

The use of plastic shield to protect anastomotic line internally in primary colonic anastomosis without preparation in traumatic colonic injury in Assuit

By

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Abstract

In this study, 12 patients were chosen from Trauma Unit, Assuit University Hospital, all of them complaining of traumatic colon injury of variable degrees(gradeII-VI).

The ages of our patients were variable, and the injury was caused by either penetrating injuries (5 cases) or blunt injuries (7 cases). The proposed technique for management is primary colon repair with the implantation of an intra-colonic bypass tube that was formed from condom catheter sleeve after good debridement or resection of the colon if viability is questioned. It was the only procedure in 4 cases or combined with other surgical procedures (as splenectomy, or repair of a liver tear), in 8 cases, it was a relatively safe and easy technique and the operative time was greatly reduced (90 min.) as compared with other options for treatment as proximal colostomy or an intra-operative lavage (120 and 180 min respectively), moreover the mortality rate was zero percent in our work, and all cases were operated smoothly without any problem. And our patients were followed up in the department till discharge after a very short hospital stay (5-7 days) in comparison to greater period for other techniques (10-15 days), consequently the overall morbidity was very low (16.5%) in the form of mild wound infection or mild fever.

The intra-colonic sleeve was expelled from the rectum within 2 weeks later on with good follow up for all our patients, so primary colon repair with an intra-colonic sleeve is a very effective and easy way for management of colon injuries with a very low morbidity and no mortality rates and a very short hospital stay.

Introduction and aim of the work:

Surgeons have long recognized that traumatic perforation of the colon is more dangerous than other gastrointestinal injuries, the mortality rate may approximates 4-10 % for isolated colon injuries (1). The colon is a thin walled viscus with thin muscles and high mean intra-luminal pressure that may propel heavily contaminated liquid faeces through perforation and place stress on closure and anastomotic lines (2).

There has been considerable improvement in the associated mortality and morbidity, much of the improvement is due to decreasing the time from injury to treatment, improved method of resuscitation and the vast improvement of antibiotics and its use, these improvement led some surgeons to advocate the technique of primary repair of the colon, and it was the preferred method of treatment both for civilian colon injuries (3, 4, 5, 6), as well as for military injuries in the Afghan war (7, 8), and the Serbian war (9, 10).

More than 90% of colon injuries are penetrating (11), and laparoscopic surgery is an emerging cause of colon perforation (12)

If clinical examination discloses no sign of injury, sequential clinical examination can detect some signs of importance.

Diagnosis:

Diagnostic process proceeds simultaneously with resuscitation however, a standard abdominal radiographs can express extra-luminal gas (1), and peritoneal lavage although it is sensitive for bleeding (in 98% of cases) yet it is accurate in only 73 % of patients with gunshot wound of the colon and 64% of stab wounds (2). Other diagnostic tools can also be helpful as sonar, abdominal CT scan, and recently laparoscopy (13), but frequent evaluation of patients by an experienced surgeon still the most important tool for early diagnosis especially in blunt injuries (14, 15).

Intra-operative identification of the severity of the colon trauma by scoring system proposed by the OIS (organ injury scaling) committee of the American Association for Surgery of Trauma (AAST) as shown in the following table.

Grade	Injury description	
I	Hematoma	Contusion or hematoma without devascularization
	Laceration	Partial thickness, no perforation
II	Laceration	Laceration < 50% of circumference
III	Laceration	Laceration > 50% of circumference without transection
IV	Laceration	Transection of the colon
V	Laceration	Transection of the colon with segmental tissue loss
VI	Vascular	Devascularized segment
*-Advance one grade for multiple injures to the same organ.		
*- Based on the most accurate assessment at laparotomy.		

Table (1): Grades of colon injuries. (16)

Although each of these indices has its limitations, they do provided a mechanism whereby severity of injury can be compared between various series, and it does appear that they may provide a useful piece of information when trying to determine the method of treatment for the patient (11)

Treatment modality advocated in the study (primary colon repair):

Primary repair of colon injuries is becoming increasingly popular since it was firstly adopted by for traumatic colon perforation (17), more and more are now advocating its adoption especially in isolated injuries (18, 19, 20, 21 & 11), although there still remains a lack of consensus regarding the selection criteria, but many reports concluded that it is the method of choice despite any associated risk factors (22, 23, 24 & 25). Usually anastomosis is done with a standard two-layer closure, sometimes with staples or intra-colon bypass tube (ICBT) (26)

Intra-colonic bypass tube (ICBT) was first proposed by Ravo & Ger (27), it is sutured within the proximal bowel lumen to conduct the faecal flow into the distal bowel without contacting the anastomotic site (Coloshield) permitting anastomosis even in the presence of copious faecal loading, perforation, pus or peritonitis (fig.1).

