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Original Research Article

Primary abdomen closure (using sheath relaxation) versus staged closure (using modified Bogota) following laparotomy in secondary peritonitis: a comparative study

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ABSTRACT

Background: Primary closure or open laparostomy after laparotomy for peritonitis have their own morbidities. In this study, rectus sheath relaxation was used as an alternative to conventional primary closure and compared to the modified Bogota technique in patients of peritonitis.
Methods: We included 60 patients of peritonitis with two of the following criteria: APACHE II score 10-20, Mannheim peritonitis index (MPI) 20-30 or post-resuscitation intraabdominal pressure (IAP) >15 mmHg and randomized them to group A (Sheath relaxation technique) and group B (modified Bogota). Outcome criteria studied included procedure failure, complications, pain, mortality and duration of ICU and hospital stay.
Results: Both groups were comparable in terms of age, gender, inclusion criteria, ICU stay and mortality. The success rate in group A was 63.33% while in group B, was 53.33% with complication rates of 37% and 46.67% respectively. The pain and duration of hospital stay were significantly less in group A.
Conclusions: We concluded that primary abdomen closure using rectus sheath relaxation in select patients was an easy, feasible and better alternative than the staged closure using modified Bogota technique following laparotomy in patients of severe secondary peritonitis. Patients with higher APACHE II and MPI scores may be better managed primarily by modified Bogota technique, while those with lower APACHE II and MPI do well with primary closure with sheath relaxation. The pre- operative APACHE II, MPI and post resuscitation IAP either individually or in combination, could, therefore, predict the wound failure rates, choice of closure techniques.

Keywords: Bogota, Peritonitis, Sheath relaxation

INTRODUCTION

In patients undergoing laparotomy for secondary peritonitis, the abdominal cavity closure has been an important issue. Conventionally, the abdomen is closed primarily by continuous suture technique (Jenkins) using 1-0 prolene.[1] Laparostomy is a surgical closure method in which the peritoneal cavity is not sutured but kept protected with a temporary coverage followed by a delayed closure. Primary closure of the abdomen in patients of severe secondary peritonitis however, has certain disadvantages: raised intra- abdominal pressure (IAP) affecting splanchnic, renal and abdominal wall perfusion, fascial wound ischemia and necrosis causing burst abdomen, increased incidence of multi organ failure and mortality.

In post- operative patients raised IAP levels are seen as a result of ileus, visceral and peritoneal edema and reduced abdominal wall compliance caused by pain. Uncontrolled IAP may lead to multiple organ failure in which all major organ systems are involved, associated with a high morbidity and mortality rate. With the development of the abdominal compartment syndrome the mortality can

be as high as 50%.[2] However, to minimize the ill effects of closed abdomen, managing severe secondary peritonitis by open technique following laparotomy carried its own morbid consequences: open viscera exposed to the exterior susceptible to exogenous infection, continuous fluid and electrolyte losses necessitating their proper correction, increased risk of bowel fistula formation and retraction of the abdominal wall needing major surgery for later closure or requiring delayed primary closure causing prolonged hospital stay.[3]

In this study, we used rectus sheath relaxation technique as an alternative to conventional primary closure and randomized it to modified Bogota technique in patients of severe secondary peritonitis and analysed their results statistically.

METHODS

A prospective study was conducted in the department of general surgery in a tertiary care hospital over a period of one year from December 2018 to December 2019. Written informed consent was obtained from all patients and the study protocol was approved by the institutional ethics committee.

Inclusion criteria

The study included all consecutive patients of secondary peritonitis admitted within the study period, regardless of the etiology, with any two of the following criteria: APACHE II score 10-20, Mannheim peritonitis index (MPI) 20-30 or post resuscitation intra-abdominal pressure (IAP) >15 mmHg. There were 134 patients suitable for enrolment, of which 60 patients consented to participate in the study.

Exclusion criteria

Patients under 12 years age, pregnant females. APACHE II <10 or >20, MPI <20 or >30, IAP <15 mmHg, those who needed re-operation and those didn't consent were excluded from the study.

The patients were randomly divided into two categories: 30 patients in the study group (group A) who underwent primary abdominal closure using the rectus sheath relaxation technique and 30 patients in the control group (group B) who underwent staged closure using modified Bogota technique. The randomization was done using the sealed envelope technique wherein the surgical team was given randomly created group allocations within sealed opaque envelopes. Once a patient had consented to enter the study, an envelope was opened and the patient was allocated to the respective group.

