

A COMPARATIVE STUDY OF 1-0 VICRYL VS 1-0 PROLENE FOR RECTUS CLOSURE IN ELECTIVE LAPAROTOMIES FOR INCIDENCE OF EARLY WOUND DEHISCENCE

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Abstract

Background: Many abdominal disease processes demand surgical correction in the form of a laparotomy. Even today, diagnostic surgical exploration is sometimes necessary. The incidence of wound dehiscence is 1 to 6 percent and burst abdomen remains is 1-3 percent. The associated mortality is 35 to 40 percent. **Materials and Methods:** It is a Prospective and Comparative Study done for a period of 3 months from March 2023 to May 2023 at Department of General Surgery, Chengalpattu Medical College & Hospital, Chengalpattu for all patients undergoing elective laparotomies for all pathologies. Patients are randomly divided into two groups A and B. A – 1-0 Vicryl used for closure, B - 1-0 Prolene used for closure. Patients are followed up for two weeks post operatively. **Result:** Out of 50 patients, five developed Burst Abdomen (10%), out of which three (60%) 1-0 Prolene, two (40%) – 1-0 Vicryl. There was no significant association between the type of suture material with development of Burst Abdomen. Among the five who developed Burst Abdomen, two had SSI, all five had duration of surgery > 2.5 Hours. On comparing Vicryl and Prolene with relation to wound related factors, though not statistically significant Prolene had slightly higher number of burst abdomen and wound infections while the seroma formation rate was similar in number. **Conclusion:** Burst Abdomen can occur; based on a variety of variables, such as patient variables (such as age, gender, glycemic status, RTI, SSI, malnutrition, obesity, etc.) as well as practical aspects (such as surgery, the type of suture used, the method employed, the length of the procedure, the incision made, perioperative sepsis, blood loss, hypotension, and closure technique). A higher risk is linked to older age, man gender, SSI, forceful coughing, uncontrolled diabetes, and prolonged length of surgery, midline incisions, and sepsis. It is very uncommon for a single factor to cause a burst abdomen. These elements interact and each play a role in the development of burst abdomen.

INTRODUCTION

The abdominal cavity has rightly been compared to Pandora's Box. Innumerable processes are simultaneously at work to maintain a physiological milieu compatible with life. Various extrinsic and intrinsic insults can lead to disease and affect normal functioning of abdominal organs. Many abdominal disease processes demand surgical correction in the form of a laparotomy. Even today, diagnostic surgical exploration is sometimes necessary. ¹The incidence of wound dehiscence is 1 to 6 percent and burst abdomen remains is 1-3 percent. The associated

mortality is 35 to 40 percent. There are various factors that predispose an individual to these post-operative wound complications. These include a patient's demographic profile, co-morbid illness, lifestyle factors, and surgical technique. ^{1,2}Two most important factors to prevent wound dehiscence and burst abdomen are:

(1) Choice of suture material (2) the technique of wound closure. Surgery and sutures are inseparable. Down the ages, newer and more efficacious suture materials and techniques have been introduced. The finest duty of a surgeon is letting a wound heal by primary intention. Among all wound closures,

abdominal wound closure is the most challenging task for a surgeon. There are different techniques according to suture material, suturing technique and length of suture material that have been suggested optimal for rectus closure. These prospects are still under study and are controversial. Early dehiscence usually occurs from the fifth to eighth post operative day presenting as serosanguinous discharge from wound site and feeling of 'give way'. Collagen formation in a wound occurs by two weeks until which the tensile strength of the suture material is required to provide mechanical strength to the wound. The tensile strength of vicryl is two to three weeks and that of prolene is many years. Theoretically vicryl gets absorbed faster than prolene. This study is to compare the efficacy of vicryl and prolene for rectus closure by studying the occurrence of Burst Abdomen following their usage.

Aim and Objectives

To compare the use of 1-0 vicryl and 1-0 prolene for rectus closure in elective cases and following up their rates of early dehiscence (upto two weeks).

MATERIALS AND METHODS

Design of study: Prospective and Comparative Study.

