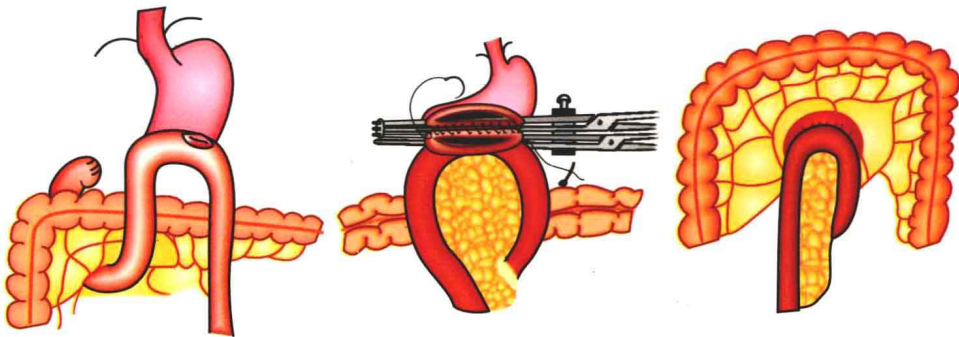
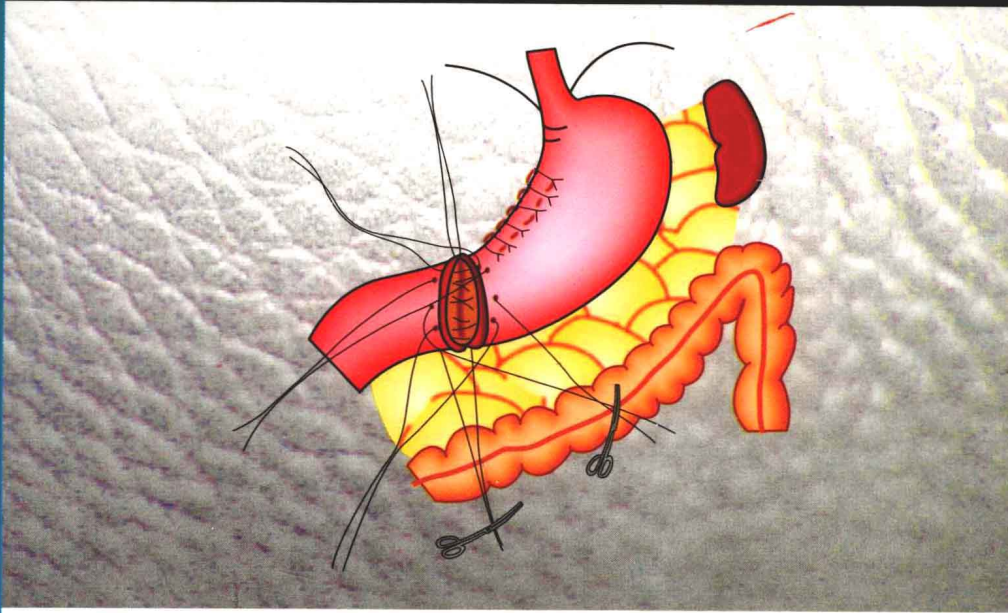


# Foundation in Operative Surgery



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JAYPEE

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**Foundation in Operative Surgery**

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*To*  
*My Parents*  
*My wife Dipa*  
*Daughter Mowe*  
*and*  
*Son Shironjit*

# Preface

This book provides comprehensive operative procedures dealing with all surgical problems related to general surgery, gastro-intestinal surgery and urological surgery. Emergency vascular operations on Embolectomy and rupture aortic aneurysm have been described in detail because these cases are often admitted under the general surgery department.

Responsibility of the surgeon has been highlighted before the operative procedures being undertaken. This book has included postoperative care related to respective operative procedures that would make the trainees as well as trained surgeons confident how to deal with any unexpected postoperative complication. In this book, methods of preoperative assessment, preparations, consultation to the patients, merits of the varieties of operative techniques and outcome of the operations have been described in detail.

