>
<td>1. Age between 16 and 65 years</td>
</tr>
<tr>
<td>2. BMI of 32 with co-morbidity</td>
<td>2. Documented failure at non surgical approaches to long-term weight loss</td>
</tr>
<tr>
<td>3. BMI of 30 if they have central obesity along with at least two of the additional criteria for metabolic syndrome</td>
<td>3. Acceptable operative risks</td>
</tr>
<tr>
<td>4. BMI less than 30 - should be strictly done only under study protocol with an informed consent from the patient</td>
<td>4. A well-informed and motivated patient</td>
</tr>
<tr>
<td>5. Commitment to prolonged lifestyle changes</td>
<td>5. Commitment to prolonged lifestyle changes</td>
</tr>
<tr>
<td>7. Resolution of alcohol or substance abuse</td>
<td>7. Resolution of alcohol or substance abuse</td>
</tr>
<tr>
<td>9. Absence of active psychosis and untreated severe depression</td>
<td>9. Absence of active psychosis and untreated severe depression</td>
</tr>
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</table>
non-obese patients.

**Operating theatre facilities**

Furthermore, hospitals must possess the infrastructure to support bariatric surgery, including rooms with wider doorways and special furniture that would support the extra weight of patients. Especially designed operating tables are recommended. Trolleys to transport patients must be suitably equipped.

**Choice of surgical approach**

Rapid advancement in minimally invasive surgery since the 1990s has lead to laparoscopic bariatric surgery being widely practiced now. It gives excellent access to the hiatus and proximal stomach in the head-up position. Standard laparoscopic instruments are not suitable for bariatric work. Open Hasson's technique is not recommended for pneumoperitoneum, as the abdominal wall in these patients can be several inches thick. Instead, Veress needle insertion in the left upper quadrant is preferred. Some surgeons utilize an optical trocar but this technique needs experience for safe practice [18]. Difficulties in trocar insertion for working ports can be encountered due to the thick abdominal wall. Specially designed longer ports must be used. The same applies to instruments and stapling devices, as they too must be longer than the standard instruments used in upper gastro-intestinal surgery.

Surgeons undertaking bariatric surgery must be familiar with the technical issues if the need arises to perform open surgery either by choice or due to conversion from a laparoscopic procedure. This is especially relevant in patients with central obesity and patients with large fatty liver. Retraction is one of the main impediments and may require a dedicated “Omnitract” system with deep-bladed retractors. Adequate measures must be undertaken in the closure of the abdominal incision, as the incidence of incisional hernia may be as high as 18.7 percent at 2 years after open surgery [19].

Laparoscopic bariatric surgery is associated with significant shorter recovery time and reduced 30 day-morbidity rates [20]. Data from the United States indicate an increase in laparoscopic bariatric surgery from 20 to 90 percent between 2003 and 2008. During the same period there was a decrease in in-hospital mortality from 0.21 percent in 2003 to 0.10 percent in 2008 [21]. Recent reports from Asia too indicate a dramatic increase in bariatric surgery by almost 449 percent between 2005 and 2009 [22].

**Peri-operative care**

Most obese patients with uncomplicated medical comorbidity can be managed post-operatively in the standard surgical unit with adequate monitoring. It includes monitoring of fluid intake and output; drain output if any and clinical evaluation for possible anastomotic leak. Initially, patients are kept “nil by mouth” and subsequently commenced on clear liquids and then advanced to a high-protein liquid diet. Limiting intensive care admission to patients with a BMI >60 and severe OSA do not show any significant increase in the overall incidence of postoperative respiratory complications or length of hospital stay [23].

Following the introduction of a structured protocol based bariatric surgery service in the United States, a review of 98,553 bariatric surgical patients for hospital acquired conditions HACs: surgical site infection (SSI), urinary tract infection (UTI), and venous thromboembolism (VTE), demonstrated a significant drop in the rate of HACs from 4.6 percent in 2005-06 to 2.5 percent in 2012 [24]. Another similar study concluded that a bariatric surgery clinical protocol is feasible and safe with substantial cost savings due to low patient re-admission and complication rates [25].

**Treatment**

Hendrickson performed the first bariatric surgical procedure back in the 1950s; it was an extensive small bowel resection, which led to malabsorptive weight loss [26]. The practice remained dormant until the discovery of the relationship between obesity and metabolic syndrome. With the subsequent explosion of the obesity epidemic, bariatric surgery has been widely recognized as the most effective and well-researched modality. It must also be emphasized that surgical intervention is final; it can have dangerous long-term effects, which can lead to a life-long dependency on medical assistance. Due to limitations of infrastructure, expertise and cost, only a minority of eligible candidates are able to undergo bariatric surgery. Even in the United States only an estimated 1 percent of patients who are eligible receive bariatric surgery in any given year [27].

The basic principle of obesity surgery is to reduce caloric intake and is undertaken by changing the
anatomy of the gastrointestinal tract. This alters the gut–brain axis peptides, by increasing anorexigenic gut hormones such as peptide YY from the small bowel, and a reduction in the orexigenic hormone, ghrelin - mainly produced in the fundus of the stomach [28]. The mechanisms utilized to achieve this involve malabsorption, restriction or a combination of the two. (Table 2)

The surgeon in consultation with the MDT and the patient will propose the surgical options. This must be based firstly on the merits of the procedure for the patient's BMI (and comorbidity), and secondly on the patient's preference.

Surgical procedures

**Laparoscopic adjustable gastric band (LAGB)**

This was a popular procedure up until a few years ago and was promoted as a safe and reversible procedure. It was perceived to be a simple procedure with lower complication rates when compared with the more established procedures. The degree of restriction can be varied if required by altering the band volume [29]. Currently available popular brands are the Lap-band® System and the Swedish adjustable band.

This is carried out by placing a band around the proximal stomach approximately 2 cm distal to the gastro-oesophageal junction. (Figure 1) The aim is to create a 25-30 ml upper gastric pouch and the band is fixed to prevent slippage. The balloon in the band is connected to the subcutaneous port and can be varied by injecting saline via the tubing as shown in the picture LAGB has shown to have high rates of intermediate (band erosion or slippage) and long-term complications (failure to achieve or maintain weight loss) requiring re-operation in up to 20 percent of patients [30]. There are conflicting reports as some centres show very good long-term results. A durable weight loss with 47 percent excess weight loss (EWL) maintained to 15 years was demonstrated in a prospective longitudinal cohort study of 3227 LAGB patients. This weight loss occurred regardless of whether any revisional procedures were needed [31]. Despite this, surgeons are now opting for laparoscopic roux-en-y gastric bypass resulting in fewer LAGB procedures being performed [32].

**Roux-en-Y gastric bypass (RYGB)**

RYGB is the gold standard bariatric procedure in the United States, accounting for 93 percent of all such

<table>
<thead>
<tr>
<th>Purely restrictive</th>
<th>Purely malabsorbtive</th>
<th>Combined</th>
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<tbody>
<tr>
<td>Laparoscopic gastric banding (LAGB)</td>
<td>Jejunoileal bypass Duodenal switch</td>
<td>Roux-en-y gastric bypass (RYGB) Bilio-pancreatic diversion (BPD) with or without duodenal switch</td>
</tr>
<tr>
<td>Sleeve gastrectomy (LSG)</td>
<td></td>
<td></td>
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<tr>
<td>Vertical banded gastroplasty (VBG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreases the stomach capacity leading to reduced food intake</td>
<td>Reduces nutrient absorption due to a shortened functional small bowel Good weight reduction High rate of major metabolic and nutritional complications</td>
<td>Creation of a small gastric pouch, thereby restricting food Malabsorptive component limiting caloric absorption Good long-term weight reduction</td>
</tr>
</tbody>
</table>

Table 2- The standard bariatric procedures

![Figure 1. Laparoscopic adjustable gastric band (LAGB)](image)
operations in 2000 [33]. This is also the commonest operation worldwide because it combines both components of weight reduction surgery in one procedure, and since Mason first performed the procedure in the 1960s, there have been multiple revisions to the procedure [34]. At present, most of these procedures are performed laparoscopically. The stomach is restricted by creating a 25-30ml proximal gastric pouch. (Figure 2) The pouch is divided and separated from the distal stomach. The small intestine is divided at about 30 to 50 cm distal to the ligament of Treitz. The roux limb (or alimentary limb) is anastomosed to the gastric pouch. The divided biliopancreatic limb is anastomosed to the roux limb approximately 150 cm distal to the gastrojejunostomy. Most digestion and absorption of nutrients occurs distal to this anastomosis. Variations in technique have focused on optimization of the length of the roux limb to achieve the best balance between weight reduction and complications of altered gastrointestinal anatomy and physiology.

Studies have shown suppression of pulsatile release of the orexigenic hormone and increase in levels of the anorectic hormones glucagon-like peptide-1 (GLP-1) and cholecystokinin (CCK) after gastric bypass [35, 36].

This procedure produces better weight loss compared to purely restrictive operations but has many complications. Most significant of these are stomach ulcers that necessitate prophylactic ulcer therapy. Also, vitamin and mineral deficiencies may need lifelong supplementation.

**Laparoscopic sleeve gastrectomy (LSG)**

LSG has gained popularity and acceptance among bariatric surgeons, mainly due its low morbidity and mortality. Sleeve gastrectomy is a restrictive procedure. A vertical resection of the stomach is performed, in which the majority of the greater curvature is removed and a long tubular stomach defined by a bougie lying against the lesser curve is created. The pylorus and part of the antrum are preserved. (Figure 3)

![Figure 3. Laparoscopic sleeve gastrectomy (LSG)](image)

Although initially it was part of first stage of a duodenal switch, now it is considered as an effective stand-alone restrictive procedure. LSG is currently the fastest growing bariatric procedure, and in 2011, accounted for 28 percent of all bariatric procedures performed worldwide [37].

It is technically easier to perform and is a favoured by patients as it is less drastic. The small tubular stomach is resistant to stretching and has fewer ghrelin-producing cells. After LSG, gastric emptying is accelerated in the majority of patients but dumping is minimized due to the preservation of the antrum, pylorus and the duodenal continuity. Some patients may develop mineral and vitamin deficiency and should be considered in the dietary management after surgery as it could play a significant role in the outcome [38]. After LSG, weight loss is usually dramatic, but dilatation of the gastric pouch can occur.
tube, over time, can lead to weight gain. Studies show LSG to be safe and effective with 3-year excess weight loss (EWL) of 77.5 percent and 6+ year of 53.3 percent [39]. A systematic review of 27 studies (673 patients) after LSG showed the resolution of diabetes in 66 percent and improvement in another 27 percent with a mean decrease in glycosylated hemoglobin of 1.7 percent [40]. The two common complications after LSG are staple-line bleeding and anastomotic leakage. A recent analysis of 42 selected papers showed a very low morbidity (<10%), mortality (<1%), 20 to 31 percent prevalence of gastro esophageal reflux and the possibility of regaining weight after 5 years in 15 to 75 percent of individuals following this procedure [41].

**Comparison of surgical procedures**

A systematic review evaluating the clinical outcomes for LABG and RYGB involving 14 comparative studies showed excess weight loss at 1 year was consistently greater for RYGB than LABG (median difference, 26 percent; range, 19-34 percent; P<001). Resolution of comorbidity was greater after RYGB with resolution of diabetes noted in 78 percent versus 50 percent. Weight loss outcomes strongly favored RYGB over LABG [42]. The reduction in BMI and most weight-related comorbidity after LSG is between those of LAGB and RYGB [43]. Although current evidence favours RYBG, it is incumbent on all surgeons to be familiar with other bariatric operations.

**Uncommon procedures**

**Jejunoileal bypass**

Is purely a malabsorptive operation and was popular in the 1970s. With the evolution of bariatric surgery, it has been replaced by other procedures due to significant morbidity and mortality rates [44].

**Vertical banded gastroplasty (VBG)**

VBG was the first purely restrictive procedure for treatment of obesity and was introduced in the early 1970s. The upper part of the stomach is partitioned by a vertical staple line with a tight outlet wrapped by a prosthetic mesh or band. (Figure 4) The procedure is rarely undertaken now as it has very poor long-term weight loss.

**Bilio-pancreatic diversion (BPD)**

BPD consists of a partial gastrectomy and

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*Figure 4. Vertical banded gastroplasty (VBG)*

gastroileostomy with a long segment of roux limb and a short common channel. This procedure may result in anaemia, diarrhoea, and stomal ulceration. It is a technically difficult operation and known to cause fat and protein malabsorption. As such, it has not been widely accepted.

**Bilio-pancreatic diversion (BPD) with duodenal switch (DS)**

Originally described by Scopinaro in 1979 to replace jejunoileal bypass [45], BPD with DS is a combination of restrictive and malabsorptive weight loss mechanisms and is performed in the super obese (BMI >50) patient or in some cases as a revisional procedure for failed weight loss. Bilio-pancreatic diversion (BPD) involves sleeve gastrectomy, ileal division (enteric limb) 250cm proximal to the ileo-caecal junction and anastomosis of the distal ileal limb to the stomach pouch. The proximal bilio-pancreatic limb is joined to the distal ileum 50cm proximal to the ileo-caecal junction to form a common channel. (Figure 5)

A recent systematic review and meta-analysis confirmed weight loss and diabetes resolution were greatest for patients undergoing biliopancreatic diversion with duodenal switch, followed by gastric bypass, and was least for banding procedures [46]. Another randomized trial conducted to evaluate perioperative (30-day) safety and 1-year results of RYGB and DS showed comparable results with regard
to safety [47]. DS also provided greater weight loss in the super-obese patients [48].

**Conclusion**

Bariatric surgery is now widely accepted as the most effective treatment for long-term weight loss. The definition of obesity and the criteria for bariatric surgery in the Asian subcontinent is not similar to other parts of the world. It is recommended that a dedicated well trained multi-disciplinary team, committed to long-term patient management and follow-up, must be involved in the care of these patients. Bariatric surgery should be carried out in surgical units with adequate facilities and infrastructure and practice must follow a standard protocol for bariatric services. This is cost-effective and ensures a safe and a successful outcome.