A detailed clinical history was obtained from the patients regarding the onset and duration of symptoms. Detailed clinical examination was performed to look for signs of peritonitis and hemodynamic stability. Investigations included hemogram, blood urea, serum creatinine, serum electrolytes, random blood sugar, arterial blood gas, chest radiograph and ultrasonography of the abdomen to help in the diagnosis of hollow viscous perforation (intra-peritoneal collection with internal echoes), ruptured liver abscesses, tubercular abdomen, appendicular abscess or perforation. Pre-operatively, all patients were given injection ceftriaxone 1 gram 12 hourly, injection metronidazole 100 ml 8 hourly, injection tramadol 50 mg 8 hourly. Post-operatively antibiotics were given based on culture and sensitivity reports. The patients were adequately resuscitated, the end point of which was defined by a combination of the following factors: systolic blood pressure of more than 100 mmHg, correction of acidosis and urine output of 1 ml/kg/hour or more. Following resuscitation pre-operative IAP was measured in cm saline using the method suggested by Basu et al and the pressure thus obtained in cm of saline was converted to mm Hg [IAP mmHg= (IAP cm saline)/1.36] and all the patients then underwent midline exploratory laparotomy.[4]

In our study group A, the skin flaps were mobilized on either side of the midline and exposing the anterior rectus sheath on both sides. A longitudinal incision was then made through each anterior rectus sheath about 6 to 7 cm lateral to the incision line, which relaxed the rectus sheath flap and exposed the anterior surface of the rectus muscle. The fascial edges of the linea alba were thereafter sutured in the midline with continuous nonabsorbable polypropylene using the Jenkins technique.[1] The skin and subcutaneous tissue were then approximated with interrupted nonabsorbable sutures. To avoid seroma formation in the space created between the anterior rectus sheath and the skin and subcutaneous tissue, Romo Vac suction drains were placed. If the patient developed dehiscence, the laparotomy wound was then managed by modified Bogota technique.

In the control group B, patients primarily underwent modified Bogota bag closure. A sterile opened urobag was cut in the size of the abdominal wound and was placed over the open abdomen (exposed bowel) after making multiple openings of 0.5×0.5 cm in it. Intravenous set tubings were placed 5 cm lateral to the skin edges of the incision on either side (using stab incisions through the entire thickness of the abdominal wall as retention strings) at a distance of 3 cm from each other. These tubings were gradually tightened up every 48 hours, thereby achieving staged delayed primary closure in the form of secondary suturing. Abdominal drainage, where indicated, was provided through a separate stab incision employing a Malecot catheter drain. In the post- operative period, the intra-abdominal pressure of the patients was monitored to decide the need for intervention in the patients of group A and to adjust the degree of approximation of the wound edges in the patients of group B.

The outcome in both the groups was measured in terms of the following parameters: 1) Surgical site complications-seroma, hematoma, wound infection and dehiscence (failure) in group A and presence of persistent infection and enterocutaneous fistula and failure of delayed primary closure in group B. 2) Pain assessed by visual analog scale (after 48 hours post-operatively). 3) Time to resumption of oral diet. 4) ICU stay. 5) Length of hospital stay (in group B, patients were kept admitted till secondary suturing was done to achieve delayed primary closure). 6) Mortality.

The patients were followed up for a period of 30 days post-discharge.

Failure of modified Bogota technique was defined as the inability to achieve delayed primary closure by secondary suturing in which case the open abdomen was left to granulate and undergo secondary healing. In case of persistent infection (indicated by fever, purulent discharge from the wound also validated by positive pus culture and sensitivity tests), saline wash was given and urobag dressing was changed every 48 hours.

Failure of rectus sheath relaxation technique was defined as dehiscence of the wound (rectus sheath) which could be as a result of either wound infection and/or increased intra- abdominal pressure post-operatively. The formation of seromas/hematomas was not included in the failures as those were managed by removing few skin sutures as and when required. When there was collection in the wound, the discharge was sent for culture and sensitivity tests and dressing was changed twice a day. If the discharge was found to be sterile, it was labelled as seroma and if there was purulent discharge and bacterial growth was found on culture, it was termed as wound infection. In the patients with significant wound discharge, skin sutures were partly or completely removed and a dressing was applied. Following the failure of rectus sheath relaxation (rectus sheath dehiscence), patients were managed by the modified Bogota technique.