Duration of study: 3 Months Period of the study: March 2023 to May 2023

Study Centre: Department of General Surgery, Chengalpattu Medical College & Hospital, Chengalpattu.

Study Population: All patients undergoing elective laparotomies for all pathologies in Chengalpattu Medical College and Hospital

Sample size: 50

Inclusion criteria

All patients undergoing elective laparotomies for all pathologies in Chengalpattu Medical College and Hospital

Exclusion criteria

- Old age >80 years and <18 Years
- Morbid obesity
- Chronic steroid intake
- COPD Patients
- Patients with previous laparotomy and midline scar.
- Patients who are not willing to participate or not willing to sign the consent.

Methodology: Ethical clearance will be obtained from the institutional ethical committee. Written informed consent will be obtained from all patients before subjecting them for the study. All patients undergoing laparotomy in an elective setting (other than exclusion criteria) are registered and followed up in the early postoperative period upto two weeks watching out for wound dehiscence and burst abdomen. Patients are randomly divided into two groups A and B. A – 1-0 Vicryl used for closure, B - 1-0 Prolene used for closure. All wounds are closed

in a standardized manner to prevent bias, ratio of suture material length to wound length being 4:1, continuous suturing, inter suture distance 1 cm, and distance from wound edge being 2 cm. Patients are followed upto two weeks of surgery. Other parameters like demographic and clinical variables were also observed. The observations were recorded and tabulated.

Review of Literature

Exploratory laparotomy is a major surgical procedure. Midline laparotomy is the most common technique of opening the abdomen as it is simple, provides adequate exposure to all four quadrants, and affords quick exposure with minimal blood loss. A midline laparotomy requires opening of linea alba which is a weak and tendinous zone. The weakness of the linea alba is enhanced when its fibers are vertically sectioned to access the peritoneal cavity. Thus, when closing the linea alba using sutures, these fibers are subjected to the tension induced by the mechanical forces that act on it.

Laparotomy wounds have been closed in various ways in terms of continuous versus interrupted closure, single layer versus mass closure, and absorbable versus non-absorbable sutures. The continuous sutures have the advantage of evenly distributed tension across the suture line and being more expedient. It has the disadvantage of being a single suture holding the fascia together. The multiple interrupted suture method has been used successfully for many years, but it has the disadvantage of being time consuming to perform and of isolating the tension of each individual stitch. The complications which may arise following fascial closure include wound dehiscence, wound infection, incisional hernia, and suture sinus formation. They may arise partly as a result of poor technique, faulty selection of suture material, and patient's factors; however, the most important causes are poor surgical technique, persistent intra- abdominal pressure and local necrosis due to infection. Elective patients with adequate nutritional status and otherwise free from risk factors related to dehiscence, type of closure may not be so important, but in emergency patients with multiple risk factors for developing dehiscence or burst abdomen, it may prove decisive. There is no best wound closure method that would be suitable for all situations. Therefore, the correct choice of suturing technique is vital. A marked reduction in the incidence of burst abdomen can be achieved by employing a correct technique of abdominal closure. A major surgical complication after elective / emergency midline laparotomy is abdominal fascial dehiscence. It may appear either as an early (burst abdomen with evisceration and partial dehiscence) or a late (incisional hernia) complication. Post-operative complete wound dehiscence is an unfortunate condition and serious complication is associated with a high morbidity and mortality rate. These patients usually undergo multiple dressings, fecal fistula formation, and surgery for secondary fascial closure, which is associated with markedly increased

morbidity, with high incidence of incisional hernia.

RECTUS SHEATH: Rectus muscle is enclosed between a sheath which is formed by extensions of all muscles both anteriorly and posteriorly. The space between the muscle and sheath allow muscle to contract freely. The linea semilunaris (of Douglas) is located between the umbilicus and pubic symphysis. At this junction aponeurosis changes to fascia. If the change from aponeurosis to fascia is gradual, the line is poorly defined. If the change is abrupt, the line is well marked. The two recti are separated by the linea alba in its entire length. Linea alba is a tendinous line formed by decussation of all three muscles in the midline. This helps in the contractile properties of the abdominal wall. The linea alba is wider above the umbilicus narrow below it. Thus, a midline incision inferior to the umbilicus will tend to pass through the laminae of the rectus sheath

