

Values of early colostomy closure in comparison to conventional colostomy closure for patients with penetrating & shell injuries to the large bowel

Dr.Hussein qader ahmed

M.B.Ch.B.-C.A.B.S.(general surgery)

Department of surgery-kirkuk medical college

ABSTRACT

BACKGROUND:

Colostomy construction has an important role in the management of penetrating large bowel injuries despite the recent trend toward primary repair of these injuries. Colostomy closure timing is a controversial issue among general surgeons. This prospective study involved comparing the post operative outcome between conventional colostomy closure (CCC) & early colostomy closure (ECC) for patients with penetrating (shell & bullet) injuries to the large bowel, mainly in the view of mortality, morbidity, fistula rate & post operative length of hospital stay(LOS).

AIM & OBJECTIVES:

To establish the safety & cost effectiveness of ECC in patients with penetrating (shell & bullet) injuries to the large bowel who fit the selection criteria of early closure.

PATIENTS & METHODS:

Fifty five patients, all sustaining penetrating (shell & bullet) injuries to the large bowel & treated with colostomies were selected & prospectively divided into two groups, first group (ECC group) comprises 16 patients, fulfilling special criteria including absence of severe intra abdominal sepsis, no malnutrition, no multisystem trauma & no major wound problems, good anal continence & absence of systemic diseases, they underwent ECC within 15 -20 days (17.8 mean) from time of the injury, and the second group (CCC group) comprises 39 patients, who did not fulfill the mentioned criteria above, underwent CCC closure within 55-95 days (79.5 mean) from time of the injury. Both groups were similar in preoperative characters such as age & sex.

Preoperative data & post operative outcome were collected and analyzed. Statistically significant values defined as those with P value of > 0.05 .

RESULTS:

The mean colostomy closure time for ECC was 17.9(15-20) days, & for the CCC was 80.5(65-95) days .A total of 5 patients (31.28%) with ECC developed complications compared to 15 patients (43.58%) having CCC (P value 0.7), overall morbidity was 40%. In ECC group, 1 patient (6.25%) developed fistula, & in the CCC group, 3 patients (7.6%) had fistula and overall fistula rate was 7.27 %. Mean post operative LOS for the ECC group was 6.07 days (5-10 days), & for the CCC group was 6.41 days (5-11 days). Mortality was zero for both groups.

CONCLUSIONS:

ECC is a safe & cost effective technique for colostomy closure in selected group of patients with penetrating (shell & bullet) large bowel injuries.

INTRODUCTION

Colostomy is defined as an artificial opening or connection of the colon to the skin of the abdominal wall with no sphincteric control¹.

Colostomies are classified into different types according to their anatomic location, aetiology & function (table 1).

Colostomies have played an integral role in the management of colorectal injuries despite its well-recognized morbidity, cost & the delay until colostomy closure^{2, 3}.

From the physiologic point of view, different parts of the colon have different characters regarding peristalsis, absorptive function & stool consistency. The right side of the colon absorbs water & has irregular peristaltic contractions. Colostomies made from the proximal half of the colon usually expel a liquid content. The left colon serves as a conduit & reservoir & has a few mass peristaltic motions per day, its content is more solid & its output usually can be regulated by irrigation. Therefore, the left colon should be used for a colostomy if possible (or the distal transverse colon), while the proximal colon should be avoided as it will combine the worst features of both a

colostomy & an ileostomy: a liquid, high volume, foul smelling effluent¹.

Colostomy closure is a frequently performed procedure for temporary colostomy⁴. Timing of colostomy closure is a controversial issue among general surgeons. The most important consideration in dealing with closure of a temporary colostomy is deciding when it is safe to restore intestinal continuity⁵.

ECC can be safely undertaken in most patients in the absence of severe intra abdominal sepsis, malnutrition & major wound problems⁴. ECC may be as safe as the CCC with a shorter operating time & less intra operative blood loss^{5, 6}.

The concept of ECC is highly attractive & accepted by most patients. Same admission colostomy closure (SACC) is a technique of ECC which is undertaken in the very first admission during which the colostomy was constructed⁴.

The concept of ECC has been discussed by various authors & it is not a revolutionary new technique⁴.

Boyden (1950) was the first who questioned the rule that colostomy should be maintained 3 months or more⁷. Powers & O'Meara in 1938 reported the first case

of SACC for rectal trauma in a patient who had transanal rectal injury⁸.

Siler & Bebbin in 1950 reported a similar case of transanal rectal injury with suturing of the rectal wound & a sigmoid loop colostomy which were closed on 9th post injury day with no complications⁹. In 1952 Powers reported another case of SACC for sigmoidoscopic perforation of distal sigmoid, SACC done at 17th day with no complication up to 5 year follow up period¹⁰. In 1984, Aston & Everett retrospectively reviewed 38 patients who underwent SACC within 3 weeks of their initial surgery with results that were not different from those reported after CCC². In 1991, Geoghegan & Rosenberg retrospectively reviewed 17 patients who underwent colostomy closure 11-26 days after a Hartmann procedure with results that were superior to those that were reported after CCC¹¹. Renz et al in 1993 found that SACC can be safely performed in a carefully selected group of patients¹².

The concept of ECC is supported by analyzing the phases of wound healing & the optimal timing of collagen synthesis & content of the wound edges at the anastomotic site⁴. It has been shown in animal models (pigs) with end sigmoid colostomy that collagen content of colostomy ends were optimal (normal or

increased) 7-11 days after colostomy construction¹³.