The data collected was analysed by using statistical package for social sciences (SPSS) statistics and Microsoft Excel software to calculate the mean and standard deviation of the variables. Statistical tests of significance used were chi-square test, Fisher's exact test and independent samples t-test. Logistic regression analysis was used to prove predictability and the difference was considered significant if the P value was less than 0.05.

RESULTS

The mean age of patients in group A was 33.6 years and in group B was 37.4 years (p=0.265). Among the 30 patients in group A, 20 were males and 10 were females. In group B, 23 patients were males and 7 were females. The mean APACHE II score, mean MPI score, and mean pre-operative post-resuscitation intra-abdominal pressure were comparable in both groups (p>0.05, Table 1).

Table 1: Pre-operative comparison of both groups.

	Group	Mean	Std. deviation	P value
Age	A	33.57	12.019	0.265
	B	37.43	14.493	
APACHE II	A	13.67	2.324	0.681
	B	13.97	3.232	
MPI	A	22.37	3.275	0.241
	B	23.30	2.806	
Pre-operative IAP	A	15.53	2.636	0.625
	B	15.17	3.130	

In group A, aetiologies of secondary peritonitis were ileal perforations in 13 patients, pre- pyloric perforations in 10 patients, ruptured liver abscesses in 2 patients and 1 patient, each of appendicular abscess, appendicular perforation, abdominal tuberculosis, stricture perforation and cecal volvulus leading to gangrenous caecum. In group B, 14 patients had ileal perforations, 6 patients had pre- pyloric perforations, 3 patients were of ruptured liver abscess, 2 patients had ileal gangrene, 1 patient, each of jejunal perforation, colonic perforation, gangrenous right colon, pyoperitoneum and strangulated incisional hernia. Ileostomies were performed depending on the surgeon's decision based on the intra- operative findings: 10 in group A and 15 in group B.

Table 2: Outcome criteria in both groups.

	Group	Mean	Std. deviation	P value
Post- operative IAP	A	11.47	2.726	0.809
	B	11.67	3.594	
Oral diet	A	3.47	1.279	0.615
	B	3.63	1.273	
Pain	A	5.67	1.493	0.001
	B	7.80	0.961	
Hospital stay	A	19.37	11.524	0.105
	B	23.50	7.468	
Need for ICU admission (%)	A	13.33%	-	>0.05
	B	16.67%	-	

The mean post-operative IAP measured on post-operative day 1 was 11.5 mmHg in group A and 11.7 mmHg in group B. The mean duration to resume an oral diet was 3.5 days in group A and 3.6 days in group B, however this difference was not statistically significant (p>0.05) (Table 2). In group A, 4 out of 30 had to be admitted in the ICU post-operatively while in group B, 5 out of 30 had to be admitted in the ICU post-operatively, however the results were not significant (p>0.05). The mean duration of hospital stay in group A was 19.4 days and in group B was 23.5 days, the difference of which was not found to be significant (p>0.05) (Table 2). However, the mean pain score as assessed by the visual analog scale on

post-operative day 2 was 5.7 in group A and 7.8 in group B, which was found to be statistically significant (p<0.05, Table 2).

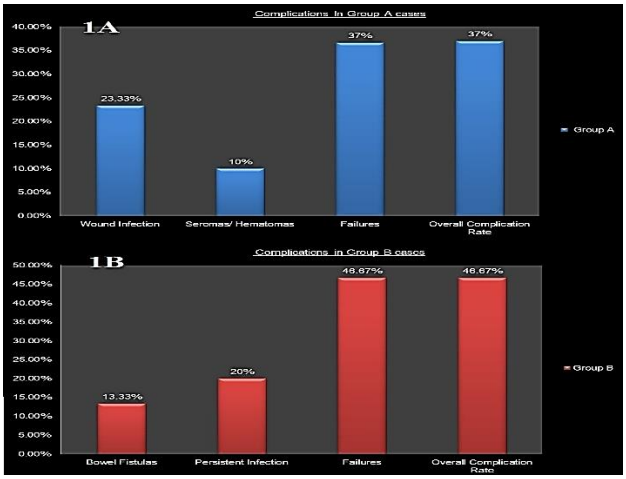

Figure 1: Complication rates in group A (1A) and group B (1B).