It was suggested that intra-luminal contact due to faecal loading at the anastomosis is a more important factor contributing to anastomotic complications than is peritonitis (2), this ICBT passes through the rectum 10-19 days thereafter (28 & 29).

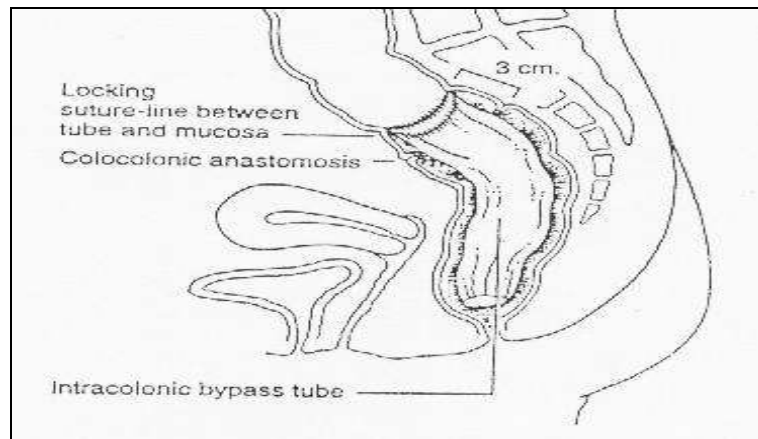


Fig. (1) Intra-colon bypass tub. (30)

The aim of this work is to study the use of an intra-colon bypass tube (a plastic tube formed from the sleeve of the condom catheter that was sheep and available), and evaluate its role in the management of traumatic colon injuries by primary anastomosis without preparation in trauma center in Assuit.

Patients and methods

12 patients were encountered in trauma center, Assuit University Hospital in the period from Mars. 2001 to Feb. 2003.

All of them complaining of traumatic colon injuries of variable types (penetrating injuries, gun shot injuries, and sever blunt abdominal trauma) and of variable degrees ranging from simple laceration (grade II injury) up to sever laceration of the colon wall and its blood supply (grade V injury) with exclusion of grade I injury.

Resuscitation process takes place as soon as the patient enters the trauma unit. Patients were thoroughly examined, and all needed investigations were urgently done with special attention to:

- *-Cross blood matching and transfusion if needed prior surgery.
- *-Radiological examinations to detect gas under diaphragm and any foreign body.
- *-Abdominal ultrasonography for detection of any collection or associated lesions.
- *-Others (e.g. CT and MRI if needed and feasible).

All patients were subjected to urgent surgical interference without delay within a short period after the trauma (from 2-8 hours).

Laparotomy was done through midline exploratory incision with assessment of the colon trauma intra-operatively using colon injury scale with good peritoneal toileting and debridement.

Primary anastomosis without a preliminary preparation was done using a plastic tube sleeve (the condom plastic tube of the condom catheter was the type used in the study) that was sutured internally to the proximal colon by an absorbable material e.g. catgut 3-5 cm from the cut end, and introduced freely through the distal colon to a distance about 10 cm, then the colon anastomosis was done over the tube shield without soiling with one or two layer technique. Lastly closure with a single tubal drain through left iliac fossa was done.

Patients were followed in the surgical department for a period ranging from 5-9 days with plenty of fluids and antibiotics (combination of metronidazol and third generation cephalosporins represent a good choice) with recording of postoperative complications as leakage or sepsis and any other associated morbidity or mortality till discharge of the patient.

Follow up was done for those patients at 1, 2, 4 & 6 weeks post-operatively in the out patient clinic, general surgery department, Assuit university hospitals, Assuit, for detection of any complications or morbidity with assessment of healing of the colonic wound and full extraction of the bypass tube by sigmoidoscopic examination 4 weeks after the operation.

Results

Age and sex incidence:

Most of our patients were males (66.7%), in a variable age periods as shown in the following table.