The 7 day old distal anastomosis was able to handle restored fecal flow & there were few anastomotic leakage or perianastomotic abscesses¹².

This prospective study was carried out to determine the safety of ECC in terms of morbidity & cost effectiveness & to compare the outcome after ECC & CCC in patients with penetrating (shell & bullet) injuries to the large bowel.

AIM & OBJECTIVES

1. To determine the safety of ECC in terms of cost effectiveness, morbidity & site specific complications mainly fistula & wound infection.
2. To compare the outcome after ECC & CCC in patients with penetrating (shell & bullet) injuries to the large bowel.
3. To determine a safe technique for performing ECC.
4. To define patient selection criteria for performing ECC.

PATIENTS AND METHODS

PATIENT SELECTION

From 1st of September 2007 to 1st of September 2011, we carried out a prospective study including 55 patients (2 female, 20% & 44 male patients, 80%)

admitted to Kirkuk Hospitals - surgical unit, all were suffering from penetrating (shell & bullet) injuries to the large bowel & all underwent fecal diversion by colostomy construction (predominantly with temporary loop colostomies because of its effectiveness & ease of eventual closure). Out of the 55 patients included in the study, 16 patients (29.09%) were selected for ECC, who were fitting the following criteria:

1. Absence of intra abdominal sepsis.
2. Absence of wound infection & other systemic infections.
3. Good general condition (no malnutrition, no immune suppression, no anemia, no multisystem trauma & no systemic diseases such as IHD or DM).
4. Regarding those patients with distal anastomosis, having contrast enema done for them in the 2nd post operative week with no leak at the anastomotic site.

5. Normal anal continence.

ECC Group

Regarding the ECC group which comprises 16 patients, mean age was 29 years (13-43years), 2 patients (12.5%) had bullet injuries & 14 patients (87.5%) had shell injuries. Regarding colostomy type, all patients had loop colostomies (one

patients had transverse loop colostomies & 15 patients had sigmoid loop colostomies). Ten patients (62.5%) had colonic wounds which were liable to be exteriorized as loop colostomies, & the other 6 patients (37.5%) had either a distal anastomosis at colonic injury site that cannot be exteriorized, protected by a proximal defunctioning colostomy, or had two colonic injury sites ,one proximal injury exteriorized as defunctioning colostomy & the other distal injury repaired.

CDCC Group

Regarding the CDCC group which comprises 39 patients, mean age was 29.8 years(15-44 years), 2 patients(5.12%) had end colostomies & 37 patients(94.07%) had loop colostomies(3 patients transverse loop colostomies & 34 patients sigmoid loop colostomies).5 patients (12.82%)had bullet injuries & 34 patients(87.17%) had shell injuries .

TECHNIQUE

For the ECC group, closure was done within 15 -20 days (17.9 mean) from time of injury, either on the same admission (SACC, 5 patients, 31.25%) or during a re-admission (11 patients, 68.75%).For those 11 patients (68.75%) who had distal anastomosis, prior to colostomy closure, in order to evaluate healing of distal anastomosis, they underwent contrast

enemas per anus 10- 14 days after injury. Bowel preparation was done preoperatively.

Regarding the CCC group, colostomy closure was done within 65-95 days (79 mean) from the time of the injury. Bowel preparation was done preoperatively.

All patients had the same preparation regimen, which included:

1. The patient was on only clear fluid intake for 72 hrs. preoperative.
2. Administration of coloclean powder 24 hrs. preoperative.
3. Two rectal enemas, 24hrs.preoperatively.

OPERATIVE TECHNIQUE

Operative technique involved opening the abdomen at the colostomy site in the majority of patients (midline laparotomy in patients with end colostomy) including excision of a small fringe of skin about 2-3 mm, the bowel freed from adhesions & its edges refreshed, then anastomosis was done between the two edges in a double layer interrupted hand sewn suturing, using 3/0 absorbable suture material.

Controlled anal stretch was done at the end of operation to counteract the increased internal anal sphincter tone due to disuse.

All patients received the same antibiotic regimen, first dose given intraoperatively

with the induction of anesthesia, followed postoperatively by a 5-7 days course, including metronidazole 500mg three times daily & ceftriaxone 1gm, tow times daily.

Patients were discharged when they were eating a regular diet & having normal bowel movement.

All calculations including data comparison & statistical significance were done using GraphPad Instat Version3.00 & Fisher's exact test. Statistically significant values defined as those with P value of > 0.05 .

RESULTS

Comparing the preoperative patient characters in both groups, they were similar in most aspects .Regarding age distribution of the patients in the two groups; mean age for the ECC group was 29 years(13-43 years), & mean age for the CCC group was 30 years(15-44 years). The difference in age distribution between the two groups is not statistically significant (P value >0.05).

Regarding sex distribution between the two groups, patients in the ECC group were 14 male (87.5%) & 2 female (12.5%) patients, while the CCC group included 34 male (87.17%) & 5 female (12.82%) patients, as shown in table (2).

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The difference in sex distribution between the two groups was non significant statistically (P value >0.05).

Regarding causes of injury, penetrating (shell & bullet) injuries to the large bowel was the cause of injury in the two groups, including shell injuries, in 48 patients (87.27%), & bullet injuries in 7 patients (12.72%).