PARAMETERS FOR MEASURING THE STRENGTH OF NORMAL BODY TISSUE:

- Tensile Strength**—The load per cross-sectional area unit at the point of rupture.
- Breaking Strength**—It is the load required to break a wound regardless of its dimension.
- Burst Strength**—The pressure required to rupture a viscus. The tensile strength depicts the tissue's ability to withstand injury. Collagen accumulates in a wound during its reparative phase. But it takes time to reach a plateau until which the wound requires extrinsic support in the form of sutures. The skin and fascia are strong structures but take a long time to recover in contrast to hollow viscera.

FACTORS AFFECTING WOUND HEALING : **INTRINSIC OR LOCAL FACTORS** - They are abnormalities within the wound that prevent normal wound healing.

- Ischemia and hypoxia (Oxygen needed for collagen crosslinking and migration of fibroblasts).
- Infection
- Foreign bodies and necrotic tissue, Hematomas, seromas, devascularized bone, and sequestrum are all factors that can increase the susceptibility of a wound to infection.
- Chronic venous insufficiency
- Edema. Acute swelling, especially can lead to skin breakdown, infection.
- Microenvironment of the chronic wound This occurs through inadequate synthesis of extracellular matrix proteins, increased degradative enzymes.

EXTRINSIC OR SYSTEMIC FACTORS - These factors are primarily linked to the underlying general health of the patient.

- Malnutrition, Vitamin C deficiency produces inadequately hydroxylated collagen
- Diabetes mellitus, The lack of insulin (due to trophic effects on healing tissues), hyperglycemia (affecting the migratory and phagocytic functions of inflammatory cells), neuropathy, and the micro/macrovacular disease that occurs in diabetics contribute to poor healing.
- Steroid and antineoplastic drugs. Steroids decrease the immunity. Chemotherapeutic agents decrease mesenchymal cell proliferation
- Collagen vascular diseases due to accompanying vasculitis and drugs used for treatment which impair the immunity.
- Cleansing agents Chlorhexidine or Povidone iodine (Betadine) affect cell migration.

Repetitive trauma Due to shearing or pressure forces often leads to a failure in healing.

- Renal disease and liver disease.
- Hematopoietic disorders.
- Age — Decreases both skin and muscle tissue loose their tone and elasticity.
- Weight — Obese patients have excess fat at the wound site that may prevent securing a good closure and decrease blood flow.
- Dehydration – causes electrolyte imbalances which causes cardiac, renal injury, alters blood oxygenation and cellular metabolism.
- Radiation therapy
- Smoking

RESULTS

The best method of wound closure is one that maintains tensile strength throughout the healing process with good tissue approximation, does not promote wound infection or inflammation, is well tolerated by patients, and is technically simple. The occurrence of burst abdomen was used as a parameter to assess the efficacy of the suture material. Objective was to compare the use of 1-0 vicryl and 1-0 prolene for rectus closure in elective cases and following up their rates of early dehiscence. Total no. of patients enrolled in the study period – 50. The patients chosen by inclusion criteria were categorized into two groups of 25 each with Vicryl & Prolene. The comparison was made by assessing the prevalence of Burst Abdomen (within two weeks) in all patients. Gender distribution revealed more male involvement (M>F 52.5% vs 47.5%) and there was no significant association with development of Burst Abdomen. The median Age group in the study was between the range 40-50 years (53% prevalence of age > 45 years) and there was no significant association with development of Burst Abdomen. There was 45% prevalence of Duration of Surgery > 2.5 Hours which had significant association with the occurrence of Burst Abdomen. Out of 50 patients, five developed Burst Abdomen (10%), out of which three (60%) had 1-0 Prolene, two (40%) had – 1-0 Vicryl sutures. There was no significant association between the type of suture material with development of Burst Abdomen. Among the five who developed Burst Abdomen, two had SSI, all five had duration of surgery > 2.5 Hours. All patients who developed Burst Abdomen had a midline incision (2 Female & 3 Male). All patients who developed Burst abdomen had LGI Malignancy of which 3 were Post NACRT. Out of the 50 patients enrolled in the study i.) 7.5% of the population had RTI ii.) 32.5% were Diabetic (16% had uncontrolled diabetes) iii.) 22.5% had SSI none of which individually contributed to the occurrence of Burst Abdomen. On comparing Vicryl and Prolene with relation to wound related factors, though not statistically significant Prolene had slightly higher number of burst abdomen and wound infections while the seroma formation rate was similar in number.