Sex ► And age ▼	Males		Females		Total	
	No.	%	No.	%	No.	%
→20	1	8.3	-	-	1	8.3
20-30	2	16.6	1	8.3	3	25
30-40	1	8.3	1	8.3	2	16.6
40-50	2	16.6	1	8.3	3	25
50-60	1	8.3	1	8.3	2	16.6
60→	1	8.3	-	-	1	8.3
Total	8	66.7	4	33.3	12	100

Table (2): Age and sex incidence.

Clinical presentations:

Most of our cases were of gunshot or car crash accident groups (8 cases out of 12) as seen in the following table

The presentation	Males	Females	No.	%
Penetrating injuries:				
*Gun shot	3	1	4	33.3
*Stab wound	1	-	1	8.3
Road crash accident	2	2	4	33.3
Sever blunt abd. Trauma	2	1	3	25
Total	8	4	12	100

Table (3): Number and percentage of the presenting symptom.

The exploratory data:

All cases were managed by laparotomy and diagnostic staging of colon injuries for estimation of the best way of interference.

The majority of our cases were combined colon injuries with other injuries (8 cases constituting 66.7%), in comparison to isolated colon injuries that were seen in 4 cases only (33.3% of cases), all data are shown in the following table.

The exploratory data	No.	%
Colon injury without other visceral injury	4	33.3
Combined colon injury with :		
*-Rupture spleen.	2	16.6
*-Vascular injuries of the colon vessels.	3	25
*-Liver lacerations of variable degrees.	1	8.3
*-Fracture of pelvic bones.	2	16.6
Total	12	100

Table (4): Exploratory data and its percentage.

The degree of colon injury:

Colon injuries with variable degrees were seen as shown in the following table.

The degree of injury	No.	%
Laceration (Grade II)	2	16.6
Incomplete transection (Grade III laceration)	2	16.6
Complete transection with lacerated edges (Grade IV)	3	25
Laceration with segmental tissue loss (Grade V)	2	16.6
Lacerated wall with vascular injuries (Grade VI)	3	25

Table (5): Number and percentage of each degree of colon injury.

Operative morbidity and mortality:

All our patients were managed with colon resection and anastomosis using the colonic bypass tube as mentioned without prior preparation or proximal colostomy as the sole operative procedure in 9 cases (75% of cases), or in conjunction with other procedures as splenectomy in 2 cases (16.6%), and repair of a liver laceration in one case (8.3%). The operative mortality was zero percent, and all cases were operated smoothly without any difficulties or complications.

The operative time was greatly reduced (about 90 min.) as compared with the conventional intra-operative preparation (about 180 min.) or doing a proximal defunctioning colostomy (about 120 min) with the subsequent great decline in the incidence of intra-operative morbidity and mortality that reach zero percent.

All patients were looked after in the general surgery department, Assuit University Hospitals for a post operative period ranged from 5-7 days that constitute a very low hospital stay period in comparison with other maneuvers of colon resection with intra-operative preparation (7-10 days), or colon resection with proximal colostomy that necessitates re-admission another time for colostomy closure with a total hospital stay about 10-15 days.

The overall morbidity was comparatively low if it is not negligible, as mentioned in the following table.

The item	No.	%
Nonspecific complications (wound sepsis)	1	8.3
Post op. fever	1	8.3
Smooth postoperative course without any problem.	10	83.3
Total	12	100

Table (6): Number and percentage of complications recorded.

Follow up data:

Ten patients out of twelve were followed up regularly in out patient clinic, general surgery department, and all were good and well during clinical assessment and the intra-colon tube was extruded from the rectum within two weeks post-operatively, and data is shown in the following table.

The item	No.	%
Good follow up	9	75
Missed during follow up	3	25
Total	12	100

Table (7): Follow up data and its percentage.

Discussion

This study included 12 patients chosen randomly from casualty reception of trauma center, Assuit university hospitals, Assuit, all of them with traumatic colon injuries with variable degrees and conditions.

Most of our patients were males (8 cases about 66.7%) in comparison to females (4 cases about 33.3%) and male to female ratio was 2:1, this may be explained by the greater exposure of males to external environment and accident more than females, ages of our patients were of variable age periods with no significant relation.

