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Original Research Article

Pre-operative hypoalbuminemia is a major risk factor for anastomotic leak in emergency gastrointestinal resection and anastomosis

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ABSTRACT

Background: The serum albumin level is one of several clinical parameters of the status of general health. Hypoalbuminemia is known to be associated with delayed wound healing. The hypoalbuminemic state interferes with the normal functioning of the gastrointestinal tract. This study evaluates the relation of pre-operative albumin level and the risk for anastomotic leak in emergency gastrointestinal resection and anastomosis.
Methods: A total of 112cases that meet the inclusion and exclusion criteria are included from Bangalore Medical College and Research Institute, Karnataka, India for a duration of 18 months November 2014 to October 2016.51 cases belonged to the stapled group and 61 cases belonged to the sutured group. Anastomosis using the two techniques, stapled and hand sewn anastomosis are evaluated separately.
Results: The relation of pre-operative serum albumin and anastomotic leak is analysed in each study group separately and found that a pre-operative albumin of <3.5gm/dl is significantly associated with post-operative anastomotic leak, with a p-value of 0.0418 ($p<0.05$) in stapled anastomosis group and a p-value of 0.0357 ($p<0.05$) in hand sewn anastomosis group.
Conclusions: Pre-operative albumin of <3.5gm/dl is significantly associated with post-operative anastomotic leak in both the groups, irrespective of the technique adopted.

Keywords: Albumin, Anastomotic leak, Emergency surgery, Hypoalbuminemia, Intestinal anastomosis

INTRODUCTION

Intestinal anastomosis is one of the most commonly performed surgical procedures, especially in the emergency setting and is also commonly performed in the elective setting. The major concern following bowel anastomoses is anastomotic failure leading to leakage peritonitis, sepsis, abscess, fistula, necrosis, stricture etc. adding to the morbidity and mortality. (e.g., 22% mortality in patients with a leak vs. 7.2% mortality in those without leak.[1] Anastomotic leak after gastrointestinal anastomosis is one of the important postoperative complication that leads to significant morbidity and adversely affects length of hospital stay. Various factors that contribute to these complications includes nutritional status of the patient, anemia, intra operative hypotension, suturing technique, suture material, presence of concurrent sepsis, vascular compromise and so on. Serum albumin is a good and simple predictor of surgical risk and has a close correlation with the degree of malnutrition. Albumin is a single-chain, non-glycosylated polypeptide with a molecular weight of 66,500 Da containing 585 amino acids.[2] It is a helical protein with turns and extended loops Low concentrations are common. The serum albumin level is one of several clinical parameters of the status of general health. There is a marked correlation between low albumin levels and the incidence of morbidity and mortality in hospitalized patients. Hypoalbuminemia is known to be associated with

delayed wound healing. The hypoalbuminemic state interferes with the normal functioning of the gastrointestinal tract. These changes occur at the microscopic level. A surgeon, however, is limited to the macroscopic repair that he/she can facilitate.

METHODS

This study evaluates the relation of pre-operative albumin level and the risk for anastomotic leak in emergency gastrointestinal resection and anastomosis. Anastomosis using the two techniques, stapled and hand sewn anastomosis are evaluated separately. A total of 112 cases that meet the inclusion and exclusion criteria are included from Bangalore Medical College and Research Institute, Karnataka, India for a duration of 18 months November 2014 to October 2016.51 cases belonged to the stapled group and 61 cases belonged to the sutured group.

RESULTS

In our study total 112 patients were enrolled, in which 51 were in stapled anastomosis group and 61 were in hand sewn anastomosis group. In our study, in stapled anastomosis group there were 14 females (27.45%) and 37 males (72.55%). Hand sewn anastomosis group had 16 females (26.22%) and 45 males (73.77%).

Table 1: Type of anastomosis.

Type of anastomosis	Count
Stapled	51
Hand sewn	61
Grand Total	**112**

Table 2: Age distribution.

Row Labels	Stapled	Hand sewn
<20	1	2
20-29	7	7
30-39	8	12
40-49	8	8
50-59	17	22
60-69	9	9
70-80	1	1
Mean Age	**46.05**	**46.50**

Table 3: Site of anastomosis.

