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A CLINICAL STUDY OF THE FACTORS AFFECTING THE OUTCOME OF INTESTINAL RESECTION AND ANASTOMOSIS

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ABSTRACT :

Background :Intestines form a major part of human digestive system. Both in terms of length as well as surface area, the small and large intestines constitute about 90% of the digestive system. They play a major role in absorption of nutrients, water and other micro nutrients. The study titled “A clinical study of the factors affecting the outcome of intestinal resection and anastomosis” is a humble attempt to analyse the factors affecting the outcome of bowel anastomosis, so as to implement the factors which produce a favourable anastomotic healing.

Methods:This study was conducted with the approval of institutional ethical committee. 50 cases requiring intestinal resection and anastomosis admitted in sree mookambikai Medical College were selected after applying inclusion and exclusion criteria.These cases were followed up intra operatively and post operatively until discharge from hospital or another outcome like anastomotic leak or death of the patient.

Results: 13 patients, or 26% of the total 50 patients included in the study had an elevated random blood sugar. Among these 4 patients developed anastomotic leak. That is 30.7% of the patients with hyperglycaemia developed anastomotic leak. In contrast, only 2 patients or 5% of the patients with a normal random blood sugar developed anastomotic leak.

Conclusion: Anaemia, elevated renal parameters, elevated blood sugar and low serum albumin predisposes to anastomotic leak.End to side anastomosis and anastomosis between small bowel and large bowel has a higher risk for anastomotic leak.Transfusion of TPN appears to be protective and helps in better healing of the anastomosis.

Keywords: Instestinal resection.

INTRODUCTION:

Intestines form a major part of human digestive system. Both in terms of length as well as surface area, the small and large intestines constitute about 90% of the digestive system. They play a major role in absorption of nutrients, water and other micro nutrients. Thus they play a major role in growth and proper functioning of the human body. Any pathological condition of the bowel leads to

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disturbance in the homeostasis of the human body.

Timely intervention and correction of the pathologies affecting the bowel is of utmost importance in providing a healthy functional life to the patient.One of the most common surgeries done on the intestines is resection and anastomosis. It is the surgical procedure of removing the diseased portion of the bowel and joining the normal viable disease free bowel ends.History of bowel anastomosis goes back to early 17th and 18th
century. Galen was the first person to coin the term “Anastomosis”.

From the 17th century to the modern times intestinal resection and anastomosis remains one of the most common yet very challenging surgeries the surgeon faces. This is the significance of the following study.
The study titled “A clinical study of the factors affecting the outcome of intestinal resection and anastomosis” is a humble attempt to analyse the factors affecting the outcome of bowel anastomosis, so as to implement the factors which produce a favourable anastomotic healing.

AIM AND OBJECTIVES OF THE STUDY:

To identify the patient’s clinical and surgical factors that affects the outcome of intestinal resection and anastomosis and predispose to anastomotic leak.

MATERIALS AND METHODS:

This study was conducted with the approval of institutional ethical committee. 50 cases requiring intestinal resection and anastomosis admitted in sree mookambikai Medical College were selected after applying inclusion and exclusion criteria.These cases were followed up intra operatively and post operatively until discharge from hospital or another outcome like anastomotic leak or death of the patient.

Inclusion criteria Are Patients Age >18yrs,Patients Requiring Intestinal Resection And Anastomosis,Exclusion criteria are patient’s age <18yrs,pregnant Women, Prisoners, Cognitively Impaired Subjects,Immuno Compromised.These are the factors that are influenced by the patient as well as the operating surgeon. These are partly non-modifiable and partly modifiable. This study evaluates how the modifiable factors influence the outcome of
intestinal anastomosis.

RESULTS:

ELEVATED BLOOD SUGAR

Diabetes as mentioned above leads to a state of poor healing. An elevated blood sugar in biochemical analysis points towards the possibility of hyperglycaemia which later leads on to poor anastomotic healing.For the purpose of the study, patients were classified into two categories – those with random blood sugar taken prior to surgery less than 140 and those with blood sugar more than 140.

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	No. of cases (T=50)		Anastomotic leak	
Elevated RBS	13	26%	4	30.7%
Normal RBS	37	74 %	2	5.4%

DELAY IN PRESENTATION OF THE PATIENT

In the study, delay is studied in the form of duration of symptoms before presentation.