The nature of the injury demonstrated in our study was mainly gunshots (4 cases about 33.3%) and car accidents (4 cases about 33.3%) however other causes are represented but with smaller values, and this coincide with the literatures stated that stab wounds and gunshots are major cause of colon injury (31), and vehicle accident constitutes the majority of blunt abdominal injuries (15), and also as stated that blunt injuries and gunshots are the most frequent causes of colon injury (32).

The majority of our patients were combined colon injuries (8 cases about 66.7%) and this could be attributed to the high incidence of gunshots and car accident that constitutes the majority of our cases with affection of many organ and usually associated with haemodynamic derangement (11). However, isolated colon injury was also encountered in 4 cases only (33.3% of cases) and mainly in localized trauma group as stab wound injury and localized gunshot injury.

Since the colon is an intra-abdominal organ, its injury is estimated and well diagnosed by laparotomy, however sometimes it can be suspected as in gunshot in proximity of the colon, or if the omentum or intestine is prolapsed through the entry wound (1, 2), nevertheless blunt abdominal injuries present a spectrum of challenging problems, so it is mandatory to proceed for investigations as CT scan that can provides relative to specific organ injury and its extent (33), sometimes only abdominal sonar is diagnostic of gut injury by the presence of a collection, in absence of liver or splenic injuries, and in spite of these modalities, frequent evaluation by an experienced surgeon is the most important tool for diagnosis (14, 15).

The degree of colon injury detected during operation was variable depending on the type and extent of trauma into grade II in 2 patients (16.6%), grade III in 2 patients (16.6%), grade IV in 3 patients (25%), grade V in 2 patients (16.6), and grade VI in 3 patients (25%).

Primary colon repair was done for all cases with the use of the condom catheter tube as a bypass intra colon tube in contradistinction to Ger and Ravo whom implanted a latex/silastic sheeting within the colon lumen, this technique was done even in the presence of massive contamination, or in the presence of copious fecal loading,

perforation, pus or peritonitis (2), without proximal colostomy as advocated previously (34), or exteriorization repair as advised by other authors (35).

The intra-colon tube bypass not only reduced the operative time to a great extent excluding the extra-time needed for either colostomy or an intra-operative preparation (36), but it reduced the post operative morbidity with lower wound infection rate, lower intra-abdominal infection rate, and shorter hospital stay (37 & 38), moreover it was stated that morbidity may be ten fold higher if colostomy technique is advocated (17), so it was advised by many authors through a flood of reports that conclude that primary repair is the method of choice for treatment of colon injury despite any associated risk factors (22, 23, 11, 25 & 24), and usually anastomosis in our cases was done using a slandered two-layer closure as advocated, however it can be done using single layer technique (26).

For all our cases, the intra-colon bypass tube was smoothly extruded from the rectum within two weeks post-operatively, as it was proved previously that the tube is extruded from the rectum between the second and third week post-operatively (28, 29).

The overall mortality in our study was zero percent in agreement with the reported data by Durham et al with blunt injuries (11), however the rate was 18% in Kafi and his colleagues with blunt injuries (39) but this high rate may be related to the high injury severity score in patients of this study

The post-operative morbidity rate in our study was 16.6% in the form of wound infection in 1 case (8.3 %), and post-operative fever in another case (8.3 %).

The reported wound infection rate ranged between 4 and 17 % (5, 40, 11) and the incidence of fascial dehiscence was as high as 13.8 % in Jacobson et al series (21). However, the term Fever of unknown origin was reported in 4.8 % and they attributed it to a degree of peritoneal cellulites that never developed into an abscess (5).

Primary repair of the colon with an intra-colon bypass tube appears to be relatively safe and involves simple closure and is usually selected for injuries ranging from mild injuries to massive laceration and vascular affection. Adequate debridement of the surrounding tissue is important to obtain viable wall apposition, and resection & anastomosis is appropriate for major wall injury or an injury to colon blood vessels. This repair can be performed with either one or two layer suture technique with a very low mortality and morbidity rates, so it is becoming increasingly popular and more and more are now advocating its adoption.