Site of anastomosis	Stapled	Hand sewn
Colo colic	3	3
Colo rectal	3	1
Gastro jejunal	6	3
Ileo ileal	23	40
Ileo transverse	11	5
Jejuno jejunal	3	4
Jejuno transverse	2	5
Grand total	**51**	**61**

In present study we had two groups, stapled anastomosis group and hand sewn anastomosis group. Maximum number of patients in Stapled anastomosis group were in the age group of 50-59 years i.e. 17 (33%) and in hand sewn anastomosis maximum number of patients were in the age group of 50-59 years i.e. 22 (36%). The mean age in stapled anastomosis group was 46.05 years and in hand sewn anastomosis group was 46.5 years (Table 2).

In present study group maximum number of anastomosis performed were ileo-ileal anastomosis that is 63, of which 23 were stapled type and 40 were hand sewn type. Minimum number was colo-rectal anastomoses that is 4, of which 3 were stapled type and 1 was hand sewn type (Table 3).

Table 4: Anastomotic leak.

Row labels	No leak	Leak
Hand sewn	54	7
Stapled	45	6
Grand total	**99**	**13**

Of the 61 patients who underwent hand sewn anastomosis 7 (11.47%) developed anastomotic leak and 54 (88.52%) patients had no leak. Of the 51 patients who had undergone stapled anastomosis, 6 (11.76%) developed anastomotic leak and 45 (88.23%) patients had no leak. This data was statistically analyzed using Chi Squared test and found that there was no significant difference between the occurrence of anastomotic leak between the two study groups irrespective of whether the anastomosis is hand sewn or stapled, with a p-value of 0.9620 ($p>0.05$).

Table 5: Serum albumin (in stapled anastomosis group).

Serum albumin (gm/dl)	No leak	Leak
1.5-2	0	1
2-2.5	1	0
2.5-3	11	2
3-3.5	4	2
3.5-4	14	0
4-4.5	15	1
Grand Total	**45**	**6**

Table 6: Serum albumin (in hand sewn anastomosis group).

Serum albumin (gm/dl)	No leak	Leak
2-2.5	3	0
2.5-3	6	3
3-3.5	11	3
3.5-4	18	1
4-4.5	15	0
4.5-5	1	0
Grand Total	**54**	**7**

The relation of pre-operative serum albumin and anastomotic leak is analyzed in each study group separately and found that a pre-operative albumin of <3.5gm/dl is significantly associated with post-operative anastomotic leak, with a p-value of 0.0418 ($p<0.05$) in stapled anastomosis group and a p-value of 0.0357 ($p<0.05$) in hand sewn anastomosis group.

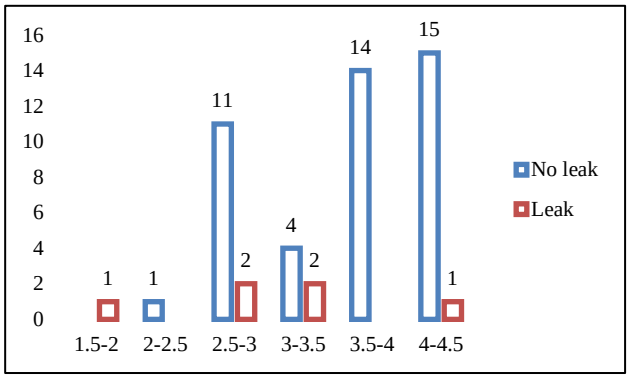

Figure 1: In Stapled anastomosis group.

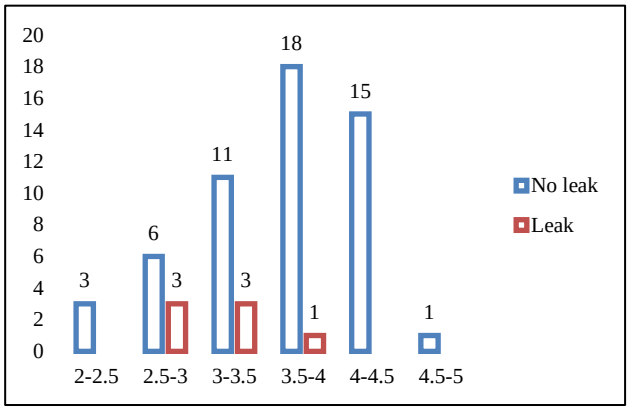

Figure 2: In hand sewn anastomosis group.