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Cancer genetics and the surgeon – new frontiers
N.D. Sirisena, V.H.W. Dissanayake
Human Genetics Unit, Department of Anatomy, Faculty of Medicine, University
of Colombo, Sri Lanka

Keywords: Genetics, genetic testing, hereditary cancer, germline mutations, risk assessment

Abstract
Cancer is a leading cause of death both globally and nationally. Recent advances in research have unraveled the molecular mechanisms responsible for many cancers. This has helped to transform the continuum of cancer care - from primary prevention, to screening and diagnosis, to treatment and follow-up using genetic information gathered by testing patients, their families, and the tumour tissue itself. New guidelines for risk assessment, genetic counseling, and planning of appropriate therapeutic and screening options based on the phenotypic and molecular characterization of cancers have now been developed. Such knowledge is vital not only for the treatment and follow up of patients but more importantly for screening of at risk family members with a hereditary predisposition to cancer. Awareness of their mutation status will allow such family members to make informed decisions regarding reproduction, lifestyle and clinical risk-reduction strategies to prevent future occurrence of cancer. At the national level adopting evidence-based strategies for early detection, counseling, improved surveillance and selection of effective therapeutic options will help to significantly reduce the mortality and morbidity associated with cancer in the country.

Introduction
Cancer is defined as the uncontrolled growth and proliferation of cells which can affect any part of the body. The growth often invades surrounding tissues and can metastasize to distant sites [1]. Cancer is known to result from mutations in critical genes within a single cell, allowing it to escape the normal control mechanisms of cell growth and proliferation resulting in the development of a clinically evident tumor [2].

Since genetic mutations play a role in the development of all cancers, all cancer is said to be genetic but only some are inherited. Inherited mutations account for about 5 to 10 percent of all cancers [2]. Genetics is known to play a vital role in the entire continuum of cancer care - from primary prevention, to screening and diagnosis, to treatment and follow-up procedures. Over the past few decades, research into cancer genetics has unraveled the molecular mechanisms responsible for many cancers. It has opened up the possibility of defining cancer from a molecular pathological standpoint which is more accurate than the currently practiced histopathological gradings. This has led to the development of guidelines for risk assessment, genetic counseling, and planning of appropriate therapeutic and screening options based on the phenotypic and molecular characterization of hereditary cancers. Such knowledge is vital not only for the treatment and follow up of patients but more importantly for screening of individuals with a hereditary predisposition to cancer. Characterization of such genetic mutations allows at risk family members to make informed decisions regarding reproduction, lifestyle and adoption of preventive, clinical risk-reduction measures leading to improved survival and quality of life. These measures have helped to significantly reduce cancer mortality and morbidity in most of the developed countries, mainly due to improvements in early detection and treatment [3].

There is, however, a dearth in the knowledge and understanding of the clinical and molecular mechanisms associated with hereditary cancer syndromes in the Sri Lankan population. This deficit in knowledge has also resulted in sub optimal management, follow-up and surveillance of individuals.
with an inherited predisposition to cancer. This paper aims to describe the vital role genetics plays in the entire continuum of cancer care - from primary prevention, to screening and diagnosis, to treatment and follow-up.

Global Burden of Cancer

Cancer is a leading cause of death globally [1]. According to GLOBOCAN 2008, about 12.7 million cancer cases and 7.6 million cancer deaths are estimated to have occurred in 2008. Among them, 56% of cases and 64% of deaths occurred in the economically developing world. Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer deaths among females while lung cancer is the leading cancer in males worldwide. Cervical cancer was the commonest cause of cancer deaths during previous decades but has now been replaced by breast cancer in the developing world. Although overall cancer incidence rates in developing countries are half that seen in developed countries, the overall cancer mortality rates are almost similar. Cancer survival is poorer in developing countries due to late stage diagnosis and limited standard management protocols [4].

National Burden of Cancer

The World Health Organization has stated that proportional mortality of cancers was 9.0% in Sri Lanka in year 2008. Age standardized death rate per 100,000 population for cancer was reported to be 90.0 and 77.8 for males and females respectively [5]. One of the main functions of the National Cancer Control Programme (NCCP) is surveillance and monitoring of the cancer disease burden in Sri Lanka. It maintains a cancer registry database of pathology, epidemiology and public health related data [1]. The registry contains cancer incidence data in the Sri Lankan population according to the age groups, sex, ethnicity, cancer sites and mortality rates.

According to the 8th publication of the Cancer Registry in 2012, the increasing trend in the incidence of cancers which was observed from 1985 had continued in 2006 as well [1]. In the year 2006, a total of 14,080 new cancer cases were diagnosed and the crude cancer incidence rate was estimated to be 70.9 per 100,000 population. The crude incidence rates of cancer in males and females were 62.7 and 79.0 per 100,000 population respectively. Breast cancer is the commonest cancer among Sri Lankan women, accounting for 27% of all female cancers and also the leading cancer among Sri Lankans, contributing to 12.6% of all cancers [1]. An increase in breast cancer incidence in 2006 of approximately 1 per 100,000 population compared to the year 2005 has been recorded. 'Lip, oral cavity and pharynx', trachea, 'bronchus and lungs', oesophagus, 'colon and rectum' and lymphoma were the five commonest cancer sites in males. Among the females, the top five cancer sites were breast, uterine cervix, ovary, thyroid and oesophagus. However, the contribution of genetic factors to these figures remains unknown as no large scale research into cancer genetics has been conducted in the country. Treatment modalities were recorded for cancer cases diagnosed in the year 2006. Out of all patients, 46% had received surgical treatment, 52% chemotherapy and 50% radiotherapy while 1.4% of patients had received only symptomatic treatment [1]. According to the Department of Census and Statistics, with the increase in cancer incidence, the deaths due to cancer have also increased. The death rates were reported to be higher in males compared to females [6].

In Sri Lanka, a large number of cancer patients tend to seek treatment when the disease is at an advanced stage, at which point currently available treatments are of little benefit. This has led to the increased burden of cancer in the country with huge amounts of public health sector funds being expended on management of patients who present in late stages, with very low quality results as the outcome [7]. The economic burden of cancer is most obvious in health care costs, such as those for hospitals, other health services, and drugs. This has resulted in an alarming increase in the national cancer budget. Indirect costs arise from loss of productivity as a result of the illness and premature death of those affected.

Genetic Basis of Hereditary Cancer

Cancers can be broadly classified into: hereditary, familial and sporadic [8]. Inherited mutations play a major role in the development of about 5 to 10 percent of all cancers due to highly penetrant germ-line mutations in cancer predisposition genes, while 10–15% are familial due to a combination of multiple low penetrant genes and shared environmental or lifestyle risk factors.
Numerous genetic alterations that affect cell cycle regulating genes such as proto-oncogenes, tumour suppressor genes, DNA mismatch repair genes and p53 genes have been identified in neoplastic cells. Hereditary cancer syndromes generally follow the Knudson “Two Hit” hypothesis [9]. According to this hypothesis, dominantly inherited predisposition to cancer entails a germline mutation (“first hit”), while tumorigenesis requires a somatic mutation (“second hit”). A positive family history usually indicates possibility of hereditary cancer. Beside positive family history, specific or common characteristic features can be identified among different hereditary cancer syndromes. These include: earlier age of onset, multiple primary cancers in an individual, clustering of rare cancers and bilateral or multifocal cancers [8].

Hereditary Cancer Syndromes

Hereditary cancers are caused by highly penetrant, germline pathogenic mutations in cancer susceptibility genes. They are commonly inherited as autosomal dominant traits but autosomal recessive traits also exist. The commonest hereditary cancer syndromes are hereditary breast and ovarian cancer (HBOC), hereditary non polyposis colorectal cancer (HNPCC), familial adenomatous polyposis (FAP), multiple endocrine neoplasia type 2 (MEN 2), Von Hippel-Lindau disease (VHL) and familial retinoblastoma (RB1). Genetically determined breast cancer syndromes include: Hereditary breast and ovarian cancer syndrome (HBOC) – BRCA1 and BRCA2 genes; Cowden syndrome (multiple hamartoma syndrome) - PTEN gene; Li-Fraumeni syndrome - TP53 and CHEK2 genes; Peutz-Jeghers syndrome - STK11 gene; Ataxia-telangiectasia - ATM gene and Hereditary Diffuse Gastric Cancer – CDH1 gene. Approximately 7% of breast cancers and 10% of ovarian cancers are known to arise from inherited mutations in specific tumor suppressor genes, namely BRCA1 and BRCA2. Women who carry mutations in BRCA1 and BRCA2 genes are estimated to have a 60 to 80% life time risk for breast cancer [10]. Although BRCA1 and BRCA2 mutations are inherited in an autosomal dominant manner, their expression depends on acquiring a second mutation in the normal BRCA1 or BRCA2 gene in somatic cells. Even though children of mutation carriers are at 50% risk of inheriting the mutation, the age of onset of their cancer is difficult to predict. It is important therefore to explain the difference between inheriting the mutation and development of the cancer to those seeking genetic counseling to help them understand the meaning of a positive test result and discuss with them the estimated lifetime risk of cancer.

Mutations in five DNA mismatch-repair genes which cause HNPCC (MLH1, PMS2, MSH2, MSH6, EPCAM) account for approximately 5% of colorectal cancers and less than 1% are due to mutations in the FAP gene which causes familial adenomatous polyposis. The discovery of genes responsible for hereditary cancer has been accompanied by technological advances in the characterization of the genetic mutations that predispose individuals to increased risk of cancer, as well as by advances in therapeutic interventions and screening strategies that effectively address hereditary cancer risk [11].

Identifying Hereditary Cancer Syndromes

The key to identifying individuals who are at risk for a hereditary predisposition to cancer lies in obtaining and analyzing a complete and accurate three-generation family history (pedigree). Pedigrees should include detailed medical history of the person seeking consultation (who may or may not be a person affected with cancer at the time of consultation), as well as their first-, second- and third-degree maternal and paternal relatives (i.e. children, parents, siblings, grandparents, aunts, uncles, nephews, nieces and first cousins). The pedigree should document the type and primary site of cancer, bilaterality, age at diagnosis and the current age or, if deceased, the age at death for each affected individual as well as information about other family members. Confirmation of cancer diagnosis through review of medical records, pathology reports or death certificates of family members will be useful in families where the verbal history appears to be unreliable. The extended pedigree of a family with hereditary breast cancer is shown in Figure 1.

When to Suspect Hereditary Cancer Syndromes

Table 1 shows the criteria for suspecting hereditary cancer syndromes in patients and their families [12].
Figure 1. Pedigree of a family with hereditary breast cancer syndrome due to mutation in the BRCA1 gene.

**When to Refer Patients for a Genetic Consultation**

Knowledge of the guidelines for referral for genetic evaluation would guide clinicians in the decision making process by providing evidence-based strategies for early detection, counseling, improved surveillance and selection of effective therapeutic options for patients and family members with predisposition to hereditary cancer syndromes [12]. The referral guidelines for genetic consultation for breast and colorectal cancer are shown in Table 2 and Table 3 respectively.

**Table 1: Characteristic Features of Hereditary Cancer Syndromes** [12]

<table>
<thead>
<tr>
<th>In the Individual Patient</th>
<th>In the Patient’s Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple primary tumours in the same organ</td>
<td>Two or more first-degree relatives on the same side of family with tumours of the same site</td>
</tr>
<tr>
<td>Multiple primary tumours in different organs</td>
<td>Two or more first-degree relatives with tumour types belonging to a known familial cancer syndrome (e.g. breast and ovary)</td>
</tr>
<tr>
<td>Bilateral primary tumours in paired organs</td>
<td>Two or more first-degree relatives with rare tumours</td>
</tr>
<tr>
<td>Multi-focality within a single organ</td>
<td>Three or more relatives in two generations with tumours of the same site or aetiologically related sites</td>
</tr>
<tr>
<td>Younger-than-usual age at tumour diagnosis</td>
<td>Evidence of autosomal dominant transmission – cancer occurring in multiple generations in the family</td>
</tr>
<tr>
<td>Tumours with rare histology</td>
<td>Diagnosis of a hereditary cancer syndrome in a family member.</td>
</tr>
<tr>
<td>Tumours occurring in the sex not usually affected (e.g. breast cancer in men)</td>
<td></td>
</tr>
<tr>
<td>Tumours associated with congenital anomalies</td>
<td></td>
</tr>
<tr>
<td>Tumours associated with an inherited precursor lesion</td>
<td></td>
</tr>
<tr>
<td>Tumours associated with another rare disease</td>
<td></td>
</tr>
<tr>
<td>Tumours associated with cutaneous lesions known to be related to cancer susceptibility disorders (e.g. the genodermatoses)</td>
<td></td>
</tr>
<tr>
<td>Characteristic combination of cancers</td>
<td></td>
</tr>
</tbody>
</table>

**Genetic Counselling for Hereditary Cancer Syndromes**

Genetic counseling allows individuals an opportunity to learn how heredity contributes to cancer risk, understand their personal risk of developing cancer, understand their options for managing their cancer risk and encourage adoption of risk-reducing behaviors that are appropriate for them. All individuals undergoing genetic testing should be offered pre-test and post-test counseling.

Pre-test counseling is a process that includes discussion of personal risks of cancer based on the family history, the possible outcomes of genetic testing, including benefits, risks, limitations of testing and obtaining informed consent prior to testing.

Post-test counseling is a process in which the genetic test results and their significance are discussed, and medical management is reviewed, including screening and treatment options.