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Illustrative case

Fig. (2) Op. photo shows traumatic vascular injury of the sigmoid that was controlled by ligation prior

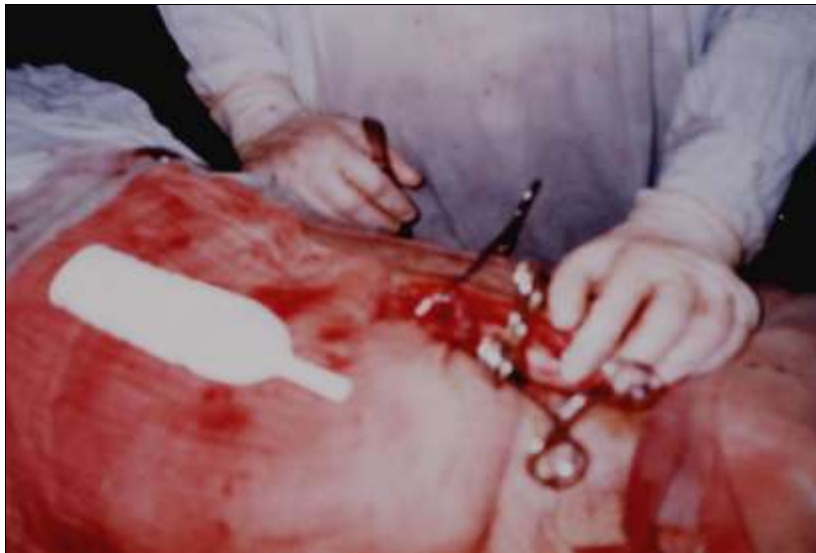


Fig. (3) Op. photo shows the condom catheter before construction of the colon sleeve

Fig. (4) Op. photo shows the intra-colonic sleeve after construction

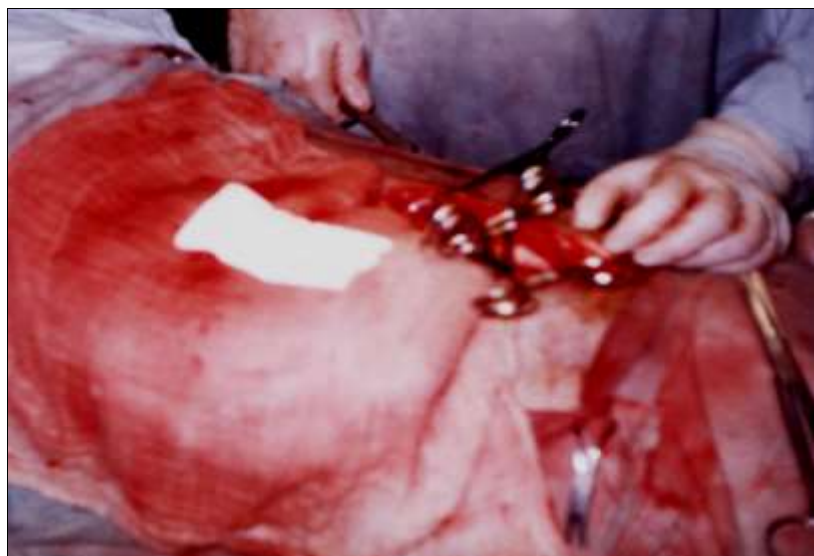


Fig. (5) Op. photo shows the intra-colonic tube in position after resection of the sigmoid before sutures fixation

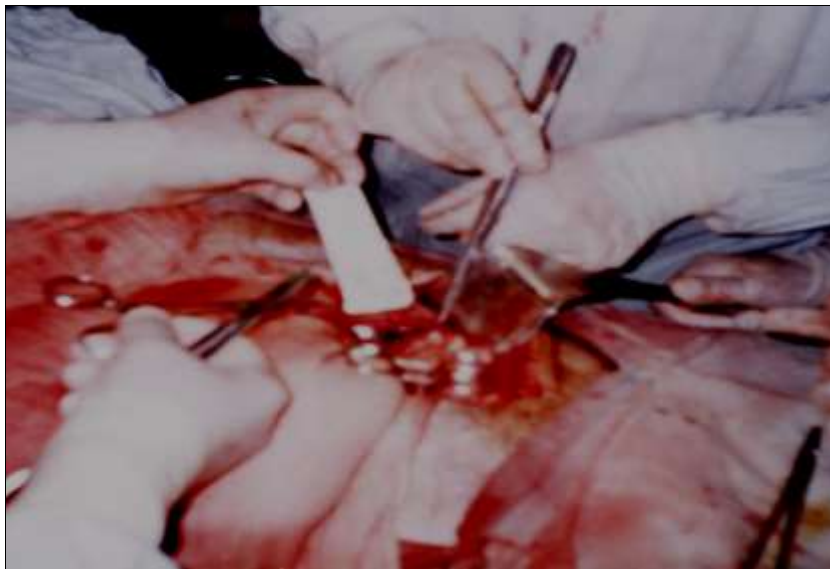


Fig. (6) Op. photo shows the intra-colon sleeve after fixation by sutures to proximal colon 5cm from its edge