Table 1: Prevalence Of Risk Factors In Study Group

RISK FACTORS	PREVALENCE	% OF PREVALENCE
DURATION OF SURGERY >2.5 HRS	18	45%
INTRA OP HYPOTENSION	3	7.50%
DIABETES	13	32.5%
RESPIRATORY TRACT INFECTION	5	12.5%
SURGICAL SITE INFECTION	10	25%
AGE (>45 YRS)	21	53%
GENDER (MALE)	21	52.5%
MALIGNANCY	10	25%
NEO ADJUVANT RADIOTHERAPY	5	12.5%

Table 2: Parameters And Their Association With Wound Dehiscence

CLINICAL PARAMETERS	WOUND DEHISCENCE	STATISTICAL SIGNIFICANCE
MALES	3	NOT SIGNIFICANT p value - 1.80
INTRA OP HYPOTENSION	NIL	NOT SIGNIFICANT p value - 0.54
DIABETES	1	NOT SIGNIFICANT p value - 0.73
SURGICAL SITE INFECTION	2	NOT SIGNIFICANT p value - 0.37
PROLENE	3	NOT SIGNIFICANT p value - 0.11
VICRYL	1	NOT SIGNIFICANT p value - 1.18
SURGERIES >2.5 HRS	3	NOT SIGNIFICANT p value - 0.04

Table 3: VICRYL Vs Prolene

	VICRYL	PROLENE
BURST ABDOMEN	1	3
WOUND DEHISCENCE	4	5
SEROMA	3	3

DISCUSSION

Laparotomy wound can give way in many ways. Abdominal wound dehiscence is give way of few layers and Burst Abdomen is the give way of all layers which can be with or without evisceration. The occurrence of Burst Abdomen depends on a number of factors including patient factors (like age, gender, glycemic status, RTI, SSI, malnutrition, obesity etc) and technical factors (like surgery done, suture material used, suturing technique used, duration of surgery, incision used, intra op sepsis, blood loss, hypotension and method of closure). Older age, male gender, Uncontrolled diabetes, SSI, violent coughing, prolonged duration of surgery, sepsis and midline incisions are associated with a higher risk. Therefore a single factor solely leading to Burst

Abdomen is usually not possible. One or more of these factors are associated with each other and contribute to Burst Abdomen.

CONCLUSION

There are numerous ways a laparotomy wound can fail. Diffuse abdominal wound Burst Abdomen is the give way of all layers, while wound dehiscence is the give way of a few layers, can either have evisceration or not. Burst Abdomen can occur based on a variety of variables, such as patient variables (such as age, gender, glycemic status, RTI, SSI, malnutrition, obesity, etc.) as well as practical aspects (such as surgery, the type of suture used, the method employed, the length of the procedure, the incision made, perioperative sepsis, blood loss, hypotension, and closure technique). A higher risk is linked to Older Age Man gender, SSI, forceful coughing, uncontrolled diabetes, and prolonged length of surgery, midline incisions, and sepsis. It is very uncommon for a single factor to cause a burst abdomen. These elements interact and each play a role in the development of burst abdominal. Typically, continuous, mass closure with delayed absorbable sutures is used. The suture to wound length is 4:1, there is a 1.5 cm interbite spacing, and the suture is placed 1.5 to 2 cm from the wound edge. Retention sutures are prophylactically used to close high risk patients. Burst Abdomen is accompanied by a variety of preoperative comorbidities intraoperative infections, and postoperative sequelae. For the purpose of assessing risk in Burst Abdomen, various risk indices like Rotterdam, Webster, and VAMC are available. There are many innovative suturing techniques available for rectus closure.

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