Other matters to be discussed during counselling include: privacy and confidentiality of genetic information; potential insurance, employment and social discrimination; adverse psychological reactions;
**Table 2: Breast Cancer - Referral Guidelines for Genetic Consultation** [12-15]

<table>
<thead>
<tr>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple cases of breast and/or ovarian cancer in the family occurring in two or more close relatives:</td>
</tr>
<tr>
<td>Two 1st degree, or one 1st and one 2nd degree relative with breast cancer &lt;60 years and/or ovarian cancer at any age on the same side of the family.</td>
</tr>
<tr>
<td>Three or more family members (1st or 2nd degree) with breast or ovarian cancer on the same side of the family, any age.</td>
</tr>
<tr>
<td>Patient or 1st degree relative with breast cancer &lt;40 years, with or without family history.</td>
</tr>
<tr>
<td>Triple negative disease &lt;60 years.</td>
</tr>
<tr>
<td>A family member with bilateral breast cancer.</td>
</tr>
<tr>
<td>A family member with both breast and ovarian cancers.</td>
</tr>
<tr>
<td>A family member with primary cancer in both breasts if one or both cancers diagnosed before age 50 years.</td>
</tr>
<tr>
<td>A family member with male breast cancer.</td>
</tr>
<tr>
<td>A family member with ovarian cancer.</td>
</tr>
<tr>
<td>A family history with characteristic combinations of cancers.</td>
</tr>
<tr>
<td>Diagnosis of a hereditary breast cancer syndrome in a family member.</td>
</tr>
<tr>
<td>A family member with an identified BRCA1 or BRCA2 mutation.</td>
</tr>
</tbody>
</table>

...and sharing test results with relatives.

**Genetic Diagnosis of Hereditary Cancer Syndromes**

The identification of specific genes associated with hereditary cancer has enabled direct diagnosis of hereditary cancer syndromes through genetic analysis. Knowledge of the genetic mutations in families with hereditary cancer syndromes is vital for planning effective treatment strategies and for the early detection of hereditary cancer risk in other first and second degree relatives. Several studies have shown a reduction in breast and ovarian cancers in BRCA1 and BRCA2 mutation carriers through risk-reduction procedures such as bilateral prophylactic mastectomy and salphingo-oophorectomy respectively [3] as well as by chemoprevention using drugs like Tamoxifen and Raloxifene [18]. Germ line mutations of DNA mismatch-repair genes are a characteristic feature of HNPCC. Clinical surveillance of mutation carriers with hereditary predisposition to colorectal cancer can help prevent cancer. It is known that a significant proportion of hereditary cancers can be cured by surgery, radiotherapy, chemotherapy or hormone therapy, especially if detected early [3].

**Genetic Testing**

Genetic testing for Hereditary Breast and Ovarian Cancer (BRCA1 and BRCA2), Von Hippel-Lindau (VHL) and Retinoblastoma (RB1) mutations are available in Sri Lanka. Testing is done on DNA extracted from peripheral venous blood. In addition to these, the following pharmacogenomic tests are also available: k-Ras mutation testing (metastatic colorectal cancer), EFGR mutation testing (non small cell lung cancer) and BRAF mutation testing (papillary thyroid cancer, melanoma, colorectal cancer). In pharmacogenomic tests the tumour tissue is tested to predict response to chemotherapy so that chemotherapy can be modified accordingly.

**The steps involved in genetic testing**

- Test an affected family member FIRST after providing pre-test counseling and obtaining written informed consent.
Table 3: Colorectal Cancer - Referral Guidelines for Genetic Consultation [12, 13, 16, 17]

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal cancer (CRC) diagnosed &lt; 60 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>Endometrial cancer diagnosed &lt; 50 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>CRC or Endometrial cancer at any age with a family history of 2 or more family members with Lynch Syndrome-related cancers.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>Pancreatic adenocarcinoma &lt; 50 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>All epithelial ovarian cancers.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>&gt;10 adenomatous polyps.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>&gt;2 “Peutz Jegher” type hamartomas.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>&gt;3 Juvenile type polyps.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>Diffuse gastric cancer &lt; 50 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>Diffuse gastric cancer &gt; 50 years + additional relatives with gastric cancer.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>1st or 2nd degree relative with CRC ≤ age 35 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>1st or 2nd degree relative with 2 or more HNPCC/Lynch Syndrome-related cancers.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>2 or more 1st or 2nd degree relatives on same side of family with CRC diagnosed &lt; age 50 years.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>3 or more relatives with any HNPCC/Lynch Syndrome-related cancers at any age, on same side of family, at least 1 of whom has CRC.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
<tr>
<td>Family member with an identified HNPCC/Lynch Syndrome mutation.</td>
<td>Please refer to Table 3 for genetic consultation guidelines.</td>
</tr>
</tbody>
</table>

- If a mutation is found, then other family members, including those who are not affected, can be tested for that mutation.
- If a mutation is not found, consider testing other genes.
- Always provide post-test counseling.

**Benefits of genetic testing**
- Clarify risks of cancer.
- Identify individuals who are at increased risk who could benefit from increased cancer surveillance, or measures to decrease risk.
- Identify individuals who may not be at increased risk.

**Implications of a positive test result**
- Modify the age at initial screening & frequency of screening e.g. mammography, colonoscopy, upper GI endoscopy & endometrial screening.
- Family members at risk can be offered testing and identified.
- Healthy life styles can be reinforced.
- Clinical intervention can improve outcomes e.g. risk reduction mastectomy reduces risk of breast cancer, hysterectomy reduces risk of endometrial cancer, prophylactic colectomy reduces risk of colorectal cancer and salpingo-oophorectomy reduces risk of ovarian and breast cancer (in premenopausal women).

**Implications of a negative test result**
- Reassures the individual and their family members.
Characterization of Cancer Syndromes in Sri Lanka

In a study conducted to document the breast cancer profile of a group of Sri Lankan women [19], patient-tumor characteristics and predicted prognosis were compared with immune profiles. The authors concluded that the overall profile of breast cancer and immune characteristics of Sri Lankan women were highly comparable to profiles documented elsewhere in the South Asian region despite the lower prevalence of estrogen receptors [19]. Even though BRCA1 and BRCA2 gene mutations are the common genetic variants found in hereditary breast cancer, geographical variation due to population heterogeneity is known to occur in HBOC. In a study conducted by De Silva et al. among Sri Lankan breast cancer patients and in high risk individuals, novel sequence variants and a high frequency of recurrent polymorphisms in BRCA1 gene were identified. After screening 66 patients with family history and 64 sporadic breast cancer patients, six novel sequence variants were discovered [20]. However, no genotype-phenotype correlations were done in this study. A study conducted by Perera et al. to determine the prevalence of colorectal cancer and survival in patients from the Gampaha district, North Colombo region indicated that the burden of colorectal cancer in Sri Lanka is on the rise. Up to a third of cancers were found to occur in those under 50 years, and the majority of cancers were in the rectum or recto-sigmoid region [21]. A twelve year prospective database of colorectal cancer patients was analyzed by Chan et al. to compare the clinico-pathological features in young (<40 years) and older (≥50 years) patients. They observed that duration of symptoms and clinical presentation was similar in both groups [22]. Another comparative study on the clinico-pathological features of colorectal malignancies in Sri Lankan patients aged 40 years or younger and older patients conducted by De Silva et al. reported that there is no difference in clinical presentation between the 2 groups. In this study, all patients aged below 40 years diagnosed with colorectal cancer and treated at the Department of Surgery, University of Kelaniya, from September 1996 to September 2008, were analyzed from a prospective database. It was reported that patients less than 40 years old with colorectal cancer, had better survival rates with improved prognosis due to early detection and optimized clinical management [23].

Future Outlook for Cancer Genetics Research in Sri Lanka

There is a dire need to undertake large scale studies in Sri Lanka to document the phenotypic spectrum and the pattern of genetic mutations causing hereditary cancer syndromes in the local population. To date, there is paucity of data in this area in the Sri Lankan population. Moreover, due to marked population heterogeneity, the distribution of cancer predisposing genetic variants is known to differ among racial and ethnic groups. Therefore, it is necessary to map the clinical and genetic pattern of hereditary cancer syndromes in the local population to determine the prevalent genotypes and phenotypic characteristics. The findings from such studies will contribute to the advancement of the generalizable knowledge in the field of cancer genetics in Sri Lanka. The ultimate goal being to reduce cancer morbidity and mortality and improve the quality of life of cancer patients through primary prevention, early detection, improved surveillance and effective treatment options [24].

References


Common bile duct stones and their management

A. Dharmapala
Department of Surgery, Faculty of Medicine, University of Peradeniya, Sri Lanka

Key words: Common bile duct; stones; jaundice; ERCP

Introduction

Primary and secondary gall stones

Common bile duct (CBD) stones cause significant morbidity to the patient by causing obstructive jaundice, cholangitis and pancreatitis. The stones which develop in the CBD itself are known as primary biliary stones and are frequently observed in South East Asian countries. This is mainly due to parasitic infestation by liver flukes (Opisthorchis veverrini, Clonorchis sinensis). The pathogenesis is not directly related to the parasite itself but is due to the combination of stasis of bile and subclinical infection that occurs in the bile that results in stone formation. The infecting organisms are mainly Escherichia coli, Bacteroides and clostridium species which breakdown the conjugated bilirubin into unconjugated bilirubin due to the action of B-glucuronidase and furthermore, the bacteria secrete phospholipase A which produces palmitic and stearic acids. The acid hydrolases break down the conjugated bile acids into unconjugated bile acids. These chemical compounds form insoluble complexes with calcium thus forming brown pigment stones. This is quite apparent when the other conditions that lead to formation of primary biliary stones are considered, where its pathology results in bile stasis. This is seen in conditions like choledocal cysts, biliary strictures (sclerosing cholangitis, benign and malignant strictures) hepaticocejunostomies and foreign bodies (retained T tubes, parasites, sutures and blocked stents).

The common bile duct stones seen in the western world are usually migrated stones from the gall bladder. These are known as secondary stones. About 10% - 15% of the patients who undergo cholecystectomy will have gall stones in the common hepatic ducts, but only 2/3 will give rise to symptoms [2]. These CBD stones should be treated even if these are asymptomatic [3]. Since the diameter of the cystic duct is about 2-3mm, the stones which can pass through the duct will be very small. These migrated stones or gravel cannot naturally obstruct the common bile duct.

Complications

Even though these stones are small, they are capable of blocking the ampulla of Vater transiently which may result in causing gall stone pancreatitis. In addition, these stones can give rise to deranged liver enzymes or cause cholangitis. This was clearly demonstrated by a study where small gall stones were detected in faeces of about 90% of the patients who had gall stone pancreatitis [4]. This shows that transient obstruction and passage of gall stones can cause pancreatitis.

These small stones are unlikely to cause obstructive jaundice. The secondary CBD stones that cause obstructive jaundice are usually large stones. This scenario is not possible with a normal caliber cystic duct (2-3mm). On the other hand, there are short and broad cystic ducts in some patients which may allow migration of bigger stones into the CBD that might lead to obstruction.

The other instance where stones migrate into the CBD is through a fistulation between the gall bladder and the CBD. Fistulation usually takes place when a gall stone has impacted in the Hartmann’s pouch for a long time. This will result in chronic inflammation and subsequently lead to fistulation between the gall bladder and CBD. This will allow larger stones to pass into the CBD. This is also known as Mirizzi syndrome. There are 4 types of Mirizzi syndrome. In Type I there is only external compression of the bile duct. In Types II and III there is fistulation between the gall bladder and hepatic ducts. There is complete destruction of the duct
observed in Type IV [5]. Mirizzi syndrome is seen in 0.1-0.7% patients with symptomatic gall stone disease [6, 7].

**Predictors/Indicators of CBD obstruction**

CBD stones are suspected preoperatively if there is a history of jaundice, pancreatitis, cholangitis, and elevated bilirubin levels or raised liver enzymes (alkaline phosphatase). A dilated biliary duct system on imaging is a strong indicator of CBD obstruction. Transabdominal ultrasonography is a good initial investigation in picking up gall stones in the gall bladder but it is not the ideal imaging modality to look at the CBD. The sensitivity is around 95% in picking up stones in the gall bladder, as opposed to poor pick up rate of detecting stones in the CBD where it is around 30%, although the specificity is 100% [8, 9]. Multivariate logistic regression analysis on significant predictors have shown that, if cholangitis [odds ratio (OR): 10.5], a dilated CBD with evidence of stones in the gall bladder on ultrasound scan (OR: 7.4), elevated aspartate transaminase levels (OR: 2.9), and conjugated bilirubinaemia (OR: 5.3) were considered together, the likelihood of having stones in the duct is about 99%. Without any of these predictors, the likelihood drops to around 7% [10]. A prospective study of 1000 laparoscopic cholecystectomies showed that 10% of the patients had diagnosed to have CBD stones on preoperative cholangiography where the other parameters were normal. This study also showed that jaundice, cholangitis, raised alkaline phosphatase and dilated CBD were significant predictors of CBD stones [11].

**Investigations of CBD stones**

If there is unequivocal evidence of gall stones in the CBD, the preferred method is to undergo ERCP. This has a success rate of 70-90% as this is a diagnostic as well as therapeutic option [12]. There is a false positivity of around 40-60% at ERCP. This puts patients through an unnecessary investigation. The Diagnostic ERCP has a morbidity of 5-6% and mortality of 0.1-0.89%. Therefore before embarking on this invasive procedure as a diagnostic tool there should be clear indications and should be used as the last investigative procedure to visualize the CBD [13]. Of all the complications in ERCP, ERCP related pancreatitis is the leading cause for morbidity and mortality.

In situations where the diagnosis of CBD stones is inconclusive, MRCP is a much safer and reliable option. This has a very good sensitivity and specificity of around 90% [14, 15]. Contrast CT scanning is also an option in delineating common bile duct stones as this is available in most hospitals, even in emergency settings. This has a sensitivity of 65-93% and specificity of 84-100% which is far superior to transabdominal ultrasonography [16, 17].