Fig. (7) Op. photo shows colonic anastomosis & suturing the posterior colonic wall prior positioning of the intra-colonic sleeve

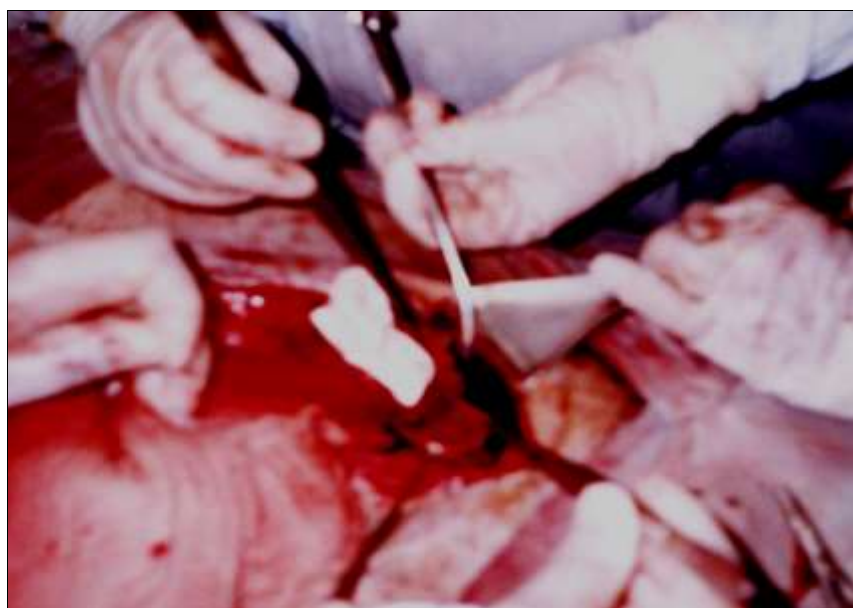


Fig. (8) Op. photo shows advancement of the sleeve through the distal colon prior suturing of the anterior colonic wall



Fig. (9) Op. photo shows suturing of the anterior colon wall with the sleeve in position

Fig. (10) Op. photo shows completion of the primary colonic anastomosis over the intra-colonic tube