Regarding the ECC group, 14 patients (87.5%) had shell injuries & 2 patients (12.5%) had bullet injuries, as shown in figure (1), where as in the CCC group, 34 patients (87.17%) had shell injuries & 5 patients (12.82%) had bullet injuries, as shown in figure (2), & in Table (3)

No significant difference observed between the two groups of patients regarding the cause of injury (P value >0.05 for shell & bullet injuries, respectively). The mean colostomy closure time for ECC was 17.9(15-20) days, & for the CCC was 79(65-95) days.

As far as our patients were victims of bullet or shell injuries, there were associated injuries in most patients, however, for the ECC group, one of our selection criteria was absence of multisystem trauma; they had mainly small intestinal injuries (43.75%) with or without a minor or low grade associated

injuries, as shown in figures (3) & (4), & in table (4) below

OUTCOME & COMPLICATIONS

Comparing post operative results, no deaths were reported in both groups & survival rate was 100%. Incidence of complications were similar in both groups as shown in table (5) & (6) below

Morbidity in the ECC group was 31.25 % (5 patients developed complications), & in the CCC group was 43.58 % (17 patients developed complications), overall morbidity was 40 %. No statistically significant difference in morbidity was noted between the two groups (P value >0.05).

Regarding general complications, five patients (12.8%) from the CCC group developed chest infection, compared to 2 patients (12.5%) from the ECC group (P value >0.05). Three patients (7.6 %) from the CCC group developed UTI, compared to 1 patient (6.25 %) from the ECC group (P value >0.05). Two patients (5.1 %) from the CCC group developed DVT, compared to zero patients from the ECC group (P value >0.05), as shown in figures (5)&(6). No statistically significant differences were found between the two groups regarding general post operative complications.

Regarding local complications, fistula rates were similar in both groups (in ECC group: 1 patient (6.25 %), & in the CCC group: 3 patients (7.6 %) & overall 7.27 %). No statistically significant difference was found in fistula formation (P value >0.05). Five patients (12.8%) from the CCC group developed wound infections, compared to 1 patient (6.25 %) from the ECC group (P value >0.05). Only 2 patients (5.1 %) from the CCC group developed wound dehiscence (infection related) compared to zero patient from the ECC group (P value >0.05). One patient (2.5 %) from the CCC group developed an intra abdominal collection compared to zero patients from the ECC group (P value >0.05) as shown in figures(7)&(8). Overall local complications compared between the two groups were statistically not significant.

Regarding post operative LOS, for the ECC group ,the mean was 6.07 days (5-10 days), & for the CCC group ,the mean was 6.41 days(5-11 days),with no statistically significant difference between the two groups(P value >0.05). Regarding intraoperative finding, in most of the patients with early closure, the procedure associated with less blood loss & adhesions with easier dissection between tissue planes, adhesions were mainly fibrinous & easy.

Regarding the ECC group of patients, bowel motion was positive in the third post operative day in 11 patients (68.75%) & in the second post operative day for the remaining 5 patients (31.25%), means 2.61 postoperative days.

Regarding the CCC group of patients, bowel motion was positive in the third post operative day in 30 patients (76.92%) & in the second postoperative day in the remaining 9 patients (23.07%), means 2.68 postoperative days.

DISCUSSION

The closure of a colostomy requires careful consideration of many factors, appropriate surgical judgment, & flexibility in planning, timing & technique¹²

The concept of ECC is based on better understanding & analyzing phases of wound healing & optimal timing of anastomotic healing⁴.

The content & synthesis of collagen in the colostomy wound are maximum at 7-11 days after colostomy construction & so colostomy closure during this proliferative phase of wound healing will ensure better anastomotic healing & strength¹³.

Prospective studies have been mixed in their results regarding the timing of colostomy closure & post operative outcome. Irvin concluded that there was no

relationship between timing & postoperative anastomotic disruption in patients who underwent colostomy closure more than 6 weeks after construction¹⁵, while Forrester et al. concluded that waiting more than 28 days to perform colostomy closure was ideal in terms of incidence of post operative anastomotic dehiscence¹⁶.

In this series, ECC was as safe as CCC in terms of post operative complication when selection of patients were done according to the mentioned criteria of ECC. No significant difference occurred between the two groups regarding mortality, morbidity & fistula rates.

Retrospective reviews in the most recent articles that included trauma patients have reported post ECC fistula rates of 0% - 8.5%^{3, 17}. In this series, fistula rate was within this range (6.92%) & all fistulae were healed spontaneously.

Mean post operative LOS for the ECC patients in this series was 6.01 days. Our result closely approaches that of Renz et al. in his study in 1993 which was 5 days¹². Overall LOS for the 8 patients who underwent SACC in this series was 18 days (17-20 days). In other related literature reviews of trauma patients with SACC, overall LOS was 8.7 to 18.1 days¹⁸.

We have shown that closure can be safely done between the 15th to 20th days from time of injury, & in those patients who had distal anastomosis (11 patients, 68.75 %) after contrast radiological confirmation of healing of distal colonic injury being demonstrated as absence of leaking of contrast during contrast enema done between 10-14 days from the 1st operation.

CCC is still recommended for those patients with colostomies after penetrating (shell & bullet) injuries to the large bowel who do not fit the criteria mentioned above for ECC. CCC helps the patients for regaining their lean body mass, resolution of peritonitis, sepsis & inflammation at the area of primary pathology, & for allowing better healing of distal repair of colonic injury or anastomosis¹⁹.