Endoscopic ultrasonography scan is also gaining popularity. This is also valuable in excluding other pathologies in lower CBD. This also has a sensitivity and specificity similar to MRCP. Meta analyses have had shown a pooled sensitivity of 94% with specificity of 95% for detecting stones in the CBD with EUS [18]. Some studies show that it is better than MRCP in detecting small stones less than 5mm in diameter with sensitivities of 100% [19, 20]. Also, EUS can prevent about 30% of unnecessary ERCP [21].

In situations where there is a history to suggest CBD stones, such as obstructive jaundice, cholangitis, acute pancreatitis, elevated liver enzymes especially alkaline phosphatase, but no definitive findings just prior to cholecystectomy, the CBD should be imaged with a sensitive imaging modality like MRCP, EUS or CT scan or else during the surgery one should at least perform intraoperative cholangiography. ERCP is better avoided in situations like this to prevent unnecessary mortality and morbidity. The same principle can be applied to patients with a moderate risk of CBD stones i.e. patients who have had deranged liver enzymes with normal caliber CBD. If stones are detected during surgery, one could complete the procedure and later perform ERCP at the same admission or had explore the CBD concurrently [22].

**Treatment options**

**Endoscopic techniques**

ERCP is becoming the preferred choice in dealing with CBD stones. A nation-wide study carried out in Sweden showed that the use of laparoscopic or open choledochootomy (CBD exploration) had dropped from 19.4 to 5.2 and ERCP had gone up 5.1 to 26.4 per 100,000 population per year. What this change has done is that there were more readmissions of patients with
biliary and pancreatic complications due to the paradigm shift from choledochotomy to ERCP [23]. This is due to the fact that after sphincterotomy and stone removal from the CBD, the patients are discharged and the cholecystectomy is usually scheduled for a later date. During this period patients present back to the hospital with the above mentioned complications. But this was not the case earlier, in patients with CBD stones and gall stones where surgery was done to remove CBD stones and the gallbladder in the same setting.

**Stone extraction**

In most instances, a sphincterotomy is done before the extraction of stones when it is done endoscopically. But if there is a coagulopathy, a sphincterotomy is not possible as this will lead to bleeding. Instead, endoscopists resort to balloon dilatation prior to extraction or a stent is placed as a temporary measure. The problem with balloon dilatation is that it carries a risk of post ERCP pancreatitis, which is significantly higher than with sphincterotomy. A US multicenter study showed that the pancreatitis rate was 15.4% in the balloon dilated group compared to 0.8% in the sphincterotomy group. This difference was significant. Some other studies also have shown similar results thus favouring sphincterotomy prior to stone removal [24,25,26].

For stone removal, the dormia basket and the balloon are being frequently used. The sphincterotomy makes it easier for the extraction.

**Large Stones**

Larger CBD stones pose a challenge to the endoscopist. A larger sphincterotomy is always advisable, but intraductal mechanical lithotripters and laser lithotripters are used to break the stones. These are successful most of the time [27]. The success rate varies in different studies, ranging from 79% to 95% [27, 28]. If such devices are not available, it is advisable to carry out open CBD explorations. Stones of 1.5cm are considered to be large stones in most studies but it has been shown that size of the stone was not a predictor for the failure of the endoscopic procedure. However impaction of the stone in the CBD and the anatomical variations of the CBD are factors that have led to failures [28].

Comparative studies on sphincterotomies and large balloon dilatations vs usage of mechanical lithotripters in extracting larger stones have indicated that both procedures show equal success rates with a marginally higher incidence of complications in the balloon dilatation group [29].

The use of the spyglass in directly visualizing the CBD when using the laser lithotripter is also being carried out with a few studies documenting the success of this procedure [30].

ERCP and sphincterotomy to extract stones in the younger age group poses the question of long term complications due to enteric reflux. Studies showed that complication rates were 11-19 %, the majority of which were due to recurrent stone formation [31]. There were no reported cases of cholangio carcinoma on long term follow up. Almost all these complications were dealt with endoscopically. Studies have shown that a CBD diameter of more than 1.5 cm, brown pigment stones and prepapillary diverticula are risk factors for the development of long term complications [31, 32, 33].

**Exploration of CBD**

Exploration of the CBD can be done laparoscopically or as an open procedure. Laparoscopic CBD exploration should be considered in situations where there is a dilated duct. This has to be done by an experienced surgeon and is not a task for a novice. There are two methods of exploring the CBD. One is through the cystic duct (trans cystic) when the duct is short and wide and the other through a choledochotomy on the anterior wall. These techniques have a complication rate of 2-17% and a mortality rate of 1-5% which are similar to those of ERCP [34].

Open exploration of the CBD is now becoming confined to situations where laparotomy is necessary for other reasons. After exploration of the CBD, a completion cholangoscopic examination or a completion cholangiogram should be considered to avoid leaving behind stones in the CBD. These are known as missed stones. The residual stones detected after routine CBD exploration with completion cholangiogram are in the range of 6–11% [4, 35].

After the exploration, the CBD is usually closed over a T tube. The T tube should be brought out from the closest
possible place in the anterior abdominal wall, expecting a short tract. This is due to the fact that if some intervention is needed later, the tract can be used as an access route. This also facilitates easy removal of the T tube. After removal of the T tube there will be leakage of bile for a short period of time but this dries off quickly. The risk of peritoneal contamination after removal is minimal and is extremely rare [36].

Performing a T tube cholangiogram before removal should be considered if a completion cholangiogram was not carried out during surgery. If missed stones are detected by a T tube cholangiogram, the T tube can be used to flush the CBD. There should not be excessive pressure when flushing as it can lead to reflux of bile into the circulation. The drip should be kept at a height of 1 meter and free flow enabled. If this fails to flush away the stones, the T tube is left in situ for 3-4 weeks for the maturation of the tract. Later, with the aid of a choledochoscope stones can be extracted through the tract.

Cochrane analyses of trials comparing the T tube drainage vs primary closure of the CBD after laparoscopic CBD exploration have shown that there is no difference in morbidity and mortality rates and recommend closing the CBD primarily. The T tube drainage group had a longer hospital stay when compared to the other group [37, 38]. The same group has shown similar results in another meta-analyses where it was reported that even after open CBD exploration, one can close the CBD primarily without a T tube [39]. Another study has shown cholecdochothomy closure over a stent results in a shorter postoperative stay and an earlier return to normal activity compared with closure over a T-tube without any increase in morbidity [40]. These studies and systematic reviews show that it is safer to close CBD primarily rather than using a T tube drainage procedure. This has to be considered in individual cases, ensuring that there are no residual stones or strictures at the ampulla because this can lead to leakage of bile from the suture line. If there is no back pressure there will be no bile leak from the suture line.

Conclusion

This article mainly tries to discuss the problems that arise in the management of CBD stones. It is impossible to pick a single best method of management as this depends on the available resources and the skills of the individual surgeon. That would be the best evidence based practice where the safety of the patient becomes the number one priority. It is not an easy task for surgeons to be conversant with every new technique and to keep up with the latest inventions that are brought on every day, especially in biliary tract surgery where the margin for error is minimal, and most of the time there will be no second chance for the surgeon. Therefore this article gives the currently available data on CBD stone management in order to compare and improve on his or her practice.

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Nasojejunal feeding versus feeding jejunostomy after upper gastrointestinal surgery

Professorial Unit, Department of Surgery, Colombo North Teaching Hospital, Sri Lanka.

Key words: Nasojejunal feeding; jejunostomy; nutrition

Abstract

Introduction

The use of enteral nutrition over parenteral nutrition is recommended in the case of patients undergoing major gastrointestinal surgery for cancer, as it reduces sepsis related morbidity. In this study we compared our experience of nasojejunal tube feeding with feeding jejunostomy.

Materials and Method

All patients who underwent elective upper gastrointestinal surgery in our unit (North Colombo Teaching Hospital) from October 2011 to October 2012 were studied. Data gathered included; type of surgery, operative factors, preoperative nutritional level, type of feeding, complications and period of hospital stay.

Results

Twenty patients, median age 53yrs; range (32 – 72), fifteen male and five female, comprised of ten patients in the feeding jejunostomy group and ten in the nasojejunal feeding group. Both groups were comparable for age, gender, body mass index, preoperative serum albumin level, type of surgery and operation time. Mortality of 40 percent was attributed to aspiration in those with a feeding jejunostomy compared with no aspiration after nasojejunal feeding. Some 60 percent of feeding jejunostomy tubes were in-situ in patients at the time of hospital discharge versus none in the naso-jejunal group. Surgery complications, such as chest infection were comparable in both groups. However, entero-cutaneous leakage occurred in 30percent, and was a considerable management burden in the feeding jejunostomy group.

Conclusion

In upper gastrointestinal surgery nasojejunal tube feeding seems better than feeding jejunostomy.

Introduction

Traditionally, in the critically ill patient, nutrition is provided through enteral as well as parenteral routes. The current guidelines of the European Society for Parenteral and Enteral Nutrition (ESPEN) and American Society of Parenteral and Enteral nutrition (ASPEN) recommend use of enteral nutrition over parenteral nutrition in the case of patients undergoing major gastrointestinal surgery for cancer, as it is known to reduce septic morbidity rates [1,2]. Enteral nutrition may be provided as oral supplements in the form of drink supplements after upper gastrointestinal surgery via an enteral tube into the stomach or small bowel. There are different methods of enteral tube feeding; enteral feeding is usually by nasoenteric or enterostomy tubes [2,3]. In this study we assessed whether nasojejunal tube placement is superior to feeding jejunostomy.

Methods

Twenty patients comprised ten patients in the feeding jejunostomy group and ten in the nasojejunal feeding group. The median age for feeding jejunostomy patients was 53 years (32–72) and for nasojejunal tube feeding patients was 56 years (32–67). A comparison of groups did not show a difference between the feeding jejunostomy and naso-jejunal feeding group (table 1).

Route of feeding

For nasojejunal feeding, we introduced a flexible 14 Ch feeding tube through the nose which was positioned in the jejunum at the time of operation. In feeding...
jejunostomy, a 14F catheter was placed trans-abdominally into the jejunum during at the end of the procedure as previously described [3]. Both tubes were stabilized - nasojejunal tube at the nostril and feeding jejunostomy catheter at the anterior abdominal wall- with a 3/0 silk suture. The choice of feeding route was based on individual surgeon’s preference.

Data collection and analysis

Data were collected using a questionnaire. The type of surgery, operative factors affecting outcome, pre-operative nutritional level, pre-operative morbidity, type of feeding and its complications, post-operative morbidity, mortality and period of hospital stay were gathered prospectively during daily patient visits. Primary endpoints were the time to removal of the tube and tube related complications. Secondary end points were complications of tube feeding, surgical morbidity, mortality and length of hospital stay.

Inclusion and Exclusion criteria

All elective upper gastrointestinal surgical procedures in our unit, between October 2011 and October 2012, were studied. Inclusion criteria were; those having oesophagectomy, total and partial gastrectomy, gastrojejunostomy, Whipple's pancreateo-duodenectomy and palliative triple bypass for inoperable pancreatic cancer. Those excluded were; patients with nasojejunal tubes which were already in place pre-operatively. There were no interventions or deviations from the normal management during this study process.

Collected data were documented in excel sheets and data analysis was performed using the Statistical Package for Social Studies (SPSS version 21.0.0, New York, USA). Data were expressed as either median and range or mean and standard deviation. The test of significance used was a Pearson correlation test. Significance was assigned to a P value of <0.05.

Results

Of twenty two patients available for the study during this period, two were excluded because they had

| Table 1: Comparison of patients in jejunostomy feeding and nasojejunal feeding groups. |
|---------------------------------|-----------------|-----------------|
| Age- median(range)              | 53 years (32 - 72) | 56 years (32 -67) |
| Gender Female:Male              | 2:8              | 3:7              |
| Body Mass Index                 | 17.77kgm^-2(SD+2.924) | 18.252kgm^-2(SD+3.195) |
| correlation bivariate test      | p value 0.810    |
| Pre-operative serum albumin     | 3.51g/dl (SD+0.655) | 3.41g/dl (SD+0.63) |
| correlation bivariate test      | p value 0.697    |
| Pre-operative morbidity         | Number           | Number           |
| 1. Diabetes Mellitus            | 2                | 3                |
| 2. Hypertension                 | 2                | 1                |
| 3. Chronic liver cell disease   | 1                | 0                |
| 4. Hypercholesterolemia        | 0                | 1                |
| 5. Hyperthyroidism              | 1                | 0                |
| 6. Hypothyroidism               | 1                | 0                |
nasojejunal feeding tubes before operation. Operation time differed according to the type of surgery. Insertion of a nasojejunal tube did not add time to operation time but feeding jejunostomy creation added, on average, 15 to 20 min to the operation. Mean operating time for the feeding jejunostomy group was 4.14hrs (+1.34) and nasojejunal feeding group was 5.0hrs (+1.80), which was not significantly different (P = 0.112 ; Pearson's test.)

Indications and type of surgery

Details of surgical procedures are shown in table 2. Most of the oesophagectomy and total gastrectomy patients had a feeding jejunostomy while those having partial gastrectomy and gastrojejunal anastomosis had a nasojejunal feeding tube. Nearly equal proportions of patients who underwent pancreatoco-duodenectomy had jejunostomy and nasojejunal feeding tubes.

Mortality

Four(40 percent) in the feeding jejunostomy group died due to pulmonary aspiration complicating feeding jejunostomy and one (10 percent) died in the nasojejunal feeding group, which was due to disseminated cholangiocarcinoma with obstructive jaundice and multiorgan failure.

Time to removal of the tube

Details of the time from placement to removal of the tube are shown in table 3. In the feeding jejunostomy group, 60% of the patients were discharged from hospital with the tube in place and 20% of the tubes were removed after 14 days. The remaining 20% were removed between 10 -14 days. In the nasojejunal feeding group, 60% of the tubes were removed within 10 days of placement.