	No. of cases (T=50)		Anastomotic leak	
<1 day	10	20%	2	33.3%
>1 day	40	80%	4	66.7%

BASED ON BOWEL INVOLVED

	No of cases (T=50)		Anastomotic leak	
SS	29	58%	1	3.44%
SL	13	26%	5	38.4%

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LL	8	16%	0	0%

BASED ON ORIENTATION OF THE BOWEL LOOPS

	No of cases (T=50)		**Anastomotic leak**	
End to End	37	74%	1	2.7%
End to Side	13	26%	5	38.5%

DISCUSSION:

Diabetes as mentioned above leads to a state of poor healing. An elevated blood sugar in biochemical analysis points towards the possibility of hyperglycaemia which later leads on to poor anastomotic healing.For the purpose of the study, patients were classified into two categories – those with random blood sugar taken prior to surgery less than 140 and those with blood sugar more than 140.

13 patients, or 26% of the total 50 patients included in the study had an elevated random blood sugar. Among these 4 patients developed anastomotic leak. That is 30.7% of the patients with hyperglycaemia developed anastomotic leak. In contrast, only 2 patients or 5% of the patients with a normal random blood sugar developed anastomotic leak.

This clearly establishes the need for control of blood sugar for a successful anastomotic healing.
Intra operative factors can be patient dependent or surgeon dependent or both. Some the factors are modifiable while others like presence of gangrene or malignancy or the aetiology for which the patient is undergoing resection is non-modifiable.

For the ease of analysis, the intra operative factors studied are divided intoPatient dependent ,Surgeon dependent.The aetiology or the disease process for which the patient is undergoing intestinal resection and anastomosis plays the most crucial role in the outcome.Aetiology is classified for the purpose of the study into 3 main categories based on the frequency of presentation

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Gangrene of bowel is one of the major aetiologies resulting in resection and anastomosis. Gangrene occurs as a result of diminished vascular supply to the bowel. It can occur in many ways.Major pathologies producing bowel gangrene areVascular occlusion,Injury to supplying vesselsBowel, both

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small and large intestine receives its blood supply through its mesentery[3]. So any occlusion or injury to mesentery and its vessels produce bowel gangrene,Mesenteric vascular occlusion can occur in two ways. It can be a mechanical occlusion like that of a volvulus or an obstructed hernia or it can be due to an embolic or thrombotic occlusion of the vessels producing mesenteric ischemia.

When there is a mechanical obstruction, first a stage of venous congestion occurs in the bowel. This leads on to accumulation of inflammatory fluids in the bowel wall, which aggravates the congestion and further diminishes blood supply. Then the stage of gangrene sets in. This leads on to peritonitis and its sequelae.

Mesenteric vascular ischemia occurs as a result of occlusion of the mesenteric vessels by an embolus or a thrombus. Superior mesenteric artery is most commonly affected than inferior. This can also occur in a non occlusive fashion, as a result of hypotension or hypo perfusion or due to vasospasm due to shock - Non occlusive mesenteric ischemia (NOMI).

Gangrene of the bowel requires immediate intervention in the form of emergency exploratory laparotomy and resection of the gangrenous bowel. Viability of the cut ends should be ensured before anastomosis. Fresh bleeding from the cut end mucosa indicates viability. If the ends don't bleed or the mucosa is dark red, viability is doubtful. In such cases, the ends should be further trimmed until vascularity is ensured. Once vascularity of the ends is ensured, we can proceed on to anastomosis. Mesenteric window created during resection should be closed to avoid internal herniation.
Tumours of intestine are another pathology requiring resection and anastomosis of bowel. Benign tumours require a limited resection while malignant ones require resection of the entire length of bowel supplied by the particular vessel supplying the segment with tumour along with removal of the corresponding lymph node stations as well[2].

Tumours of small bowel are rare. They constitute about 3% of all GI malignancies even though small bowel constitutes 80% of the total length of the Git and 90 % of the total mucosal surface area.Large bowel tumours are more common than small bowel tumours. They can be benign or malignant.Benign tumours include different types of polyps, adenoma etc. Malignant tumours are found to arise from different part of the colon like caecum, ascending colon, transverse colon, descending colon, sigmoid colon.Treatment varies according to the location of the tumour.

50% of the patients included in the study underwent intestinal resection and anastomosis for bowel gangrene commonly as a result of obstructed hernias and other intestinal obstructions.
20% or 10 out of 50 patients underwent resection and anastomosis as a part of treatment for malignancies.30% or 15 patients underwent resection for miscellaneous conditions like multiple perforations, large perforations, mesenteric tears etc.

On comparing the numbers of anastomotic leak, maximum number of anastomotic leak (5 in number) was encountered in patients who underwent resection for bowel gangrene. This number amounts to a leak rate of a huge 20% among the patients with bowel gangrene.None of the patients treated for malignancy developed anastomotic leak.