19 out of 30 patients (63.33%) in group A were discharged without any complications or failure of the procedure. Among the 11 patients who developed dehiscence, 7 patients (23.33%) had wound infection and 2 patients developed secondary abdominal compartment syndrome requiring decompressive laparotomy. Seroma formation occurred in 10% cases (3 patients, Figure 1A). The overall wound complication rate in group A was found to be 37%. 2 out of the 11 patients who developed failure died during their course in the hospital (6.67%). In group B, secondary suturing and delayed primary closure were possible in 16 out of 30 patients (53.33%). In the remaining 14 patients in whom approximation of wound edges was not possible, 4 patients (13.33%) developed enterocutaneous fistulae, 6 patients (20%) had persistent infection. The overall wound complication rate in group B was found to be 46.67% (Figure 1B). Mortality was seen in 1 out of 14 patients following failure of the procedure (3.33%).

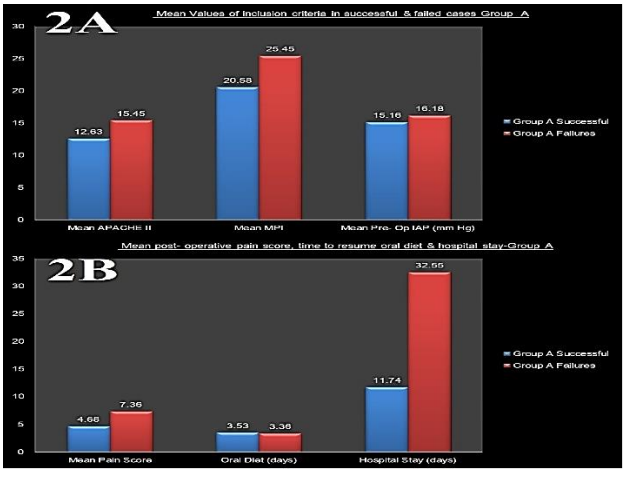

Figure 2: Inclusion and outcome criteria in subgroup analysis of group A.

In subgroup analysis of group A, the mean pre- operative APACHE II score was lower in successful cases (12.63) than failed cases (15.45), the difference being significant (p<0.05). The mean MPI score was also significantly lower in the successful cases than in the failed cases (20.58 versus 25.45). The mean pre-operative IAP was also lower in the successful cases than in the failed cases (15.16 versus 16.18); the difference was non-significant (Figure 2A). The mean post- operative IAP was higher in the failed cases (12.55 mmHg) than in the successful cases (10.84 mmHg), the difference, however, was not significant. The mean pain score as assessed by visual analog scale was higher in the failed cases (7.36) than in the successful cases (4.68), the difference of means being significant (p<0.05). The mean duration of hospital stay was also significantly higher in the failed cases than in the successful cases (32.55 versus 11.74 days, p<0.05). There was no statistical difference in the mean duration to resume oral diet between the failed and successful cases (3.36 versus 3.53 days, p>0.05, Figure 2B).

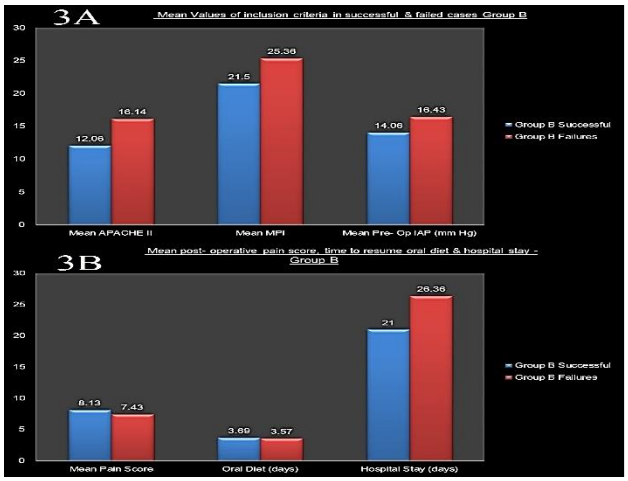

Figure 3: Inclusion and outcome criteria in subgroup analysis of group B.

Subgroup analysis of group B revealed that the mean pre-operative APACHE II score was significantly higher in failed cases than in the successful cases (16.14 versus 12.06). The mean MPI score was also significantly higher in failed cases than in the successful cases (25.36 versus 21.5). The pre-operative IAP was also significantly lower in successful than in the failed cases (14.06 versus 16.43, Figure 3A). The mean post-operative IAP was significantly higher in the failed cases (14.43 mmHg) than in the successful cases (9.25). The mean pain score was comparable between the failed and the successful cases (7.43 versus 8.13, p>0.05). The mean duration to resume oral diet was also comparable and statistically insignificant (3.57 versus 3.69 days, p>0.05). However, the mean duration of hospital stay was found to be higher among the patients who failed to achieve delayed primary closure (26.36 days) than that among the successful cases

(21 days), the result being statistically significant (p<0.05, Figure 3B).