DISCUSSION

There is a marked correlation between low albumin levels and the incidence of morbidity and mortality in hospitalized patients.

The causes include:

- Decreased synthesis.
- Inadequate nitrogen intake.
- Malabsorption.
- Chronic liver disease.
- Increased catabolism- sepsis, other catabolic states.
- Increased plasma volume- water excess.
- Redistribution- ascites, oedema, sepsis.
- Increased loss- protein-losing enteropathy nephrotic syndrome, loss of plasma, e.g. from burns.
- In the rare, inherited condition, analbuminaemia, plasma albumin is typically 250mg/L or less. Patients experience sporadic, mild, oedema but are otherwise well. In bisalbuminaemia, also a rare, inherited condition, (albumin) was normal but two species of albumin were present and appear as separate bands on zone electrophoresis of serum.

The rate of synthesis of albumin (14-15g daily) is critically dependent on nutritional status, especially the extent of amino acid deficiencies. The half-life of albumin is about 20 days, and degradation appears to occur by pinocytosis in all tissues.

The present study evaluates the relation of pre-operative albumin level and the risk for anastomotic leak in emergency gastrointestinal resection and anastomosis. Anastomosis using the two methods, stapled and hand sewn anastomosis are evaluated separately with respect to pre-operative albumin level and anastomotic leak.

Maximum number of patients in stapled anastomosis group were in the age group of 50-59 years i.e. 17 (33%) and in hand sewn anastomosis maximum number of patients were in the age group of 50-59 years i.e. 22 (36%). The mean age in Stapled anastomosis group was 46.05 years and in Hand sewn anastomosis group was 46.5 years. Comparing the sex distribution, in stapled anastomosis group there were 14 females (27.45%) and 37 males (72.55%). Hand sewn anastomosis group had 16 females (26.22%) and 45 males (73.77%). Even though it has been suggested that male sex with colorectal anastomosis is a risk factor for anastomotic leak, our sample size is inadequate to make such a comparison.

Regarding the site of anastomosis performed maximum number done is ileo-ileal anastomosis that is 63, of which 23 were stapled type and 40 were hand sewn type. Minimum number was colo-rectal anastomoses that is 4, of which 3 were stapled type and 1 was hand sewn type. In the present study the analysis and conclusions are made by including all cases irrespective of the site of the anastomosis. Comparing the anastomotic leak rate between the two groups in the present study, of the 51 patients in stapled group 6 patients developed anastomotic leak and of the 61 patients in hand sewn group 7 patients developed leak ($p=0.9620$). The result is comparable to the study conducted by Jameson L Chassin et al which included 812 anastomoses of which 472 were in stapled group and 296 were in hand sewn group.[3]

13 in stapled group developed leak and 9 in hand sewn group developed leak and they concluded that there is no significant difference in the leak rates between the two groups. In another study conducted by Farrah JP et al 20 patients of the 133 in stapled group and 6 patients of the 100 in the hand sewn group had anastomotic failure and the author concluded that the leak rate is more in the stapled group when compared to the hand sewn group.[4]

The present study also analyzed the relation of pre-operative serum albumin and anastomotic leak in each study group separately and found that a pre-operative

albumin of <3.5gm/dl is significantly associated with post-operative anastomotic leak, with a p-value of 0.0418 ($p<0.05$) in stapled anastomosis group and a p-value of 0.0357 ($p<0.05$) in hand sewn anastomosis group. The result is comparable to the studies performed by Dana A. Telem et al and Paul Suding et al.[5,6] Both the studies concluded that a pre-operative albumin <3.5g/dl is significantly associated with anastomotic leak. There are many other factors which affect the healing of bowel anastomosis. That includes both patient factors and technical factors. Patient factors include age, chronic use of steroids, smoking, alcohol abuse, co morbidities like diabetes mellitus and technical factors includes accurate apposition, distal obstruction, fecal contamination, peritonitis, hematoma formation etc. Analysis of all these factors in relation to anastomotic leak is beyond the scope of the present study. Large multi centric RCTs are needed before making a final conclusion regarding the present dilemma.

CONCLUSION

The relation of pre-operative serum albumin and anastomotic leak is analyzed in each study group separately and found that a pre-operative albumin of <3.5gm/dl is significantly associated with post-operative anastomotic leak in both the groups, irrespective of the technique adopted.

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