Complications of tube feeding

Complications that occurred from tube feeding are shown in table 4. In the feeding jejunostomy group, 40% had aspiration pneumonia, 30% had intestinal colics and complications as severe as intra-abdominal abscess formation and peritonitis were found in 20%. Mortality (40%) also found due to these complications. In the nasojejunal feeding group, 50% had nasal tube associated rhino-pharyngitis, 40% had poor compliance and 10% had aspiration pneumonia, resulting in a total complication rate of 100% (including minor tolerable complications) for nasojejunal feeding versus 80% for jejunostomy feeding.

Time to commence feeds

In both groups, time to start feeding after surgery differed according to the patient's condition. Details are shown in table 5. In 80 percent of feeding jejunostomy patients, feeding commenced on the first post-operative day whereas, in the nasojejunal feeding group, feeding commenced between the first and third post-operative day in 60 percent of patients. Feeding through the jejunostomy was discontinued in the third to fourth post operative day due to complications (aspiration pneumonia, intestinal colic, abdominal distention,

<p>| Table 2: Indications and type of surgery in both groups |
|----------------------------------------|----------------|----------------|-------------------------|-----------------|----------------|</p>
<table>
<thead>
<tr>
<th>Indications for surgery</th>
<th>Feeding jejunostomy</th>
<th>Nasojejunal feeding</th>
<th>Type of surgery</th>
<th>Feeding jejunostomy</th>
<th>Nasojejunal feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumferential duodenal growth</td>
<td>2(20)</td>
<td>1(10)</td>
<td>Oesophagectomy</td>
<td>2(20)</td>
<td>1(10)</td>
</tr>
<tr>
<td>Gastric antral tumour</td>
<td>5(50)</td>
<td>3(30)</td>
<td>Total gastrectomy</td>
<td>4(40)</td>
<td>0</td>
</tr>
<tr>
<td>GIST(Gastrointestinal stromal tumour)</td>
<td>1 (10)</td>
<td>0</td>
<td>Total gastrectomy +distal</td>
<td>1(10)</td>
<td>0</td>
</tr>
<tr>
<td>Cystic lesion in the head of pancreas</td>
<td>1(10)</td>
<td>1(10)</td>
<td>Total gastrectomy</td>
<td>1(10)</td>
<td>0</td>
</tr>
<tr>
<td>Oesophageal carcinoma</td>
<td>2 (20)</td>
<td>1 (10)</td>
<td>Gastrojejunostomy</td>
<td>0</td>
<td>1(10)</td>
</tr>
<tr>
<td>Duodenal tumor with peritoneal and liver</td>
<td>1(10)</td>
<td></td>
<td>Palliative</td>
<td>0</td>
<td>1(10)</td>
</tr>
<tr>
<td>metastasis</td>
<td></td>
<td></td>
<td>gastrojejunostomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locally advanced cholangio carcinoma</td>
<td>1(10)</td>
<td></td>
<td>Palliative partial</td>
<td>0</td>
<td>3(30)</td>
</tr>
<tr>
<td>Periampullary carcinoma</td>
<td>1(10)</td>
<td></td>
<td>gastrectomy</td>
<td>0</td>
<td>1(10)</td>
</tr>
<tr>
<td>Pyloric stricture</td>
<td>1(10)</td>
<td></td>
<td>Whipple’s pancreato</td>
<td>2(20)</td>
<td>3(30)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>duodenectomy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
abscess and peritonitis, obstruction and dislodgement – table 4). Because of the complications of feeding jejunostomy, oral feeding was omitted in one half of feeding jejunostomy patients compared with nasojejunal feeding, where all patients continued to be fed without complication.

Length of hospital stay

A majority of patients having feeding jejunostomy stayed in hospital for median of 14 days (10 to 30 days). In the nasojejunal feeding group median hospital stay was 9 days (3 to 60 days). Only one patient stayed in hospital for 60 days due to the disseminated disease. Hospital stay was significantly affected (p=0.02) by the mode of feeding.

Overall complication rate

Table 6 shows the complications, overall, in the feeding jejunostomy and nasojejunal feeding groups. In the feeding jejunostomy group 70 percent of the patients had chest infections, 30 percent had anastomotic leaks and 10 percent were free of complications. In the nasojejunal feeding group 70 percent had chest infections, 10 percent had anastomotic leaks and 20 percent remained free of complications.

Discussion

In this study we compared our experience of nasojejunal tube feeding with feeding jejunostomy after upper gastrointestinal surgery. Both groups were compared according to patient factors, preoperative nutritional level, surgical factors, tube related factors and post-operative morbidity and mortality.

Regarding the common factors, age and gender were not significant in tube feeding outcomes. Malnutrition in patients with cancer has been shown to increase the risk of postoperative complications [4]. In our study both groups had a comparable mean body mass index and serum albumin level.

The primary endpoints in this study were time to removal of the tube and tube related complications. The secondary end points were complications of tube feeding, morbidity, mortality and length of hospital stay. Those fed through a nasojejunal tube received feeds for a short period (7 to 9 days) and most (60 percent) were removed within nine days. By contrast, the majority of feeding jejunostomy patients (80 percent) had their feeding omitted some days after early commencement due to complications that resulted from the tube. Feeding jejunostomy tubes were in place for more than two weeks and most (60 percent) were not removed at the time of hospital discharge. Thus, compared to the feeding jejunostomy group, nasojejunal tube feeding patients were able to have continuous feeding without severe complications.

Review of the literature is supportive of our findings, for example Gerritsen et al showed that feeding jejunostomy patients had greater complications versus nasojejunal feeding patients [5]. In this study we found

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Table 3: Tube removal time in feeding jejunostomy group and nasojejunal feeding group.

<table>
<thead>
<tr>
<th>Time of the tube removal</th>
<th>Feeding jejunostomy</th>
<th>Nasojejunal feeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not removed at time of discharge</td>
<td>6(60)</td>
<td>1(10)</td>
</tr>
<tr>
<td>Removed within 5 days</td>
<td>0</td>
<td>1(10)</td>
</tr>
<tr>
<td>Removed between 5-9 days</td>
<td>0</td>
<td>5(50)</td>
</tr>
<tr>
<td>Removed between 10-14 days</td>
<td>2(20)</td>
<td>2(20)</td>
</tr>
<tr>
<td>Removed after 14 days</td>
<td>2(20)</td>
<td>1(10)</td>
</tr>
</tbody>
</table>

Table 4: Complications of tube feeding *

<table>
<thead>
<tr>
<th>Feeding jejunostomy</th>
<th>Frequency</th>
<th>Nasojejunal feeding</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspiration pneumonia</td>
<td>4</td>
<td>Compliance</td>
<td>4</td>
</tr>
<tr>
<td>Intestinal colic</td>
<td>3</td>
<td>Rhino pharyngitis</td>
<td>5</td>
</tr>
<tr>
<td>Water and electrolyte imbalance</td>
<td>2</td>
<td>Aspiration pneumonia</td>
<td>1</td>
</tr>
<tr>
<td>abdominal distension</td>
<td>1</td>
<td>Water and electrolyte imbalance</td>
<td>3</td>
</tr>
<tr>
<td>Cutaneous and intra-abdominal abscess, peritonitis</td>
<td>2</td>
<td>Diarrhea and vomiting</td>
<td>2</td>
</tr>
<tr>
<td>Cutaneous and intra-abdominal leakage</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstruction and dislodgement</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No complications</td>
<td>2</td>
<td>No complication</td>
<td>0</td>
</tr>
</tbody>
</table>

*Some had more than one complication
that after feeding jejunostomy, patients had aspiration pneumonia which led to mortality. Other severe complications were cutaneous and intra-abdominal leakage, peritonitis and intra-abdominal abscess formation. By contrast, complications such as rhino pharyngitis and intolerance of the tube following nasojejunal feeding were better tolerated. Thus, the nasojejunal feeding tube seemed better than the feeding jejunostomy at least in the short term.

Regarding mortality, feeding jejunostomy patients had 40 percent mortality versus 10 percent in the nasojejunal feeding group. In the former, the mortality was due to complications of feeding jejunostomy but in the latter mortality was due to disseminated cancer. Furthermore, the length of hospital stay was reduced in the nasojejunal feeding group compared with feeding jejunostomy group, which, we believe, was due to better patient tolerance, minor complications and early tube removal.

Postoperative chest infections were the most common complication in both groups. In addition, feeding jejunostomy patients had a greater anastomotic leakage where feeding jejunostomy was not a cause for anastomotic leakage, a factor that may have been better controlled if we undertook a randomized study to stratify for factors that influenced anastomotic leakage and surgical procedure. Also, the result of the study may have been improved by evaluation of a greater sample size and, perhaps, performing a multi-centre trial.

In conclusion, after upper gastrointestinal surgery, patients having nasojejunal feeding seemed to fare better than those having a feeding jejunostomy based on continuity and duration of feeding, time to tube removal, tube related morbidity and mortality and, ultimately, length of hospital stay.

References


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Table 5: Time to initial feeding and oral feeding in feeding jejunostomy and nasojejunal feeding groups

<table>
<thead>
<tr>
<th>Tube feeding time</th>
<th>Feeding jejunostomy (number)</th>
<th>Nasojejunal feeding (number)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post op D1</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>D2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>D4</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>After D5</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Not given</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 6: Frequency of surgical complications in feeding jejunostomy group and nasojejunal feeding group. (Figures in parentheses represent percentage value)

<table>
<thead>
<tr>
<th>Csłś├■┼jejunostomy group</th>
<th>Frequency</th>
<th>Nasojejunal feeding group</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chest infection</td>
<td>7 (70)</td>
<td>Chest infection</td>
<td>7 (70)</td>
</tr>
<tr>
<td>Anastomotic leakage</td>
<td>3 (30)</td>
<td>Anastomotic leakage</td>
<td>1 (10)</td>
</tr>
<tr>
<td>Haemothorax and hypoxic brain damage</td>
<td>1 (10)</td>
<td>Wound infection</td>
<td>1 (10)</td>
</tr>
<tr>
<td>Post operative ileus</td>
<td>1 (10)</td>
<td>Post vagotomy diarrhoea</td>
<td>1 (10)</td>
</tr>
<tr>
<td>No complications</td>
<td>1 (10)</td>
<td>Urinary tract infection</td>
<td>1 (10)</td>
</tr>
</tbody>
</table>

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An evaluation of the role of ultrasonography in acute scrotum in children
Departments of Paediatric Surgery and Radiology, Royal Manchester Children’s Hospital, Manchester, United Kingdom.

Key words: Torsion of testis in children, ultrasound scan of scrotum, scrotal exploration

Abstract

In children, due to difficulty in diagnosing torsion of testis (TT), a high rate of negative scrotal explorations is seen worldwide. To assess the possibility of utilising ultrasound scan of scrotum (USS-S) to minimise this rate at the Royal Manchester Children's hospital, a prospective audit of USS-S findings when diagnosis of TT became doubtful was performed.

Of the 61 children with acute scrotum admitted to emergency department (studied over 6 months), diagnosis was doubtful in 11 and hence had pre-operative USS-S: 7 urgent and 4 early. Twenty three underwent exploration without ultrasonography.

Of 7 early presenters, 3 were diagnosed as TT clinically, ultrasonically and at surgery.

One with clinically suspected but ultrasonically excluded TT had TT at exploration. Two clinically suspected torted appendages (TA) with sonographic finding of acute epididymoorchitis (AE) had AE at surgery. One with clinically doubtful diagnosis of TT/TA with USS-S finding of AE had TA at surgery.

In all 4 late presenters, TT was diagnosed clinically, ultrasonographically and at surgery.

USS-S was helpful in the diagnosis of early and late acute scrotum.

Introduction

Acute scrotal pain in children could represent a diagnostic dilemma due to difficulty in differentiating torsion of testis (TT) from torsion of appendage of testis (TA) and acute epididymo-orchitis (AE) as the typical clinical features of TT are seen only in 50% (1). Irreversible ischemic changes occur within 4 hours of onset of TT decreasing the testicular salvage rate after surgery from 90% at 6 hours to 10% at 24 hours (2). The threshold for surgical exploration has become low worldwide due to these facts resulting in 77%-86% negative scrotal explorations (3,4,5,6).

Material and methods

A prospective audit of the use of ultrasound scan of scrotum (USS-S) in children admitting to the emergency department at The Royal Manchester Children’s Hospital (RMCH) with doubtful diagnosis of TT was performed over a 6 month period (age range: from birth to 16 years).

USS-S was done urgently when the patient presented within 24 hours of onset of symptoms and, early after 24 hours of onset of symptoms. To minimise the workload on radiology department, surgery was done without USS-S when the clinical diagnosis of TT was highly likely. In every case, the clinical decision making was made by the consultant urologist or the registrar on call and the USS-S was performed by the consultant radiologist. The final management was based on the clinical findings irrespective of the USS-S results during the study period.

Patients were reviewed in the clinic at RMCH 6 months after being discharged to assess the status of the testis.

Data was collected prospectively by the first author who discussed with the decision making clinician and the consultant radiologist in each case. The audit proposal was approved by the Central Manchester Foundation Trust.

Results

The audit period was performed over a 6 month period (14/01/11-13/07/11). There were 61 patients.
Eleven had clinically doubtful diagnosis of TT and were explored after USS-S. Seven of these had urgent USS-S. Four had non urgent USS-S. In all 4 patients, TT was diagnosed clinically, ultrasonically and at surgery.

Clinically TT was suspected and explored without USS-S in 23. In these patients there were 9 TT, 4 TA and 2 AE. Eight had normal testes.

**Follow up**

Clinic review was planned after 6 months but only 13/61 attended. Only 8 of these had undergone surgery. The rest had AE.

Only 1/8 had pre-operative USS-S. His TT was confirmed clinically, ultrasonically and surgically. On review, the testis was smaller than its partner. Of the 7/8 who underwent testicular exploration without USS-S, 5 had TT, 1 had TA, and 1 had AE on exploration. On clinic review, all testes were of normal size.