ECC in an otherwise fit healthy patient is an attractive option especially if the patient is carefully selected in the view of selection criteria for early closure. ECC has a main socioeconomic advantage, it avoids the patient from the socially embarrassing & potentially risky stoma, allows early return to work & ensures that the patient will not need to learn colostomy care or purchase appliances especially in developing countries where health care & resources are not fully established¹².

CONCLUSION

Based upon our data, the following conclusions are made:

1. ECC is a safe & cost effective technique of colostomy closure in patients with penetrating (shell & bullet) injuries to the large bowel with specific criteria including absence of severe intra abdominal sepsis, malnutrition, multisystem trauma & major wound problems.
2. Colostomies were safely closed for the ECC group of patients within 15-20 days (mean 17.9 days) with an overall fistula rate of 6.25%.
3. Comparing post operative outcome between CCC & ECC patients, no statistically significant differences

REFERENCES

4. . Ira J. Kodner, Thomas E. Read. Intestinal Stomas. In: Michael J. Zinner, Stanley W. Ashley. Maingot's Abdominal Operations. 11th edition. McGraw-Hill Companies, Inc.2007; 146-148.
5. Hines JR, Harris GD. Colostomy & Colostomy Closure. Surg Clin North Am 1977; 57:1379-1392.
6. Nelken N, Lewis F. The Influence of Injury Severity on Complication Rate after Primary Closure or Colostomy for Penetrating Colon

occurred regarding fistula rate, postoperative LOS, morbidity or mortality.

RECOMMENDATIONS

1. We recommend ECC for patients with penetrating (shell & bullet) injuries to the large bowel after careful selection of them based upon a number of criteria including absence of severe intra abdominal sepsis, malnutrition, multisystem trauma & major wound problems.
2. For those patients with colostomies not fitting the mentioned criteria, we recommend further researches to evaluate the safety of ECC compared to CCC.

Trauma. Ann Surg 1989; 209:439-447.

7. M.S.Khalid, S.Moeen A., A.W.Khan, et al. Same Admission Colostomy Closure: A Prospective Randomized study in Selected Patient Groups.2005; 2-8.
8. Jordan A. Weinberg, Timothy C. Fabian. Injuries to the stomach ,small bowel, colon &rectum .In: ACS Surgery Principle & Practice ;Wilmore DW, Cheung LY,

- Harken AH, et al. USA. Web MD Inc. 2003.
9. C. Gene Cayten, Timothy C. Fabian, Victor S Garcia, et al. Patient Management guidelines for penetrating intraperitoneal colon injuries. 1998;6-7.
 10. Boyden AM. The surgical treatment of diverticulitis of the colon. Ann Surg 1950; 132:94-109.
 11. Powers JH, O'Meara ES. Perforated wound of the rectum into the pouch of Douglas. Ann Surg 1938; 109:468-73.
 12. Siler VE, Bebb K. Trauma To The Perineum, Anus, Rectum & Colon. Am J Surg 1950; 80:652-662?
 13. Powers JH. Perforations of the pouch of Douglas; three by impalement and one by sigmoidoscopy. Am J Surg 1952; 83: 403-8.
 14. Geoghegan JG, Rosenberg IL. Experience with early anastomosis after the Hartmann procedure. Ann R Coll Surg Engl 1991; 73:80-82.
 15. Renz BM, Feliciano DV, Sherman R. Same admission colostomy closure (SACC). A new approach to rectal wounds: a prospective study. Ann Surg 1993; 218:279-92.
 16. Blomquist P, Jiborn H, Zederfeldt B. Effect of Diverting Colostomy on Collagen Metabolism in The Colonic wall. Am J Surg 1985; 149:330-333.
 17. Catherine Parchment Smith, Catherine Hernon, Sudipta Banerjee, et al. MRCS System Module. First Edition 2000. Past test. 342-347.
 18. Irvin TT, Recent Results of Colostomy Closure: A Prospective Study of 98 Operations. J R Coll Surg Edinb 1987; 32:352-354.
 19. Forrester DW, Spence VA, Walker WF. Colonic mucosalsubmucosal blood flow and the incidence of faecal fistula formation following colostomy closure. Br J Surg 1981; 68: 541-44.
 20. Pachter HL, Hoballah JJ, Corcoran TA, Hofstetter SR. The morbidity & financial impact of colostomy closure in trauma patients. J Trauma 1990; 30; 1510-1513.
 21. Sweeney JL, Hoffmann DC. Restoration of Continuity after Hartmann's Procedure for The Complications of Diverticular Disease. Aust N Z J Surg 1987; 57:823-825.
 22. Milesky WJ, Rege RV, Joehl RJ. Rates of Morbidity and Mortality after Closure of Loop and End Colostomy. Surg Gynecol Obstet 1990; 171:17-21.