A single patient treated of a miscellaneous aetiology also developed anastomotic leak.This clearly points out the high risk of developing anastomotic leak in case of patients with bowel gangrene.All safety precautions like adequate vascularity of the cut ends, adequate level of serum proteins, post operative care should be maintained for a successful outcome.This is more important in case of emergencies like gangrene bowel, mesenteric ischemia, traumatic bowel and mesenteric injuries etc.The delay occurs in

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two fronts Delayed presentation of the patient,Delay in operating
. Among the total 50 patients followed, 80% or 40 patients presented with more than 1 day duration of symptoms, whereas 10 patients presented within 1 day of onset of symptoms.
Out of the total 50 patients, 6 patients developed anastomotic leak. Among these 6 patients, 4 patients presented with more than 1 day delay accounting for 66.7% of the total.

Thus it is clear that a delay in presentation influences the outcome of resection and anastomosis. Delay in operating is also more important in case of emergencycases.1 case of small bowel volvulus which was delayed in operating developed anastomotic leak. Based on the bowel involved, the anastomosis can be between two small bowel segments, two large bowel segments or between a small bowel and a large bowel as in Ileo – transverse colic anastomosis. While anastomosing two bowel loops, they may be oriented in different ways.They may be oriented such that the two ends face each other and an end – to- end anastomosis can be done. Sometimes the antimesenteric ends of the two bowel loops are apposed and a side to side anastomosis is done. When the end of one loop is apposed to side of another, we perform an end – to – side anastomosis.

An end to end anastomosis is done between two endsof small bowel or two ends of large bowel. Whereas, when we anastomose a small bowel to large bowel, we usually anastomose the end of the small bowel to the side of the large bowel. This is because of the size disparity between the ends of small and large bowel.

While anastomosing the ends of small bowel or ends of large bowel, if there is size disparity, a cut can be given on the antimesenteric border of the smaller end and then anastomosis can be done. None of the cases included in the study underwent a side to side anastomosis.74% of the patients (37 patients) underwent an end to end anastomosis, while 13 underwent end to side anastomosis. Out of the 6 patients who developed leak, 5 patients had undergone end to side anastomosis. This amounts to a leak rate of 38.5% among the patients who underwent end to side anastomosis. On the other hand only 1 patient who underwent an end to end anastomosis developed anastomotic leak, accounting for 2.7% of the total. This result may be attributed to the risk while suturing the two corner points of the anastomosis. This can be overcome to a great degree by starting of the middle on one size and ending at the middle on the opposite side rather than starting and ending at the corners.

The important post operative factors studied were transfusion of blood, blood products and TPN Transfusion of blood is a common procedure in all major surgeries that have significant blood loss. This corresponds to the saying “Blood should be replaced by blood”.Main aims of blood transfusion in relation to bowel surgeries are Correction of pre existing anaemia

Blood is preserved with anticoagulants and kept at low temperatures. The most common anticoagulant used is Citrate phosphate dextrose adenine solution (CPDA). This preserves blood for 42 days. It is stored at a temperature of 2-35 degree Celsius.Transfusion of blood in a patient has both merits and de merits.Blood transfusion produces immediate expansion of vascular compartment, provides immediate nourishment and oxygen.

Demerits include ABO incompatibility, Rh incompatibility, allergic reactions, acute haemolysis, blood borne infections, volume overload etc. With respect to wound healing, the most important complication is the decrease in IL-2 levels. Interleukin-2 is an essential factor for wound healing. It is the factor which determines the tensile strength of collagen that gets deposited during wound healing. Massive blood transfusion decreases the levels of IL-2. As a result the tensile strength of the collagen that gets deposited at the anastomotic site gets reduced. This can predispose to failure of anastomosis and

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anastomotic leak.On the other hand blood that is transfused provides oxygen and nutrients which are essential for wound healing. Anaemia adversely affects healing of the anastomosis by producing a state of hypoxia at the local site. Transfusion of fresh blood helps in overcoming this. Also transfusion of fresh blood provides glucose to the site of healing.

CONCLUSION:

Age adversely affects anastomotic healing. Elderly patients are at a higher risk for anastomotic leak.Female sex appears to be better protected against anastomotic leak.Impaired vascularity or gangrene is the predominant risk factor for anastomotic leak.Anaemia, elevated renal parameters, elevated blood sugar and low serum albumin predisposes to anastomotic leak.End to side anastomosis and anastomosis between small bowel and large bowel has a higher risk for anastomotic leak.Transfusion of TPN appears to be protective and helps in better healing of the anastomosis.

LIMITATIONS:

- A study group of 50 patients is not at all sufficient to accurately comment on a multifactorial outcome like the successful healing of the anastomosis.
- Apart from all the factors discussed above, experience of the operating surgeon in handling the bowel and creating an anastomosis influences the outcome of an anastomosis. This is something that cannot be quantitatively assessed.
- Ability of human body to heal itself and the patient's genetic makeup plays
    - a significant role in the outcome.

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