This book would assist the surgeons and particularly the trainee surgeons about how to deal with the patients and their relatives as soon as they enter into the surgical ward and how to avoid the wrong operation or operation on the wrong site.

In this book, merits of all sorts of operative techniques have been highlighted to resolve the confusion in understanding the operative techniques. Although experience is gained from working with the senior surgeons, but this is not always available at workplace. In most instances, resident surgeons need to rely upon the seniors in dealing with the unexpected problems, developed in the postoperative period. As a result, patients become the victim of poor surgical care due to lack of knowledge and understanding of the surgical care. All these problems have been highlighted in this book.

This book has described the basic surgical principle on the skin preparations, technique of skin incision, wound closure, relief of postoperative pain and wound infection. The principle aim of this book is to encourage the students about how to proceed with the minor or day surgery. With this objective in mind, smaller cases have been included in the first few chapters. These are lumps, bumps, hernias, phimosis, abscess and varicose veins. In the preface of the gastrointestinal surgery, the basic principle of postoperative care,

wound healing, operative procedures has been described. It deals with most of the intestinal diseases from the stomach right down to the anus. In the Surgery of Urology, investigative procedures, assembling and use of the optical instruments and operative procedures have been described in detail.

This book will be of immense importance to the trainee surgeons since many specialties have been separated from the umbrella of the general surgery, and the work practice has changed recently. As a result, they are not frequently exposed to all varieties of surgical procedures. Over and above, their working hours have reduced the opportunity to carry out the continuity of care of their own patients. Hence, they are missing the practical experiences. Furthermore, the opportunity to develop confidence seems to be few and far in between the hand on tools; but they could fulfil their inquest of knowledge from this book.

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# *Skin Preparation*

## **1**

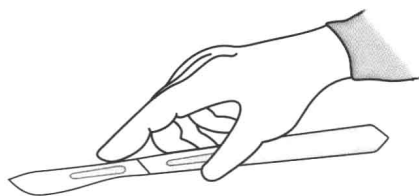
In all operative procedure, skin surface is made sterile with antiseptic solution. These are povidone-iodine (bethidin) in alcohol, chlorhexidine in alcohol, ether and cetrimide (savlon). Alcohol based preparations that provide effective bactericidal tools are preferably used in most cases but it should be allowed to let it dry in air, instead of wiping it out from the skin surface. This alcohol based preparation carries a risk of skin burn, if diathermy is used where a pool of this solution is present, nearby. This inflammable product tends to accumulate in the skin fold, umbilicus, groin, or under the buttock. Therefore, necessary precaution should be taken to stop such accident. In certain anatomical sites, water based solution such as chlorhexidine and bethidin solution or cetrimide should be used. These sites are oral cavity, penis, scrotum and perineum.

### **TECHNIQUE FOR HOW TO HOLD THE KNIFE**

Incision is an important part of the surgical skill. It makes the scar neat and enhances rapid healing. In most operations, incision should be made along the skin crease, but in certain operations, a different line of incision may require to be adopted. The cut edge of the skin must be perpendicular to the skin surface. A bevel type of skin cut is undesirable. It leads to ugly scar. Infection may creep in due to necrosis of the epidermis along the bevelled skin cut.

To avoid bevel cut, the blade has to be held firmly perpendicular on to the skin surface. For avoiding the tilting of the blade, the handle of the knife is firmly held between the thumb and the middle finger, and tip of the index finger should rest upon the upper edge of the handle. This will keep the blade firmly down, while the skin is cut through and through (Fig. 1.1). The handle of the knife should not rest upon the web between the thumb and the index finger. For a delicate dissection the knife should be held like a pen.





**Fig. 1.1:** How to hold the knife

Before the incision is commenced, a plan has to be drawn up, as to the site and size of incision to be made. The blade is next firmly placed exactly on the proposed site that needs to be firm and smooth without any puckering of the skin.

Therefore, the incision should be made between the left thumb and index finger that keeps the site of incision firm and smooth. These two fingers move concurrently forward, with the blade that continues cutting the skin further down and away from those two fingers.