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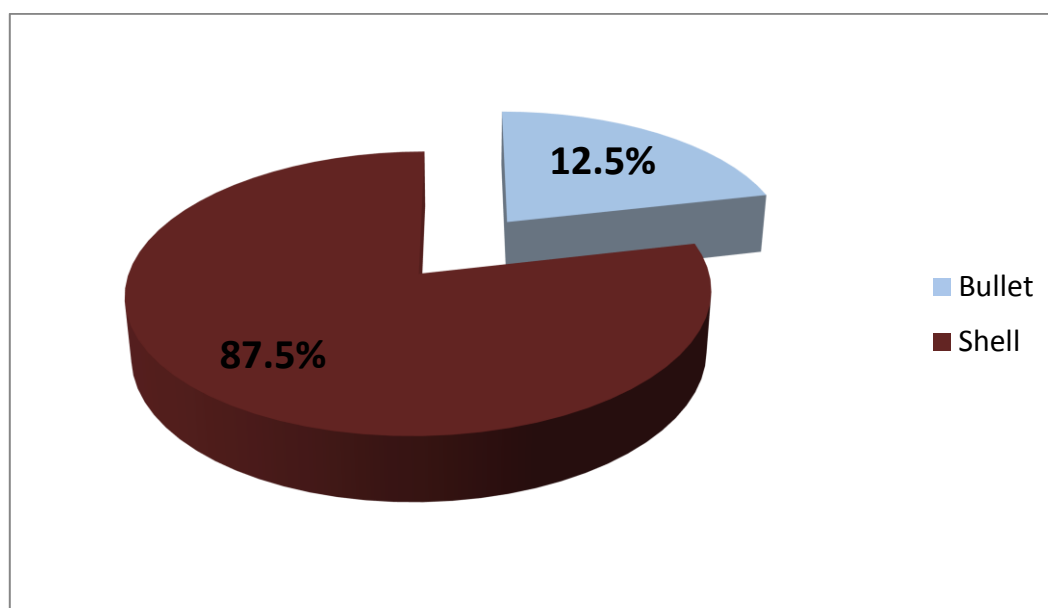


FIGURE (1): CAUSES OF INJURY IN THE ECC GROUP

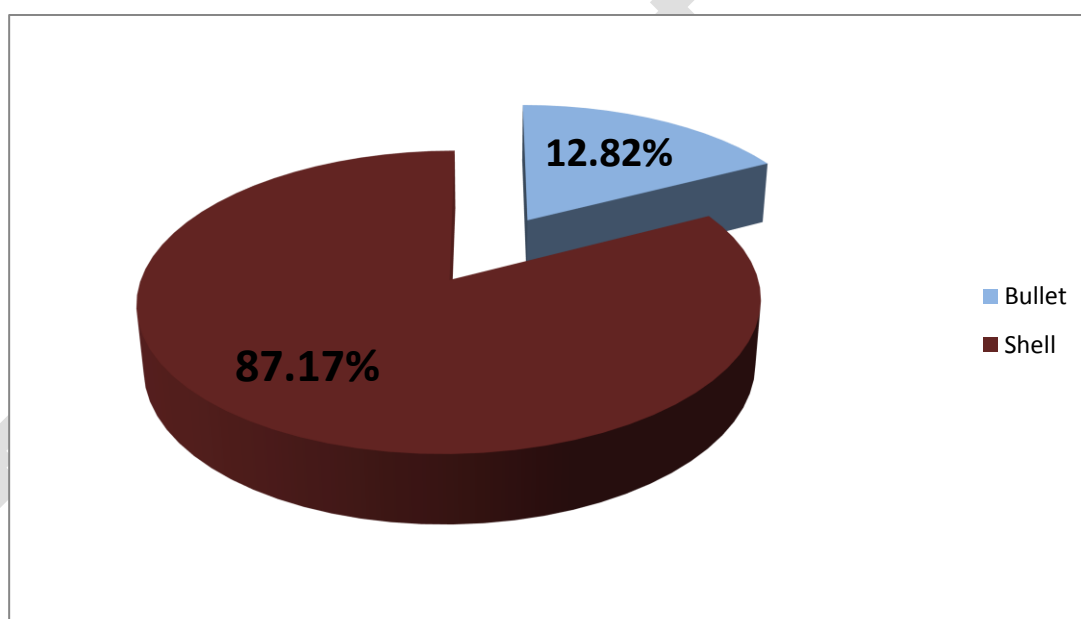


FIGURE (2): CAUSES OF INJURY IN THE CCC GROUP

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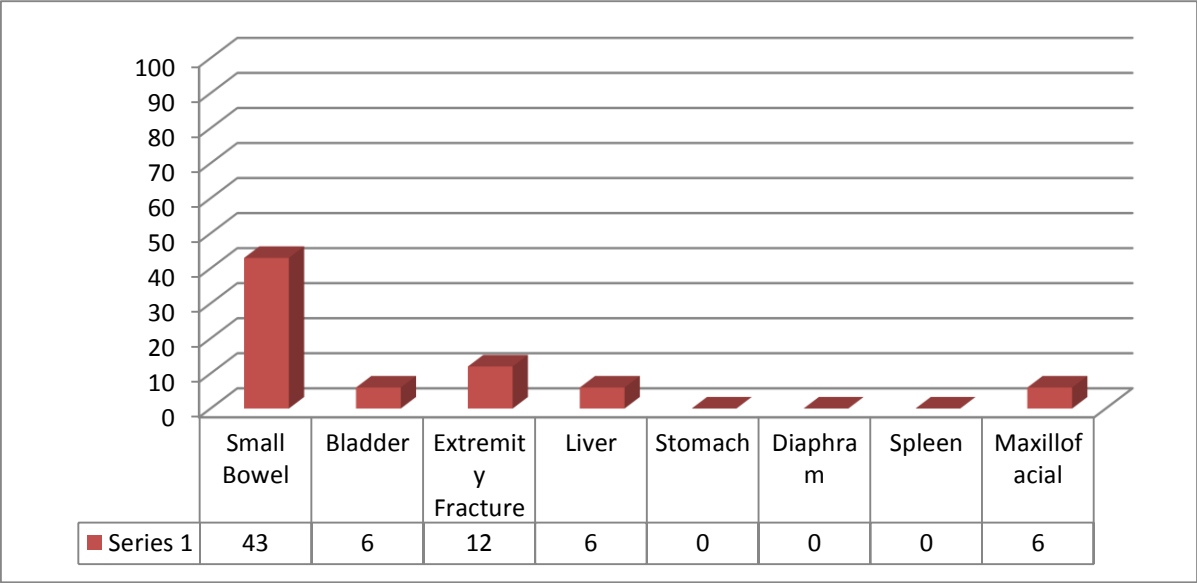