**Discussion**

At a retrospective audit previously conducted at RMCH where 205 children with acute scrotum were studied over a 2 year period, out of 104 scrotal explorations TT was found in 15 and TA was found in 61 (7). On searching for a diagnostic aid to minimise the rate of negative scrotal explorations, ultrasound scan of scrotum (USS-S) with the sensitivity and specificity around 89-100% (8) was identified as the most practical and best imaging modality.

There were no guidelines at RMCH for using imaging in the diagnosis of acute scrotum prior to this audit. At a Urology-Radiology consensus session, criteria were decided upon to use USS-S when the clinical diagnosis of TT becomes difficult. The USS-S had to be limited to instances where the diagnosis of TT was doubtful in order not to overburden the workload of the radiology department. The study would have been more informative if USS-S was performed on all patients with acute scrotum.

During the study period patient management was done solely on the clinical findings to facilitate independent assessment by sonography. Later, the clinical and sonographic diagnoses were compared with surgical findings in each patient. On reviewing the images of the patients whose clinical, radiological and surgical findings disagreed, similar to other publications(5), we found that USS-S images were not always diagnostic (eg: when USS-S diagnosis was AE while clinical and surgical findings were TT, the USS-S did not show features of TT). The difficulties expressed by the radiologists included difficulty in differentiating TA from AE and performing sonogram in an already distressed child.

The following observations made on completion of the study.

USS-S was helpful in diagnosing both early and late acute scrotal presentations but can miss TT. Sonographical differentiation of early TA from early AE was difficult. In USS-S, TT was diagnosed on finding reduced or absent vascularity to the testis and AE was diagnosed on finding swollen enlarged epididymis (and possibly testis) with increased vascularity on doppler/colour flow. These findings were sometimes very subtle and therefore could have an element of operator dependency.

The experience of the decision making clinician might have influenced the negative outcome in some patients who underwent exploration without USS-S.

The value of the audit however, was limited by the poor long term follow up. The data obtained from this study is inadequate to arrive at a final conclusion on the use of

<table>
<thead>
<tr>
<th>Number</th>
<th>Clinical diagnosis</th>
<th>USS diagnosis</th>
<th>Surgical finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/7</td>
<td>TT</td>
<td>TT</td>
<td>TT</td>
</tr>
<tr>
<td>2/7</td>
<td>TA</td>
<td>AE</td>
<td>AE</td>
</tr>
<tr>
<td>1/7</td>
<td>TA/TT</td>
<td>AE</td>
<td>TA</td>
</tr>
<tr>
<td>1/7</td>
<td>TT</td>
<td>AE</td>
<td>TT</td>
</tr>
</tbody>
</table>
ultrasonography in the diagnosis of acute scrotum in children. The final decision on the surgery still needs to be based on the clinical findings. A multi centre study would provide better information as it involves higher number of patients over a shorter period of time.

References


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Reconstruction of the middle hepatic vein in live donor liver transplantation: will it improve donor liver function?

C.A.H. Liyanage 1,2
1 Department of Surgery, University of Kelaniya medical School, Sri Lanka.
2 Department of Surgery, Asan Medical Center, University of Ulsan College of Medicine, Songpa-Gu, Seoul, Korea.

Key words: Live donor liver transplantation; middle hepatic vein; reconstruction.

Abstract:
Right liver graft with the middle hepatic vein sometimes induces postoperative liver failure in donors due to insufficient functional remnant liver volume. Venous drainage of the graft is important for prevention of congestion and proper function of the graft. Therefore right hepatic veins and the tributaries of the middle hepatic vein need reconstruction.

The unique technique of reconstructing the middle hepatic vein, the right hepatic vein and the short hepatic veins using allografts and artificial grafts are discussed.

Patients who had right hepatic and middle hepatic vein reconstructions had good graft functions and less hepatic congestion. This technique will be useful for preserving liver function in right liver lobe donors in Sri Lanka where more than 31% of the general population has fatty liver disease.

Introduction:
In partial liver transplantation, the middle hepatic vein (MHV) is included in either the right or left hemiliver. Especially in adult-to-adult live donor liver transplantation (LDLT), right liver graft with the MHV sometimes induces postoperative liver failure in donors due to the insufficient functional remnant liver volume. [1] When the MHV is included in the left liver (donor) the area drained by tributaries of the MHV in the right paramedian sector is impaired, as the MHV is known to be the major drainage vein for this sector. Whether MHV tributaries should be reconstructed in the hemiliver without the MHV is another crucial problem, since a congested area in the right liver graft is reported to result in poor liver function, followed by atrophy, unless venous reconstruction is performed. [2] As venous drainage of the liver graft is just as important as hepatic inflow for the integrity of graft function, drainage should be reconstructed where an area of more than 10% of congestion is anticipated. [3]

Sacrificing the donor's middle hepatic vein can cause congestion of the liver parenchyma drained by it, which can cause inadequate liver function in some donors.

In Sri Lanka where the incidence of non-alcoholic fatty liver disease (NAFLD) is as high as 31 %, it might be more advisable to preserve the MHV for the donor. [4] It has been our observation in the limited LDLT performed in Sri Lanka, sacrificing the MHV to the recipient, has resulted in prolonged derangement of liver functions in the donor. The possible reason could be fat laden large hepatocytes leading to parenchymal congestion. Though it is not meant to discourage fatty liver donations, the geographical supply of organs where many donors have various degrees of hepatic steatosis, its imperative to consider donor safety.

This brief report describes the technique of reconstruction of the drainage of the right lobe live donor liver graft. Hepatic venous congestion from deprivation of middle MHV outflow in the right lobe (RL) graft can be prevented by interposition of a vein graft between the major tributaries of MHV (segment V (V 5) and segment Viii (V 8) and recipient inferior vena cava (Figure 1 a). [5] In addition multiple short hepatic veins including inferior right hepatic vein (IRHV), middle right hepatic vein (MRHV) and superficial RHV will require reconstruction (Figure 1 b). [6]

The technique of this procedure was perfected at Asan
medical centre, Seoul, South Korea and might be useful for the Sri Lankan live donor transplantation program.

**Technique:**

After right lobe graft is procured (figure 1 a) and preservation solution Histidine-tryptophan-ketoglutarate-HTK) is perfused in an ice bath at the back table, the RHV, short hepatic veins and MHV are reconstructed. Long saphenous vein (LSV) is harvested from the left side of the recipient to be used as interpositional grafts and to reconstruct the RHV opening.

**Reconstruction of RHV and short hepatic veins.**

For a wide and long RHV anastomosis, the recipient’s RHV opening of the IVC should be larger than the graft's RHV opening. A vertical slit, along the RHV opening of the IVC or a transverse slit with a patch plasty or reconstruction with a diamond shaped LSV patch could be used to enlarge the recipient's RHV opening. Reconstruction of the RHV opening of the graft with the recipient's LSV graft will aid the anastomosis and at the same time it will act as a reservoir when the graft regenerates [7].

The short hepatic veins are reconstructed if the diameter is more than 5mm. They can be directly anastomosed to the IVC if the cuff of vein was adequately procured at the harvest. If not IRHV and MRHV can be anastomosed to the side of the IVC with a quilt.
venoplasty. [7]

**Reconstruction of the middle hepatic vein.**

The conduit for the de novo middle hepatic vein can be a cryopreserved iliac vein graft (IVG) (Figure 1.c), an iliac artery graft where a vein is not available or a ringed polytetrafluoroethylene graft (PTFE) (Figure 1.d). [8,9]

The iliac vein is positioned in such a way that a side branch of matching diameter is approximated to the V8. Anastomosis is done using 6/0 prolene sutures. If the diameters corresponds, the end of the iliac vein can be anastomosed to V5 or an end to side anastomosis is performed with 6/0 prolene suture. The reconstructed middle hepatic vein is later anastomosed to middle-left hepatic vein stump without excessive redundancy using 6/0 prolene suture. As most of the reconstruction is performed in the ice bath, the warm ischemia time could be reduced.

Ringed PTFE grafts can be used for middle hepatic vein reconstruction during living donor liver transplantation, as large vein allograft supply is often limited. Although PTFE grafts are freely available, their long-term patency is relatively poor. Usually a 10mm x 20 cm graft is used for reconstruction with one end occluded by a hem-o-loc. Use of LSV interposition grafts between V5, V8 and the PTFE graft has shown to increase patency rates comparable to those of iliac vein grafts.

In conclusion in right lobe graft transplants venous drainage needs to be reconstructed for optimal graft function. Large vein allografts or ringed PTFE grafts combined with small vessel patches showed high patency rates and can be used for MHV reconstruction.

**References:**


Primary bony non-Hodgkin lymphoma of vertebra

H.K.G.R. Anuradha¹, G. Sritharan¹, B.C.R.P. Bullathsinghala¹, S. Prasath¹, S.A.S.Goonewardena², A.B.S. Ananda Perera¹
1. Orthopaedic Unit, Sri Jayewardenepura Teaching Hospital, Sri Lanka.
2. Department of Urology, National Hospital of Sri Lanka.

Key words: Primary vertebral tumor, Non-Hodgkin lymphoma, D-12th vertebrae

Introduction

Primary lymphoma of the bone can be defined as lymphoma of bone without evidence of dissemination or extra osseous involvement. This is very rare accounting for less than 1% of total bone primaries. Common sites of bone lymphoma are femur, tibia, scapula and iliac bone.

Case presentation

A twenty one year old previously healthy male presented to the orthopaedic unit with chronic central back pain without radiculopathy for one year duration. He noticed a painless lump in the thoracolumbar region which was rapidly growing. Clinical examination revealed a $10 \times 10$ cm hemispherical non-tender, non-pulsatile lump. He developed weakness of left leg following trivial trauma two months later. Plain X ray of thoracolumbar spine revealed an unstable pathological wedge fracture at 12th thoracic vertebra with osteolytic lesions. (Fig 1)

MRI of the thoracolumbar spine revealed a tumor which was invading the D 12 vertebra with a moderate narrowing of the central canal. In fact it had extended to the two adjacent vertebrae and to the surrounding soft tissue including psoas and erector spinae muscles.(fig 3)

In laboratory investigations total white cell count was $18 \times 10^3$ and ESR was $>123$ mm for first hour.

The trucut core biopsy of the lump was reported as intermediate Non-Hodgkin's lymphoma which was further confirmed by immunohistochemistry.

Bone marrow of iliac spine, CT scans of chest; abdomen and neck were performed and found no evidence of dissemination.

Chemotherapy was commenced with cyclophosphamide, doxorubicin, vincristine.(Fig 2) Two months after the chemotherapy a remarkably shrunken residual tumor with minimal canal stenosis were found on MRI. Three months after the medical treatment, we performed a two level 8 screw trans-pediculer fixation with cross bars in order to stabilize the T12 vertebra. He was discharged three weeks later. (Fig 4)

Multiple biopsies taken from surrounding soft tissue and D 12 vertebra during operation was reported as fibrous tissue.
Discussion

Primary bony lymphoma is a primary single osseous lesion which remains without systemic dissemination for more than six months. By this definition the possibility of undetected primary non bony lesion will be excluded. [1,2]. In fact, primary bony presentation of Non-Hodgkin's lymphoma (NHL) is very rare, accounting for about 1% of all bone tumors. Out of this 1%, primary vertebral presentation is less than 1.7% of all bony NHL [1,2]. In later presentation with advance symptoms, it is difficult to say weather it is primary or secondary involvement of bone from distant site.

The diagnosis of primary bony NHL by plain X-ray is difficult. But osteolytic lesions are characteristic [3]. Thus the diagnosis will depend on bone biopsy of site, iliac bone biopsy and immunohistochemical studies. Limitations of such a procedure would be the difficulty in recognizing a high grade NHL, and even such a case would be interpreted as intermediate or lowgrade lymphoma. [3,4]. What ever the spinal involvement these patients are at high risk of developing central canal occlusion which may present with varying symptoms and signs of pain, motor and sensory involvement to acute cauda equina syndrome with paralysis.

In our case, the patient presented with a severe back ache and thoracic D12 wedge compression fracture with features of minimal spinal compression. This was supported by pre-operative imaging, intra-operative findings, and pathological analysis. There was no source of disseminated or extra spinal disease at presentation, nor at six months after initial diagnosis.

Chemotherapy followed by two level fixations was performed.

References

Key points:

- Primary bony Non-Hodgkin's lymphoma (NHL) is very rare.
- The diagnosis by plain X-ray is difficult, but osteolytic lesions are characteristic.
- Diagnosis will depend on bone biopsy at site of the lesion, iliac bone biopsy and immunohistochemical studies.
CASE REPORTS

Melioidosis associated with chronic osteomyelitis and visceral organ abscesses

M. Mathurageethan¹, C.N. Kahathuduwa¹, N. Badanasinghe², E. Corea³, R. Fernando⁴
1 Professorial Surgical Unit, Colombo North Teaching Hospital, Sri Lanka
2 Department of Microbiology, Colombo North Teaching Hospital, Sri Lanka
3 Department of Microbiology, Faculty of Medicine, University of Colombo, Sri Lanka
4 Department of Surgery, Faculty of Medicine, University of Kelaniya, Sri Lanka

Key words: Multiple abscesses, chronic osteomyelitis

Introduction

Melioidosis, caused by the soil saprophyte, Burkholderia pseudomallei, and acquired after exposure to soil or water, may involve multiple systems and has a variety of clinical manifestations ranging from acute sepsis, pneumonia, single or multiple abscesses to chronic granulomatous inflammation. Melioidosis is probably under-diagnosed in Sri Lanka. We present a case of a patient with chronic osteomyelitis and multiple visceral and subcutaneous abscesses attributable to melioidosis.