In group A, 77.8% of the patients with APACHE II more than or equal to 15 developed wound dehiscence whereas only 19% of the patients with APACHE II score less than or equal to 14 developed dehiscence (p<0.05). In group B, 80% of the patients with the higher APACHE II score (≥15) developed failure while only 13.3% of the patients with APACHE II ≤14 developed failure (p<0.05). In group A, 88.9% of the patients with MPI≥25 developed failure while only 14.3% of those with MPI less than 15 developed dehiscence (p<0.05). In group B, 100% patients with MPI≥25 failed to achieve delayed primary closure while 15.8% was the failure rate in patients with lower MPI (p<0.05).

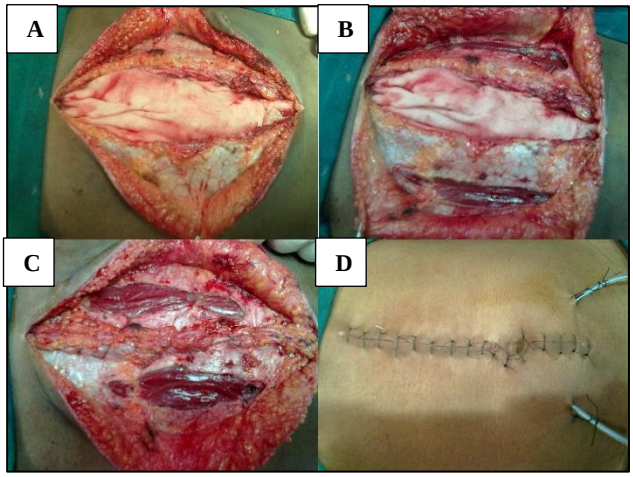

Figure 4: Primary rectus sheath relaxation closure: skin flaps mobilized on either side (A); sheath relaxation incisions given (B); midline closure of linea alba using Jenkins technique (C); closure of subcutaneous and skin with Romo Vac drains.

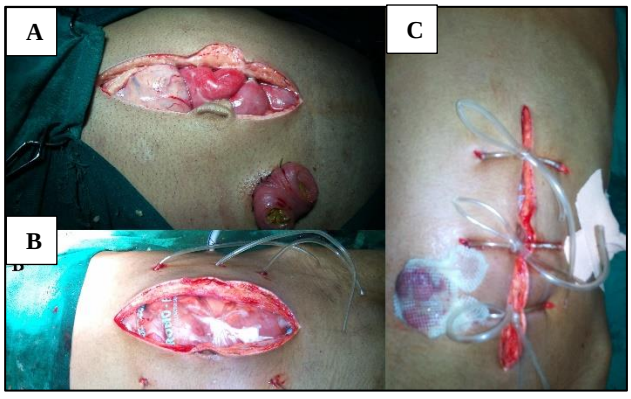

Figure 5: Modified Bogota technique: laparostomy (A); covered by sterile bag with intravenous set tubings placed (B); tubings tightened to approximate wound edges (C).

In group A, the patients with pre-operative IAP≤16 developed dehiscence in 26.3% cases whereas 54.5% patients with higher IAP developed wound dehiscence (p>0.05). In group B, 38.1% patients with IAP≤16 and 66.7% of the patients with IAP≥17 failed to achieve delayed closure (p>0.05). Using logistic regression analysis, the combination of APACHE II score ≥15, MPI≥25 and pre-operative IAP≥17 mmHg was found to be statistically significant predictor of failures in either group. Also the APACHE II≥15 score and MPI score ≥25 were found to be significant independent predictors of failures in either group (p<0.05).

DISCUSSION

In the present study, we used the rectus sheath relaxation incisions to achieve a tensionless primary closure in the group A and randomized it to modified Bogota technique of primary laparostomy in group B following the operative treatment of secondary peritonitis.