FIGURE (3): ASSOCIATED INJURIES IN THE ECC GROUP

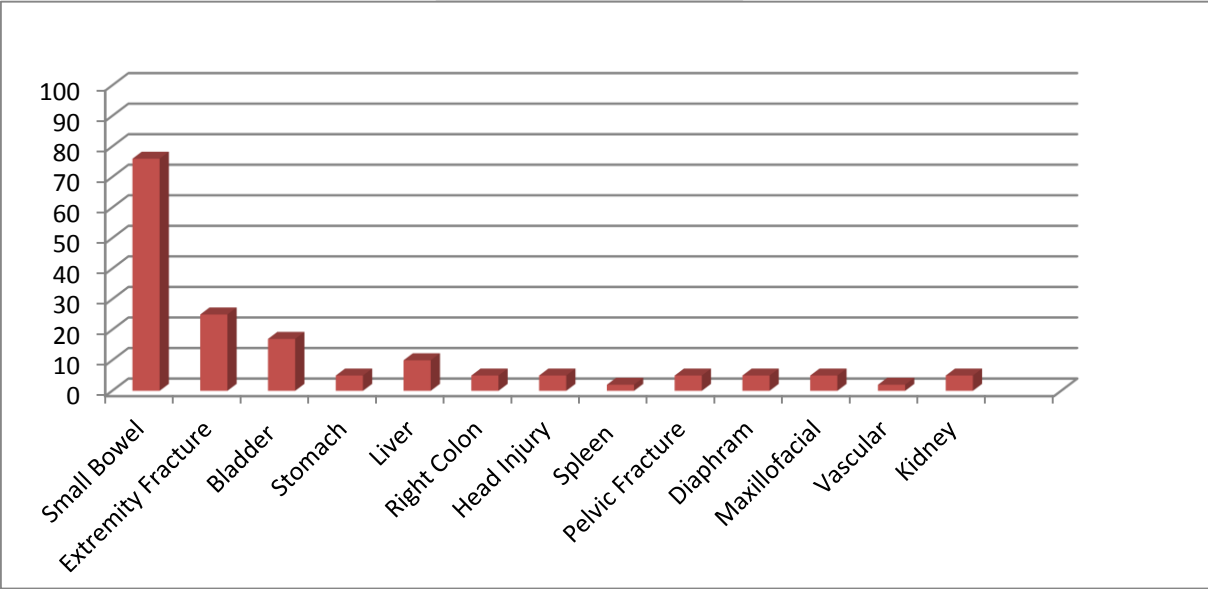


FIGURE (4): ASSOCIATED INJURIES IN THE CCC GROUP

Values of early colostomy closure in comparison to conventional colostomy closure for patients with penetrating & shell injuries to the large bowel