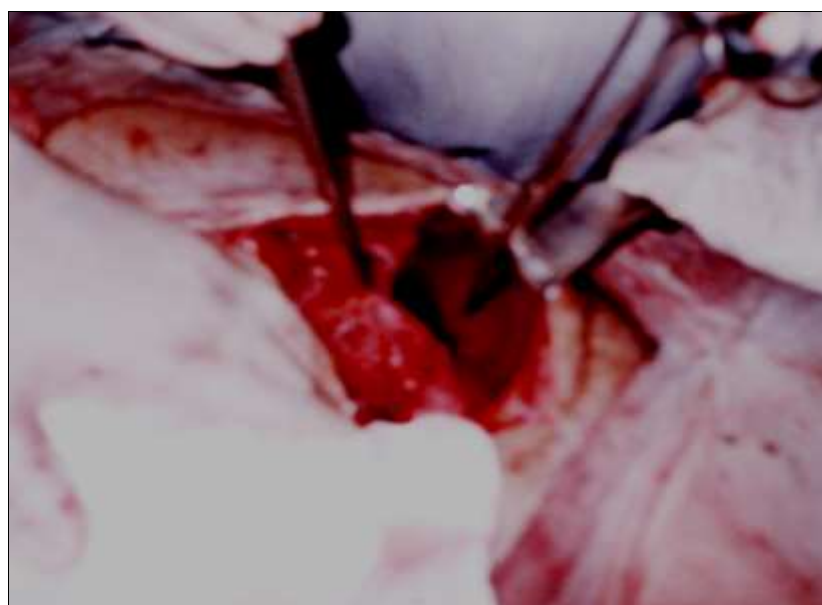


Fig. (11) Colonoscopic view shows the intra-colon tube from interior aspect

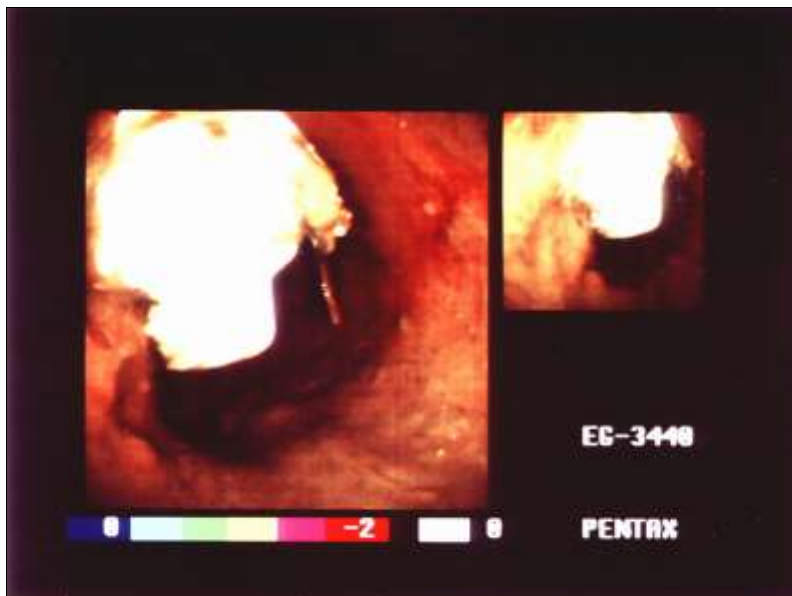
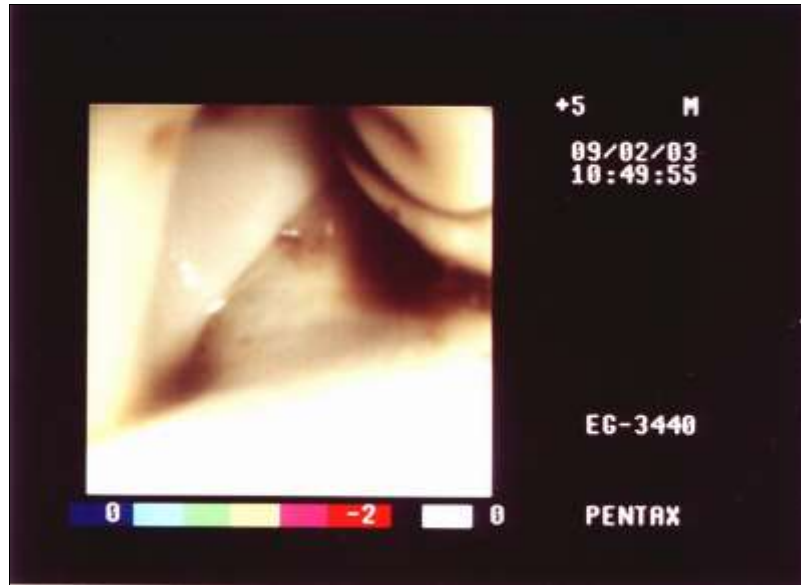
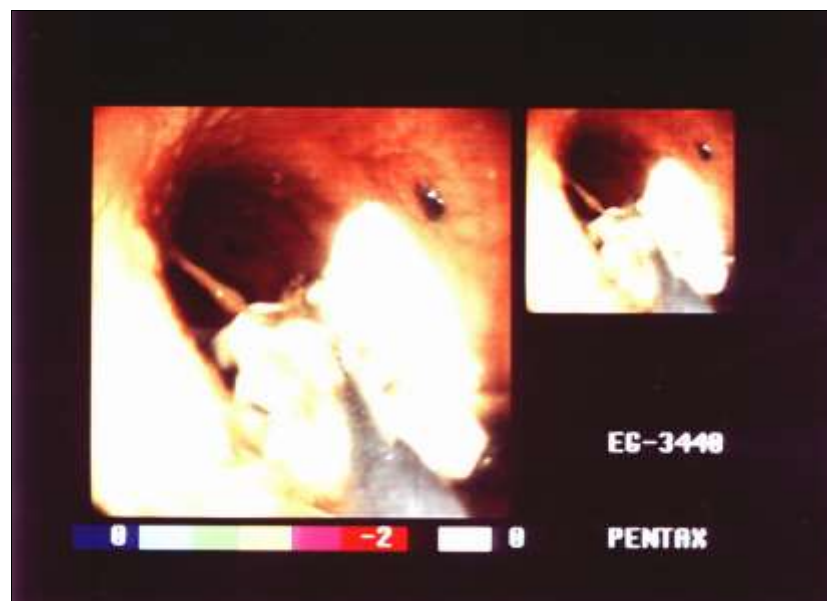