Case report

A 56-year old farmer from Kegalle, a diabetic for more than 10 years, was admitted with a history of recurrent multiple abscesses in the right arm, axilla and neck over 6 years and aspiration of a right paranephric abscess one year previously. Two months prior to admission the patient had been treated for culture negative septicaemia in the intensive care unit. He had painful swelling of the right arm and low grade fever. He was anaemic (Hb 6.5 g/dl) with neutrophil leucocytosis (WBC 14x10³), raised ESR (130mm) and raised CRP (77 mg/dl). An ultrasound scan of the right arm revealed deep seated, multiple, intercommunicating abscesses which were treated by multiple needle aspirations and open drainage (Fig 1). X-ray showed chronic osteomyelitis of the shaft of the humerus (Fig 2). Ultrasound imaging of abdomen revealed multiple focal lesions in the spleen shown by CECT to be abscesses (Fig 3). Wound swabs and blood cultures failed to isolate the pathogen. The indirect haemagglutination test (IHA) test for antibodies to B.

Correspondence: M. Mathurageethan
E-mail: mathurageethan@gmail.com

Figure 1. Incisions for drainage of multiple intercommunicating abscesses

Figure 2. X-ray Rt. humerus showing bone destruction
Marrow density and bone destruction, which were evident in the X-ray of this patient (2).

Sri Lanka is not considered endemic for the disease (1). However, increasing number of cases are being reported (3). Melioidosis was suspected in our patient based on the clinical picture of recurrent episodes of multiple superficial and visceral abscesses in a diabetic with occupational exposure to soil and water. Although a definitive diagnosis, by culture, could not be established, serological evidence was supportive of the diagnosis.

We recommend the consideration of melioidosis in the differential diagnosis of patients with recurrent admissions for deep seated or superficial collections of pus. Late recognition may lead to complications (such as chronic osteomyelitis as seen in this case) or fatal septicaemia. First line antibiotics for community acquired pyogenic infections are not effective in melioidosis. Therefore early diagnosis is necessary to institute specific therapy and avoid case fatality. Aspirated pus should be sent for culture to maximise the opportunity to obtain a definitive diagnosis.

Discussion

Melioidosis is endemic in Southeast Asia and Northern Australia (1). B. pseudomallei is found in soil and surface water. Spread is via direct inoculation through skin, ingestion or inhalation. Risk factors include diabetes, kidney disease and heavy alcohol consumption. Musculoskeletal infection, including septic arthritis, osteomyelitis, pyomyositis and soft tissue abscesses, is usually seen as a part of multi organ involvement (2). The imaging features of melioidosis in long bones include soft tissue swelling, increased

Key points:

- Melioidosis should be considered in the differential diagnosis of patients with recurrent admissions for deep seated or superficial collections of pus as late recognition may lead to complications or fatal septicaemia.
- First line antibiotics for community acquired pyogenic infections are not effective in melioidosis.
- Aspirated pus and blood should be sent for culture to enable definitive diagnosis by isolation of *Burkholderia pseudomallei*.
Jejunal obstruction due to currency notes

D. Seneviratne Epa , D.C. Palkumbura , G. Goonetilleke
Sri Jayewardenepura General Hospital and Postgraduate Teaching Institute, Nugegoda, Sri Lanka

Key words : Jejunal obstruction, foreign body, laparotomy

Introduction

We report a case of jejunal obstruction due to ingestion of currency notes in a patient with a psychiatric history. Both the site and cause of intestinal obstruction in this case is unusual.

Case Report

A 65 year old lady with a history of depression, presented with vomiting and generalized abdominal pain for three weeks, increasing in severity over three days, with no alteration of bowel habits, per rectal bleeding, loss of appetite or weight loss. There was no history of swallowing any foreign body. Abdomen was mildly distended, but was soft and non-tender. Bowel sounds were normal. Basic haematological and biochemical investigations were normal. Erect x-ray abdomen showed an elongated opacity adjacent to the tip of the transverse process of the second lumbar vertebra. Patient was managed symptomatically with initial improvement.

However on third day, she developed repeated bilious vomiting with colicky abdominal pain. Bowels remained open and abdominal signs didn't change either. Repeat erect x-ray abdomen showed multiple air fluid levels with the shifting of the previously noted opacity to a point adjacent to lateral border of third lumbar vertebral body. A nasogastric tube was inserted and intravenous fluids given. However, symptoms recurred on fifth day, after removal of the nasogastric tube and resumption of feeding. At this stage, an exploratory laparotomy was performed and an intraluminal mass was noted about one foot from the duodeno-jejunal junction, with dilated proximal jejunal loops. Enterotomy was done and an approximately 5x5x5cm cuboidal, irregular, firm mass, which was not attached to the walls of the jejunal lumen was extracted(Fig 1). It was covered with a thick layer of faecal matter and weighed 100g. Within the mass were several folded currency notes which were fragmented and defaced beyond recognition. However there was one ten rupee Sri Lankan currency note in a recognizable state(Fig 2). Rest of the laparotomy findings were unremarkable. She made an uneventful postoperative recovery and all symptoms resolved.

Discussion

Our patient developed recurrent bilious vomiting and colicky abdominal pain, but continued to open bowel and had only mild distension. This is the expected presentation of a high intestinal obstruction which predominately causes vomiting rather than distension or constipation(1). Jejunum however is an unusual site of intraluminal obstruction, but has been reported due to gall stones and haematomas(2).

Intestinal obstruction due to foreign body ingestion, usually by accident, has been reported especially among children and psychiatric patients(3). Trichobezoar due to repeated swallowing of hair, causing intestinal obstruction, is well documented among psychiatric patients(4). Our patient who also had a psychiatric history denied ingestion of a foreign body either accidental or intentional. This is probably the first report of such obstruction due to swallowing of currency notes. She was referred for psychiatric assessment with a view to avoid possible recurrence in this back ground.

The majority of ingested foreign bodies pass through the gastrointestinal tract without complications and only a minority of cases require surgical intervention for complications(5). Though our patient was initially managed conservatively, the recurrence of symptoms led to surgical intervention and a successful outcome.


References

Key points:
- Intramural obstruction of jejunum is rare.
- Foreign body ingestion is a potential cause.
- If conservative measures fail surgery is mandatory.
- The cause is usually detected at surgery.
Volvulus of the splenic flexure of the colon
S.N. Deshmukh, S.G. Agarwal, R.B. Soni
Department of Surgery, Dr. Vaishampayan Memorial Government Medical College, Solapur, Maharashtra, India

Keywords: Volvulus; splenic flexure; colon

Introduction:
A volvulus is a twisting or axial rotation of a portion of bowel about its mesentery. Volvulus may be primary or secondary. A secondary volvulus is a more common variety which occurs due to actual rotation of a piece of bowel around an acquired adhesion or stoma.[1] Volvulus of the splenic flexure is a rare clinical entity. Because of its rarity here we report a case of primary splenic flexure volvulus.

Case History:
A 29-year-old, male (mentally retarded) was admitted with abdominal pain, distention, vomiting, and constipation of 2 days duration. On examination, the abdomen was grossly distended, slightly tender and bowel sounds were present. On percussion, abdomen was resonant. Rectal examination was normal. There was no history of previous abdominal surgery. Plain abdominal radiograph revealed marked elevation of both domes of the diaphragm with massively dilated large bowel coils with air fluid level in central abdomen suggesting large bowel obstruction. Laboratory parameters were unremarkable. Exploratory laparotomy by vertical midline incision revealed anticlockwise twist of splenic flexure of colon leading to mechanical large bowel obstruction. (Figure 1) The spleen was normal in position and there was no associated malrotation of the gut or congenital bands. After detorsion of volvulus, segmental resection with primary anastomosis between the transverse and descending colon was performed. Recovery was uneventful.

Discussion:
Primary splenic flexure volvulus is extremely rare with an incidence of less than 2% of all colonic volvulus. It is rare because this part of large bowel has limited mobility due to the phrenicocolic, gastrocolic and splenocolic ligaments and the retroperitoneal position of the descending colon. For the splenic flexure volvulus to occur, some or all of these anatomical factors must be either congenitally deficient or altered by surgery, thus rendering the flexure unusually mobile. The presence of congenital bands or acquired adhesions have both been documented as aetiological factors.[2] In our patient there was no previous abdominal surgery but phrenicocolic, gastrocolic and splenocolic ligaments were absent.

The presentation is usually non-acute with recurrent episodes of abdominal pain, distension and vomiting. The acute presentation with features of gangrene and peritonitis is rare [3]. Due to its rarity, preoperative diagnosis is usually not suspected. Plain X-rays are less frequently diagnostic [4]. Volvulus of the splenic flexure is typically treated with resection and primary anastomosis [5]. A primary anastomosis is avoided in the presence of gangrenous bowel, perforation and peritoneal soiling, due to high risk of anastomotic leak.

Non-resectional colopexy can be tried in high-risk or elderly patients who are poor surgical candidates [3].

Correspondence: S.N.Deshmukh
E-mail: santoshkumardeshmukh@gmail.com
The overall mortality ranges from 16 to 33% and depends significantly on delay in diagnosis, presence of shock, feacal peritonitis and associated comorbidities [2].

References

Key points:
- Primary splenic flexure volvulus is a rare clinical entity.
- The presentation is usually non-acute with recurrent episodes of abdominal pain, distension and vomiting.
- Failure to promptly identify and treat a splenic flexure volvulus can result in colonic ischaemia, gangrene, perforation and subsequent peritonitis with high mortality rates.
Effect of daily chlorhexidine bathing on hospital-acquired infection


Background

Results of previous single-center, observational studies suggest that daily bathing of patients with chlorhexidine may prevent hospital-acquired bloodstream infections and the acquisition of multidrug-resistant organisms (MDROs).

Methods

We conducted a multicenter, cluster-randomized, nonblinded crossover trial to evaluate the effect of daily bathing with chlorhexidine-impregnated washcloths on the acquisition of MDROs and the incidence of hospital-acquired bloodstream infections. Nine intensive care and bone marrow transplantation units in six hospitals were randomly assigned to bathe patients either with no-rinse 2% chlorhexidine-impregnated washcloths or with nonantimicrobial washcloths for a 6-month period, exchanged for the alternate product during the subsequent 6 months. The incidence rates of acquisition of MDROs and the rates of hospital-acquired bloodstream infections were compared between the two periods by means of Poisson regression analysis.

Results

A total of 7727 patients were enrolled during the study. The overall rate of MDRO acquisition was 5.10 cases per 1000 patient-days with chlorhexidine bathing versus 6.60 cases per 1000 patient-days with nonantimicrobial washcloths (P=0.03), the equivalent of a 23% lower rate with chlorhexidine bathing. The overall rate of hospital-acquired bloodstream infections was 4.78 cases per 1000 patient-days with chlorhexidine bathing versus 6.60 cases per 1000 patient-days with nonantimicrobial washcloths (P=0.007), a 28% lower rate with chlorhexidine-impregnated washcloths. No serious skin reactions were noted during either study period.

Conclusions

Daily bathing with chlorhexidine-impregnated washcloths significantly reduced the risks of acquisition of MDROs and development of hospital-acquired bloodstream infections.

Commentary

Ajith de Silva.
Consultant surgeon.
National Hospital of Sri Lanka

Hospital acquired infections caused by multidrug resistant organisms create a negative impact on patients outcomes and health economics. Methicillin resistant Staphylococcus aureus and Vancomycin resistant enterococci have been the main culprit for surgical site infections, catheter associated urinary tract infections and vascular device associated sepsis in critical care settings. The infections caused by these organisms are difficult to treat due to complex drug resistant patterns. Therefore prevention has turned out to be the main answer to a complicated problem. Chlorhexidine gluconate is a broad spectrum antiseptic agent which has activity against multidrug resistant organisms. Previous observational studies have showed daily skin decontamination of patients with chlorhexidine in critical care settings to reduce hospital acquired infections caused by multidrug resistant organisms.

This multicenter, cluster-randomized, crossover trial had evaluated the effect of daily bathing with chlorhexidine-impregnated washcloths on the acquisition of multidrug resistant organisms and the incidence of hospital-acquired bloodstream infections. It concludes to show a statistically significant reduction in the acquisition of multidrug resistant organisms and the incidence of hospital-acquired bloodstream infections with daily bathing with chlorhexidine. This is a non-blinded study but it is understandable that it is not easy to perform double blinded studies in all surgical settings. In the background of developing evidence of this nature, it would be possible to lay down guidelines in the near future to use chlorhexidine-impregnated washcloths to minimize hospital acquired infections.
Hydroxyethyl Starch Reduces Coagulation Competence and Increases Blood Loss During Major Surgery Results From a Randomized Controlled Trial


Objective

This study evaluated whether administration of hydroxyethyl starch (HES) 130/0.4 affects coagulation competence and influences perioperative blood loss.

Background

Artificial colloids substitute blood volume during surgery; with the administration of HES 130/0.4 (Voluven, Fresenius Kabi, Uppsala, Sweden) only a minor effect on coagulation competence is expected.

Methods

Eighty patients were scanned for enrollment in the study, and 40 patients fulfilled the inclusion criteria. Two patients withdrew their consent to participate in the study, and 5 patients were excluded. Thus, 16 patients were randomized to receive lactated Ringer's solution and 17 to receive HES 130/0.4.

Results

Among the patients receiving HES 130/0.4, thrombelastography indicated reduced clot strength (P < 0.001) and blinded evaluation of the perioperative blood loss was 2.2 (range 0.5 to 5.0) versus 1.4 (range 0.5 to 2.4) L in the patients who received HES 130/0.4 or lactated Ringer, respectively (P < 0.038). The patients in the lactated Ringer's group, however, received more fluid (P < 0.0001) than those in the HES 130/0.4 group. There was no significant difference between the 2 groups with regard to frequency of reoperations or the length of hospital stay, but use of HES 130/0.4 was both more expensive and less efficacious than the use of lactated Ringer.

Conclusions

Administration of HES 130/0.4 reduced clot strength and perioperative hemorrhage increased by more than 50%, while administration of lactated Ringer's solution provoked an approximately 2.5 times greater positive volume balance at the end of surgery.

Commentary

Bhagya Gunathilake, Consultant Anaesthetist, Colombo North Teaching Hospital Ragama

This study evaluated whether administration of hydroxyethyl starch (HES) 130/0.4 affects coagulation competence and influences perioperative blood loss in patients undergoing cystectomy.