In our study, the mean age in group A was 33.6 years and in group B was 37.4 years (p>0.05). Khan et al reported the mean age in their study to be 34.78 years.[5] The mean APACHE II score was 13.67 in group A and 13.97 in group B (p>0.05). Similarly, the mean MPI score was 22.37 in group A and 23.3 in group B (p>0.05). The mean pre-operative IAP was found to be 15.53 mmHg in group A and 15.17 mmHg in group B (p>0.05). 4 out of 30 patients required ICU care in group A post-operatively while in group B, 5 out of 30 patients were admitted in the ICU post-operatively. The mean post-operative IAP was also found comparable in both the groups (11.5 and 11.7 mmHg in group A and B respectively). The mortality rates in group A and B were 6.67% and 3.33% respectively. This corresponded to the mortality rates in the patients with scores in this range for both APACHE II and MPI as has been seen in earlier studies.[6] Patients with scores in this range for both APACHE II and Mannheim Peritonitis Index carried high morbidity and low mortality and hence were included in this study.[7,8]

In group A, most of the patients commonly presented with small bowel perforations (43.33% enteric and 3.33% tubercular) followed by pre-pyloric perforations (33.33%), ruptured liver abscess (6.67%) and appendicular perforations (3.33%). In group B, the most common etiology of peritonitis was small bowel perforations (46.67% enteric) followed by pre-pyloric perforations (20%) and ruptured liver abscess (10%). This etiological incidence was similar to that found by most of the Indian and Asian studies.[9-11]

In the outcome analysis of wound complications, the incidence of seroma formation was 10% in group A in our study as compared to 16% in the earlier study by Marwah et al.[12] This lower value may be attributed to the use of Romo Vac suction drains in the group A patients in our study. The incidence of wound infection in our study was 23.33% in group A which was lower than that found in the previous study by Marwah et al which

reported wound infection in 32% cases.[12] In another study published by Ajao, wound infection was seen in 66% cases.[13] This lower incidence of wound infection in our study may be attributed to the addition of rectus sheath relaxation incisions which improved perfusion of the rectus sheath resulting in increased resistance to bacterial colonization.[14,15] The incidence of persistent infection in group B in our study was 20% which was lower than that observed by Orozco et al (24% cases showed bacterial colonization) in their study of open abdomen.[16] The lower incidence of infection in the open abdomen group in our study may be due to the fact that this technique allowed visual inspection of the bowel and in the presence of infection, saline wash was given and urobag dressing was changed at regular intervals besides repeated pus cultures and the use of appropriate antibiotics.

The failure rate of primary healing (fascial dehiscence) was found to be 37% in group A which was higher than the incidence reported by the previous study (22% rate of fascial dehiscence) published by Marwah et al using the rectus sheath relaxation incisions.[12] The higher dehiscence rate in our study can be explained by the fact that the patients in our study were in the intermediate risk of APACHE II and MPI scoring which is characterized by high morbidity and low mortality. These pre-operative variables were not included in the earlier study. Adesunkanmi AR et al reported a wound dehiscence rate of 38% in typhoid enteric perforations.[17] In another prospective study of 50 patients of typhoid ileal perforations published by Ajao in 1997, wound dehiscence rate was 34%.[13] Despite the conventional primary closure in these studies, the similar rates of fascial dehiscence may be explained by the fact that these studies didn't take into account the pre-operative parameters included in our study which might have contributed to inclusion of a number of patients with lower scores in these studies. The failure rate (46.67%) of delayed primary closure of the modified Bogota in our study was higher than found in the previous studies conducted by van Hensbroek et al which showed a successful delayed primary closure rate of 85% in the patients undergoing dynamic retention suture technique, however, little information was available on the severity scores of the patients included in the study and therefore the higher successful closure rate might have been due to inclusion bias (low score of APACHE II <10 and MPI <20).[18] In our study, the higher failure rate of modified Bogota may be attributed to inclusion of the patients in the intermediate risk of APACHE II (10-20) and MPI (20-30) scoring and also to the higher IAP noted post-operatively and therefore longer time for normalization of IAP resulting in granulation to set in these patients, precluding secondary suturing. Another study published by Gonullu et al in 2009 utilizing the Bogota bag technique, however, showed higher (76.4%) failure rates than our study, which may be explained by the inclusion of patients with higher risk score of APACHE II >20 in this study.[7] The incidence of bowel fistula formation in group B patients (13.33%) in our study, was similar to that found in another study published by Orozco et al (13%) utilizing the Bogota's bag and polypropylene mesh for open abdomen management.[16] This incidence of enterocutaneous fistula in our study was lower than that found in the study done by Anderson et al (31%).[19] This may be attributed to the use of i.v. set tubings in our modified technique of Bogota's which may have contributed by preventing partial evisceration of bowel loops from the wound site.