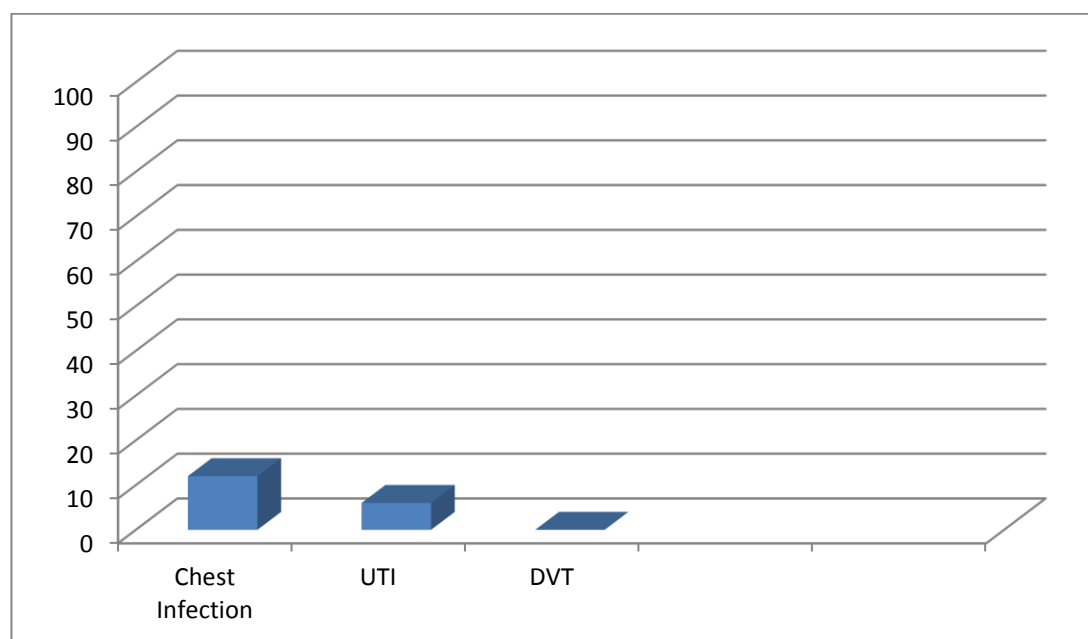


FIGURE (5): POST OPERATIVE COMPLICATIONS IN THE ECC GROUP - GENERAL COMPKICATIONS

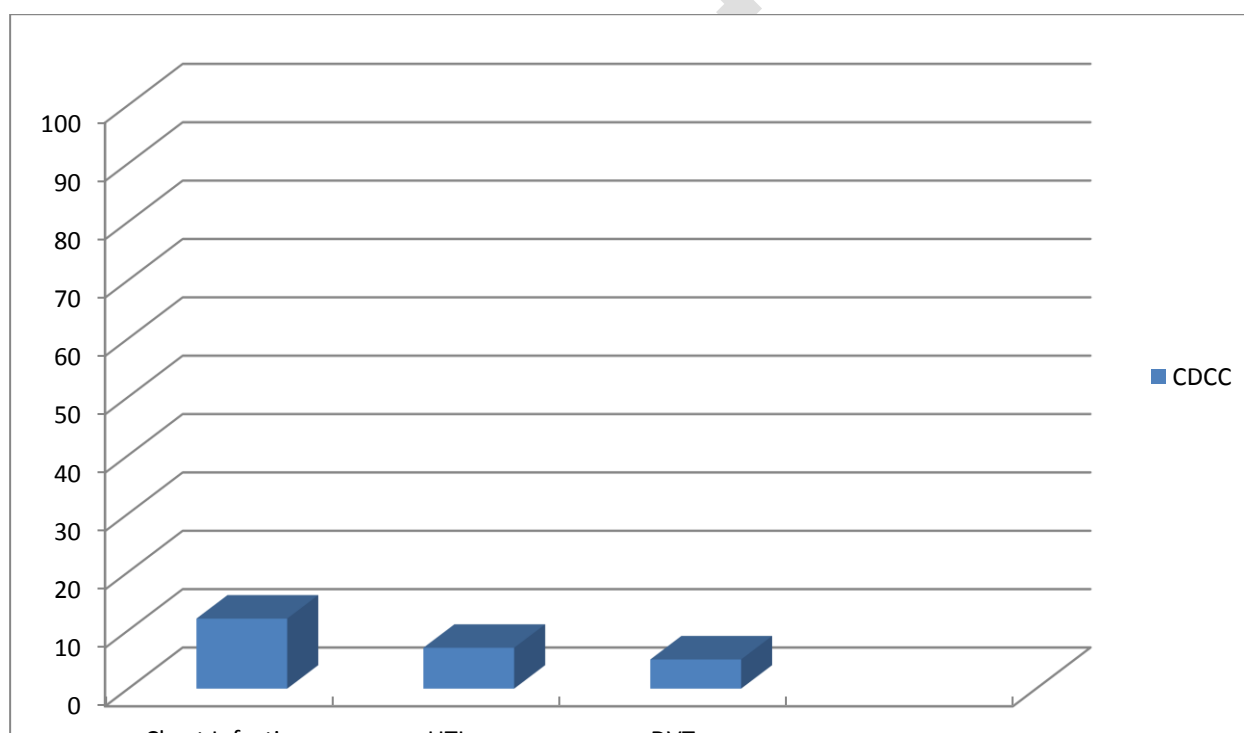


FIGURE (6): POST OPERATIVE COMPLICATIONS IN THE CCC GROUP -GENERAL COMPLICATIONS

Values of early colostomy closure in comparison to conventional colostomy closure for patients with penetrating & shell injuries to the large bowel