The results indicate that the coagulation parameters in the two groups of patients were comparable at induction of anaesthesia. Details of base line renal function are not indicated.

A significant impairment of coagulation competence was noted with lower platelet counts and fibrinogen levels and prolonged INR in addition to significantly reduced development and strength of the clot in the HES group.

The volume of intraoperative blood loss and transfused requirements were also greater in the HES group. A causal relationship between HES induced reduced coagulation competence and increased transfusion requirements maybe inferred.

However the total volume of fluid transfused, the positive fluid balance, the serum lactate levels and the mass of ephedrine used to maintain haemodynamic stability was greater in the RL group. Despite this the morbidity, including the rate of reoperations and length of hospital stay were comparable in the two groups. Late complications of blood transfusions have obviously not been measured.

Studies carried out in septic patients have demonstrated a higher incidence of acute kidney injury requiring renal replacement in patients receiving HES infusions (1).

References


**Background**

Antibiotic treatment after appendicectomy for complicated appendicitis aims to reduce postoperative infections. However, available data on the duration of treatment are limited. This study compared the difference in infectious complications between two protocols, involving either 3 or 5 days of postoperative antibiotic treatment.

**Methods**

This was an observational cohort study of all adult patients who had an appendicectomy between January 2004 and December 2010 at either one of two hospitals in the same region. At location A, the protocol included 3 days of postoperative antibiotic treatment, whereas at location B it specified 5 days. The primary outcome was the development of postoperative infections as either superficial wound infection or deep intra-abdominal infections.

**Results**

A total of 1143 patients with acute appendicitis underwent appendicectomy, of whom 267 (23.4 per cent) had complicated appendicitis. The duration of postoperative antibiotic treatment was 3 days in 135 patients (50.6 per cent) and at least 5 days in 123 (46.1 per cent). No difference was found between antibiotic treatment for 3 or 5 days in terms of developing an intra-abdominal abscess (odds ratio (OR) 1.77, 95 per cent confidence interval 0.68 to 4.58; P = 0.242) or a wound infection (OR 2.74, 0.54 to 13.80; P = 0.223). In patients with complicated appendicitis, the laparoscopic approach was identified as a risk factor for developing an intra-abdominal abscess in univariable analysis (OR 2.46, 1.00 to 6.04; P = 0.049), but was not confirmed as an independent risk factor for this complication in multivariable analysis (OR 2.32, 0.75 to 7.14; P = 0.144).

**Conclusion**

After appendicectomy for complicated appendicitis, 3 days of antibiotic treatment is equally effective as 5 days in reducing postoperative infections.

**Commentary**

Ranil Fernando
Professor in surgery and Consultant Surgeon
Colombo North Teaching Hospital, Ragama

Evidence based guidelines on the optimum duration of antibiotic treatment for complicated acute appendicitis is not available and randomized trials on the subject too are very limited.

The current study attempts to provide some data on the use of antibiotics in complicated acute appendicitis. The study is an observational cohort study and the number of patients studied is relatively small. In addition the selection into 3 or 5 days of antibiotics is done on the basis of the institution rather than randomly which introduces an obvious bias. The authors allude to some of the deficiencies in the discussion. The inferences gleaned from such a study must be considered weak evidence and recommendations based on such data must be done with caution and circumspection.

Nevertheless the data supports the view that prolonged use of antibiotics does not confer much benefit to the patients with complicated acute appendicitis and indirectly points to the fact that proper surgical treatment is the key to dealing with complicated acute appendicitis.

In an era of gross misuse of antibiotics the information available from this study must be considered in making therapeutic decisions. Similar larger randomized studies are the need of the 'hour'.

**Randomized clinical trial of donor-site wound dressings after split-skin grafting**

Bröllmann FE. British Journal of Surgery 2013 Apr;100(5):619-27

**Background**

The aim was to study which dressing material was best for healing donor-site wounds (DSWs) after split-skin grafting as there is wide variation in existing methods, ranging from classical gauze dressings to modern silicone dressings.
Methods
This 14-centre, six-armed randomized clinical trial (stratified by centre) compared six wound dressing materials in adult patients with DSWs larger than 10 cm(2) . Primary outcomes were time to complete re-epithelialization and pain scores measured on a visual analogue scale (VAS) over 4 weeks. Secondary outcomes included itching (VAS, over 4 weeks), adverse events and scarring after 12 weeks rated using the Patient and Observer Scar Assessment Scale (POSAS).

Results
Between October 2009 and December 2011, 289 patients were randomized (of whom 288 were analysed) to either alginate (45), film (49), gauze (50), hydrocolloid (49), hydrofibre (47) or silicone (48) dressings. Time to complete re-epithelialization using hydrocolloid dressings was 7 days shorter than when any other dressing was used (median 16 versus 23 days; \( P < 0.001 \)). Overall pain scores were low, and slightly lower with use of film dressings (\( P = 0.038 \)). The infection rate among patients treated with gauze was twice as high as in those who had other dressings (18 versus 7.6 per cent; relative risk 2.38, 95 per cent confidence interval 1.14 to 4.99). Patients who had a film dressing were least satisfied with overall scar quality.

Conclusion
This trial showed that use of hydrocolloid dressings led to the speediest healing of DSWs. Gauze dressing should be discontinued as they caused more infections.

Registration number:

Commentary
Kolitha Karunadasa
Consultant Plastic Surgeon
Colombo North Teaching Hospital, Ragama

Skin graft donor site wounds are expected to heal spontaneously with epithelialization. Ideal dressing for donor site has long being a controversial issue and the choice is guided by the existing practice in a unit. The randomized clinical trial by BrÖlmann et al had concluded that hydrocolloid dressing reduces the duration of healing and pain, compared to other commonly used dressings.

Pain, infection, excessive exudates, delayed healing and abnormal scar formations are associated with split skin graft donor site healing with a variable frequency. Conventional paraffin and gauze dressing is the widely practiced and relatively cheap technique used in Sri Lanka with acceptable outcome. Even though the study discusses about dressing changes and its inherent problems as pain and tissue damage, number of dressing changes per each dressing technique is not analyzed. In the local setup the initial bulky dressing with paraffin gauze, covered with several layers of absorbent cotton gauze is left undisturbed for 10 – 14 days until the wound is healed, unless they are heavily soaked with excessive exudates.

Donor site infection is multifactorial in etiology and the diagnosis depends on defined criteria, but clinically significant donor site infection with conventional gauze dressing is not a common complication in our setting. In addition, the thickness of the graft and the harvesting technique predominantly influences the duration of healing. Objective and accurate assessment of this variable is not always possible. One of the shortcomings of this study was the cost factor which was not analyzed. This is a significant determinant in a resource limited health system. Despite the proven benefits of hydrocolloid dressing the cost effectiveness of the method is yet to be evaluated.
The news of the untimely demise of Dr. Pradeep Fernando was truly saddening to many of us who were near and dear to him.

Born as the only child to Mr. Clement Fernando and Dr. (Mrs.) Selvajothy Fernando from Galle, Pradeep's early life was spent in Galle and Kurunegala. After successfully completing his studies up to the GCE ordinary level at St. Peter's College, Pradeep moved to Royal College, Colombo for his Advanced Level studies. He excelled in academic work as well as in sports at both schools. Pradeep's enthusiasm and active participation in extracurricular activities at school would have moulded his character very much. At Royal, he was the President of the English Literary Society and also the captain of the debating team and won the prestigious J.R. Jayawardane Award for the best speaker. Pradeep enjoyed music and reading. His creativity and talents were much displayed when he produced a drama at the college. He performed exceptionally well in Advanced Level Examination securing a place at the Colombo Medical Faculty winning the Prize for Zoology from the college. He excelled in studies at the Faculty and passed the Final MBBS Examination with Second Class Honors.

My association with Pradeep goes back to the time when he was a medical student at the Colombo Medical Faculty. However I came to know him more closely, when he became my Senior Registrar after passing his Masters of Surgery Examination and opted to specialize in Orthopedic Surgery. He worked in my unit for 2 years as a Senior Registrar with dedication and hard work which contributed immensely to the smooth and efficient functioning of the unit. He served his patients with much care, conducted his duties with extreme diligence and willingly shared the responsibilities. Our association grew stronger when Pradeep was appointed as the Consultant Orthopedic Surgeon at Teaching Hospital, Ragama. He is one of the very few Orthopedic Surgeons who never hesitated to take a second opinion and regularly consulted a senior colleague whenever there was a difficult problem.

Pradeep was instrumental in reactivation of the Sri Lanka Orthopedic Association in year 2000 and held the post of Secretary from 2000-2004, making our association one of the most efficient associations in Sri Lanka. He organized the first AO course in Sri Lanka in the year 2000 at the Teaching Hospital, Ragama. Since then he organized several AO courses in Sri Lanka in Association with AO International. He was the AO coordinator in Sri Lanka and participated in AO activities in the Regional Countries too.

He was a regular attendee of the outreach programmes of the Sri Lanka Orthopedic Association conducted in remote places in the country. He was a Council member of Sri Lanka Orthopedic Association and was the Vice President at the time his death.
Pradeep took a keen interest in developing health care in Sri Lanka; surgery in general and orthopedic surgery in particularly. He was a member of Board of Study in Surgery and Specialty Board in Orthopedic Surgery. He was also an examiner for MD part 1 Surgery and MD Orthopedic Surgery Final Examination. At one time he was the Assistant Secretary of the College of Surgeons of Sri Lanka and was the editor of the College Journal. During his tenure he was able to publish the journal regularly and bring it up to international standards. Through these positions he contributed much to the college and to the welfare of the members of the College of the Surgeons of Sri Lanka.

He was a live wire to the World Bank funded Health Sector Development Project. He single handedly handled most important parts of the project and travelled all over the country to get the maximum benefit of the project to the country. His efforts in the project brought enormous profits in developing much needed human resources in the health sector and also brought in much needed finances to the College.

Pradeep was happily married to Janaki, Professor of Pathology, University of Kelaniya whom he met at the Faculty of Medicine, Colombo while he was a student. They were blessed with a son Sahishna who is studying Business Management in the United Kingdom.

He was a person dedicated to his profession. When there was a disturbance in Pakistan and required medical help he was one of the first to travel to that country offering his services. With his demise Sri Lanka lost a dynamic, enthusiastic and hard working young surgeon whose contribution to society, to the Surgical and Orthopedic community was enormous. The void created by his demise will take a long time to fill.

May he attain the supreme bliss of Nibbana.

Dr. Upali Banagala
Beyond evidence-based Medicine

A.M. Abeygunasekera
Colombo South Teaching Hospital, Sri Lanka

It is with interest that I read the editorial titled evidence-based practice, a must in medical practice [1]. While agreeing with all the reasons given to promote evidence based practice among surgeons, I would like to highlight certain shortcomings in evidence-based medicine (EBM) which persuades me to propose that we should move beyond the concept of EBM to a better paradigm which is more appropriate for the delivery of good health care in Sri Lanka.

Several decades ago the necessity for EBM was obvious. At that time medical personnel used to practice ego-based medicine where the doctor said “I know everything, I can never go wrong, my word is the last, you do what I say, there is no need for questions or critical analysis”. Those who realised the perils of ego-based medicine found this new paradigm of evidence-based medicine to improve patient care. EBM was an important and necessary step forward from ego-based medicine. Therefore the medical world embraced EBM as the new paradigm. EBM was more scientifically appealing than ego-based medicine and helped to improve the health care tremendously. Even today it is a better alternative to ego-based medicine as highlighted in the editorial [1].

However after practicing EBM for several decades I have encountered some deficiencies of EBM. Initially EBM was defined as conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. Later another phrase was added to make it more realistic - integrating individual clinical expertise and the best external evidence. However those who practice medicine in the real life situation know that these idealistic words in the EBM definition are only a utopian dream. In reality such perfect health care is so expensive and demanding that it can be provided only to a handful of the society especially in resource poor settings prevalent in developing countries. Medical personnel who try to provide reasonable health care to all members of the society will be reprimanded for ignoring EBM in their practice. Therefore EBM has become a catch word that is abused by those who want to provide ‘perfect’ health care to a few privileged patients in the society. It has also given a 'scientific back-up' to those in the industry who want to sell their expensive products (with marginal or no benefits to the patient) for personal gains and to make exorbitant profits.

Publication bias, language bias, support for research from the pharmaceutical industry and lack of research in the local settings of the developing world are some of the obstacles faced during the search for current best evidence. Cultural differences, social differences and cost effectiveness make the issue more complex. Cost effectiveness which is crucial for the sustenance of any health care system is greatly ignored in EBM as there is hardly any research on cost effectiveness of therapeutic interventions in the developing world. This has lead to diversion of limited resources available in developing countries to relatively expensive interventions as medical personnel are forced to endorse such processes based on evidence generated in the developed world. Failure to do so may lead to allegations of malpractice and litigation. Guidelines and protocols based on EBM are abused by parties interested in making money out of litigation. Therefore EBM promotes defensive medicine.

Hence time is opportune for the medical community to find a new paradigm in delivery of health care which would rectify the deficiencies of the concept of EBM when practiced in resource poor countries and settings. The main aim of the new paradigm would be to provide reasonable health care to all. This could be appropriately called equity-based medicine. At present there is no political and administrative will or leadership to appreciate and support those who provide reasonable health care to all segments of the society in resource poor settings. Politicians and administrators are also misguided and frightened by the concept of EBM and have no courage to contest the inappropriateness of EBM in
resource poor settings.

We need more research on cost effectiveness done at the point of delivery. Guidelines should take into consideration the situation in the local setting. Politicians, administrators and decision makers should be encouraged to give leadership to low cost health care and reasonable care to all rather than ideal care to a few. Changes should be made in the legal framework to accept equity-based medicine as the new paradigm. We changed from ego-based medicine to evidence-based medicine two decades ago. Now it is time to improve evidence-based medicine and step into equity-based medicine.

References