Post-operatively, the intensity of pain was assessed by visual analog scale and was found to be significantly lower in the patients who underwent rectus sheath relaxation incisions (group A) than in the patients who underwent modified Bogota technique (group B). Similar results were reported by Marwah et al in their study.[12] This may be due to the less tension on the suture line in patients of group A and multiple puncture sites due to drip set tubings in group B patients.

The period of ileus i.e. the time to resume the oral diet was found comparable between the two groups (3.5 in group A versus 3.6 in group B). This outcome variable was not evaluated in the previous studies. The mean duration of hospital stay in our study was 19.4 days in the group A. Marwah et al reported a mean hospital stay of 9.1 days in patients undergoing rectus sheath relaxation incision in their study.[12] This may be attributed to the higher failure rate of primary healing in group A in our study and the patients who developed dehiscence in group A had longer hospital stay than their counterparts in group B causing a rise in the overall mean hospital stay of patients in group A.

The mean duration of hospital stay in group B patients in our study was 23.5 days which was lower than that observed by Anderson et al (87 days) in their study.[19] This shorter duration of hospital stay may be due to the lower bowel fistula rate in our study (13.33%) as compared to the previous study (31% bowel fistula rate). However, none of these previous studies compared rectus sheath relaxation with the modified Bogota technique as a method of abdomen closure in patients of secondary peritonitis.

The mean duration of hospital stay in patients who developed wound dehiscence in group A (32.55 days) was higher than in patients who failed to achieve delayed primary closure in group B (26.36 days). This was explained by the fact that patients who developed wound dehiscence in group A had to be managed by modified Bogota followed by secondary suturing thereafter.

The mean pain score was found comparable between the failed cases in both groups (7.36 versus 7.43). This was explained by the fact that the patients who failed to achieve primary healing in group A had to be managed by modified Bogota which was a further painful experience. Similar results were found by Marwah et al in their study utilizing the rectus sheath relaxation

incisions.[12] In the subgroup analysis of the successful cases, pain was found to be significantly less in group A than in group B. The mean duration of hospital stay was also significantly lesser than in group B (11.7 days versus 21 days, $p<0.05$).

The study was limited by a small sized sample. Duration of surgery, presence of uncontrolled diabetes mellitus, smoking and tobacco exposure, detailed evaluation of nutritional status were not assessed which could contribute to abdominal wall ischemia and may result in higher rate of dehiscence in group A, need for laparostomy and delayed wound healing. We included patients of secondary peritonitis requiring laparotomy regardless of the etiology which itself could have introduced a bias. With a substantial large sample size, statistical analysis in different subgroups of etiologies may provide a better insight into the cause specific method of closure.

CONCLUSION

The study concluded that primary abdomen closure using rectus sheath relaxation in select patients was found to be an easy, feasible and better alternative than the staged closure using modified Bogota technique following laparotomy in patients of severe secondary peritonitis. The successful healing rate of primary abdomen closure following rectus sheath relaxation technique was found to be 63.33% with a very low seroma formation rate of 10% and a hematoma formation rate of 0%. These patients had better outcomes in terms of significantly lower value on the pain scale and lesser duration of hospital stay, however, in failed cases of group A these advantages were outweighed by conversion to modified Bogota hence this calls for appropriate selection of closure technique at the very outset. However, the failures were found to be higher in the group A with APACHE II ≥15 and/or MPI score ≥25. The patients within this high intermediate risk subgroup having higher scores, therefore may have been better managed primarily by modified Bogota technique. The patients who even though succeeded to achieve delayed primary closure in group B with APACHE≤14 and/or MPI≤24 (low intermediate risk subgroup) may have been better managed primarily by closure using rectus sheath relaxation incisions.

The pre-operative APACHE II score, MPI score and post resuscitation IAP either individually or in combination, can therefore, predict the wound failure rates, choice of closure techniques (as shown by logistic regression analysis) and the requirement of ICU care in patients of secondary peritonitis in the post-operative period but their better correlation needs to be studied in a larger sample. The monitoring of post-operative IAP was helpful in deciding the need for any intervention in group A and to adjust the degree of approximation of wound edges in group B. Therefore, this index can be used to prevent ACS in the patients of secondary peritonitis post-operatively.

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