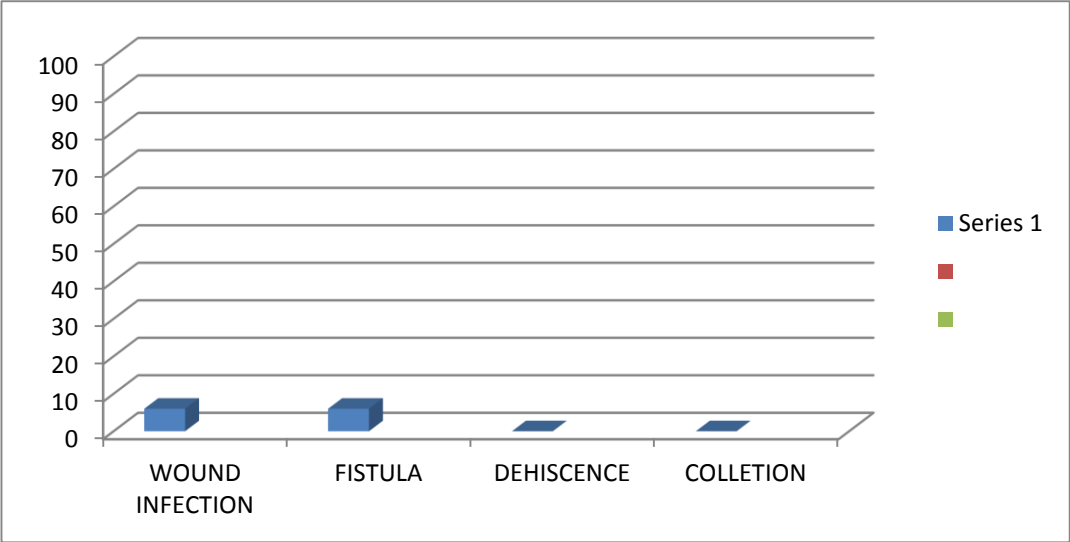


FIGURE (7): POST OPERATIVE COMPLICATIONS IN THE ECC GROUP - LOCAL COMPLICATIONS

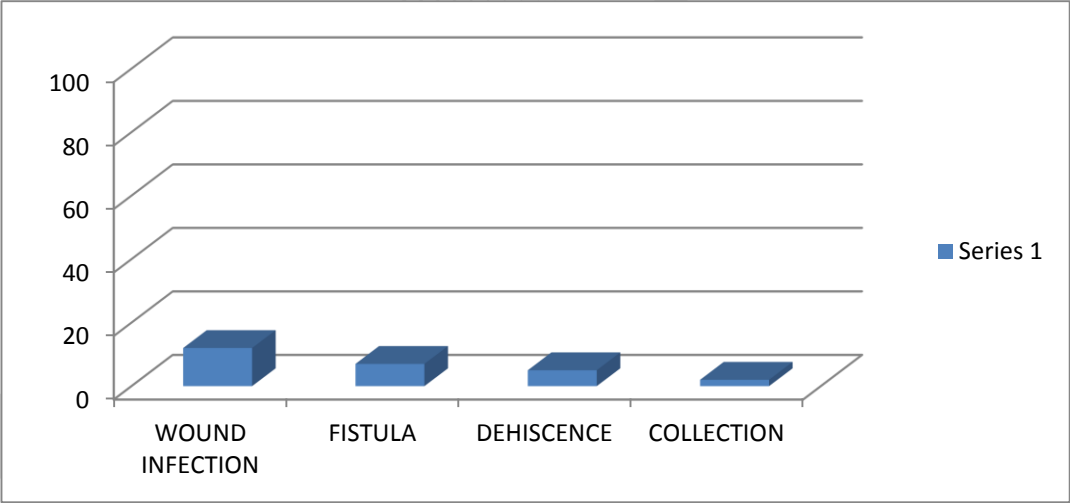


FIGURE (8): POST OPERATIVE COMPLICATIONS IN THE CCC GROUP – LOCAL COMPLICATIONS

TABLE (1): CLASSIFICATION OF COLOSTOMY ^{1, 14}

According To Anatomic Location

- Sigmoid colostomy
- Descending Colostomy
- Transverse Colostomy
- Ceacostomy

According To Aetiology

- Temporary : e.g. colonic trauma
- Permanent: e.g. Abdominoperineal resection

According To Function

- Decompressing
- Blow Hole Caecostomy or Colostomy
- Tube Caecostomy
- Loop Transverse Colostomy
- Diverting
- Loop Colostomy : e.g. Transverse or Sigmoid Loop Colostomy
- End Colostomy
- End Colostomy With Rectal Stump(Hartmann's Procedure)
- End colostomy With Mucus Fistula
- ❖ Double-Barrelled Colostomy

Table (2): Sex distribution

Gender	ECC	CCC	P value
Male	14 (87.5%)	34 (87.17%)	>0.05
Female	2 (12.5%)	5 (12.82%)	>0.05
Total	16	39	

Table (3): Causes of Injury in Both ECC & CCC Groups

Cause	ECC	CCC	P value
Shell	14 (87.5%)	34 (87.17%)	>0.05
Bullet	2 (12.5%)	5 (12.82%)	>0.05
Total	16	39	

Table (4): ASSOCIATED INJURIES IN BOTH ECC & CCC GROUPS

Type of Injury	CCC	ECC
Small Bowel	30 (76.92%)	7 (43.75%)
Extremity Fracture	10 (25.64%)	2 (12.5%)
Bladder	7 (17.94%)	1 (6.25%)
Stomach	2 (5.12%)	0
Liver	5 (10.8%)	1 (6.25%)
Right Colon	2 (5.12%)	0
Head Injury	2 (5.12%)	0
Spleen	1 (2.5%)	0

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Pelvic Fracture	2 (5.12%)	0
Maxillofacial	2 (5.12%)	1 (6.25%)
Diaphragm	2 (5.12%)	0
Vascular	1 (2.5%)	0
Kidney	2 (5.12%)	0

Table (5): POST OPERATIVE COMPLICATIONS – GENERAL

<i>Type</i>	<i>CCC</i>	<i>ECC</i>	<i>P value</i>
Chest Infection	5 (12.82%)	2 (12.5%)	>0.05
UTI	3 (7.6%)	1 (6.25%)	>0.05
DVT	2 (5.1%)	0	>0.05

Table (6): POST OPERATIVE COMPLICATIONS – LOCAL

<i>Type</i>	<i>CCC</i>	<i>ECC</i>	<i>P value</i>
Wound Infection	5 (12.8%)	1 (6.25%)	>0.05
Fistula	3 (7.6%)	1 (6.25%)	>0.05
Dehiscence	2 (5.1%)	0	>0.05
Intra abdominal collection	1 (2.5%)	0	>0.05