Fig. (12) Colonoscopic view shows the sleeve mounted within the lumen after separation from the wall prior extrusion (after 2 weeks)

Fig. (13) Colonoscopic view shows endoscopic extraction of the sleeve using biopsy forceps (delayed extrusion after 2 weeks)



استخدام واقي بلاستيك لحماية خط التوصيل من الداخل في توصيل القولون بدون تحضير في حالات إصابات القولون في أسبوط

دكتور : علاء أحمد رضوان
قسم الجراحة العامة، كلية الطب ، جامعة أسبوط

الملخص العربي

يتم في هذا البحث أخذ عينة عشوائية من مرضى الإصابات بمستشفى أسبوط الجامعي، وكان جميع المرضى يعانون من إصابات تتعلق بمنطقة القولون بدرجات مختلفة من الخطورة تتراوح ما بين الدرجة الثانية والسادسة وقد تفاوتت أعمار المرضى ما بين فترات العمر المختلفة بين الصغر والكبر، هذا وقد أثبتت البحث أن سبب الإصابة ينتج عن جروح نافذة بالبطن في خمسة من الحالات، أو بسبب الإصابات الرضية للبطن في سبعة منها. وقد تم علاج جميع هذه الحالات باستخدام الرتق المبدئي للقولون في حالات التهتكات القابلة للرتق أو بالاستئصال للجزء المهترئ أو عديم الحيوية ثم يتلو ذلك الرتق المبدئي أيضا دون الحاجة الى عمل تحويلة للبراز أو بالتحضير أثناء الجراحة كما كان يتم في سابق العهود بإصابات القولون، ويتم عمل الرتق بعد تركيب انبوبة داخلية في تجويف القولون مثبتة بالجزء الأعلى منه لوقاية خط الرتق من الداخل من أخطار الفضلات المتواجدة بالقولون مع ما يستتبع ذلك من فشل الجراحة أو على الأقل الالتهاب بمكان الرتق ومضاعفاته. وقد تم استخدام الجزء الانبوبي من قسطرة الواقي الذكرى رخيصة الثمن والمتاحة بديلا للأنبوبة المتعارف عليها غالية الثمن. كانت هذه الجراحة هي التدخل الأوحدي في ٤ من المرضى ومصحوبة بتدخلات أخرى في ثمانية من المرضى مثل استئصال الطحال ، أو التدخل الجراحي في تهتكات الكبد.

،قد أثبتت البحث بما لا يدع مجالا للشك تقليص وقت الجراحة بنسبة كبيرة (تسعين دقيقة فقط لحالات البحث مقارنة بوقت ١٢٠-١٨٠ دقيقة للجراحات التقليدية) ، ناهيك عن تقليل نسبة الوفيات والخطورة للجراحة المعتادة . وكان ملفتا للنظر تقليص وقت الحجز بالمستشفى لحالات البحث (٥-٧ أيام) مقارنة بعدد ١٠-١٥ يوم للجراحات التقليدية المعتادة ، ولم تتعدى نسبة المضاعفات بعد هذه التقنيات سوى ١٦% عبارة عن التهاب سطحي بالجلد أو حمى خفيفة غير محددة بعد الجراحة.

وبمتابعة المرضى بعد تمام الشفاء في زيارات مختلفة بالعيادة الخارجية للمستشفى تبين عدم حدوث أية مضاعفات على المدى البعيد ، وقد تم طرد الأنبوبة من جسم المريض عن طريق المستقيم مع الفضلات خلال أسبوعين من الجراحة في جميع الحالات ليثبت البحث كفاءته كعلاج بديل لجراحات القولون التقليدية ناهيك عن كونه بسيط ومبتكر وفعال مع التقليص من المضاعفات ووقت الإقامة بالمستشفى.