Once the skin cut is made perpendicular, it is continued for every few centimetre at a stroke, preceded by the change in position of the left thumb and index finger. The cut should be deep in one stroke and it should include the subcutaneous fat in one attempt. The process is repeated in order to cut the wound further deep. After the skin has been cut deep, the bleeding vessels are picked up by the artery forceps with a view to stop bleeding either by putting ligature around it or with electro-coagulation. Some surgeon changes the blade after cutting the skin, and some surgeon use the cutting diathermy after initial skin cut is made with the knife. Diathermy should not be used to stop oozing or spurting vessels, coming from the subcutaneous fat. Every precaution should be taken to avoid thermal burn to the skin edge.

## **BASIC PRINCIPLE AND TECHNIQUE FOR THE WOUND CLOSURE**

Closure of the abdominal wound seems to be simple but it requires skill and understanding of the basic principle, as to how wound dehiscence, would haematoma or infection occurs. All these morbidity is preventable if the wound is closed with due care and meticulously. First, there should not be distension of the gut during closure of the peritoneum.

Therefore, a good relaxation is a prerequisite condition that is usually provided by the anaesthetist. Surgeon should not struggle in bringing the peritoneal edges together and loops of small intestine should not pop up through the wound while closing the peritoneum.

If the peritoneum is closed under tension, sutures may cut out, or there could be splitting of the peritoneum transversely. These torn areas may need to be closed with interrupted sutures. Eventually, omentum may protrude through the gaps thus giving rise to abdominal wound dehiscence and incisional hernia in some cases.

It seems to be the race between the two teams, in that competition, one would be busy in reversing the anaesthetic effects, before the abdominal wound is closed and another team, by contrast would like to see more relaxation in the closure of the peritoneal wound. Without the help of the anaesthetist, satisfactory peritoneal closure would be impossible; but too much relaxation may lead to delay in recovery that is not desirable. On balance, experienced anaesthetist treats the patients differently that keeps every team happy.

However, the peritoneum should be closed without tension by a continuous suture using vicryl, dextron, or polydioxin suture material. Silk or nylon should not be used under any circumstances. Chromic catgut sutures are not suitable for the closure of the laparotomy wound. They produce inflammatory reaction and their tensile strength loses in a week. Furthermore, it is no longer available in surgical practice, since mad-cow disease has been identified in the firming industry.

In the past, surgeon used to use a large curved hand needle with a big eye. These are no longer used but one should know the adverse effect to the peritoneum. It makes a large puncture wound. Therefore atraumatic curved (35 mm) needle should be used in closing the abdominal wound.

To avoid tension of the sutures, the spacing between the two sutures should not exceed 1 cm and the suture bites should not be too far away from or too close to the cut edge. In the former case, there would be tension of the wound and in the latter case, the sutures may cut out. To compromise between the two evils, the suture bites should be between 0.5 cm and 1 cm away from the cut edge of the peritoneum or the rectus sheath.

Continuous suture applied across the cut edges is the established surgical procedure; but junior assistants are abdicated to close the wound, while surgeons could be busy in writing the operation notes, or surgeon closes the wound with hurry, leaving behind a large space greater than 1 cm between the sutures. The implication of these methods of closing the wound was not fully understood, but instances of incisional hernia would be very high.

When the sutures are tied at the end, the cut edges tend to buckle up because of pulling of the thread at the conclusion of the closure. In other cases, the peritoneal cut edges tend to get apart between the two suture bites. This may be attributable to intra-abdominal tension and it may occur only, if the gap is in-excess of 1cm between the two suture bites holding the two cut edges together. And the intervening sutures remain undue tension, exerted by the postoperative paralytic ileus. Furthermore, these tissues could not remain relaxed any more, once the effect of anaesthesia being worn off. In this situation, patient tends to remain lying side ways, bringing the knees towards the belly.

As a result, the cut edges of the peritoneum tend to stay apart between the sutures, thus producing a wound gaping with a configuration of diamond shape between the sutures. This may exert undue tension upon the sutures that try to keep holding the two cut edges together, but in some instances, a few of them may cut out of the tissues or snap off, at the time of recovery from the anaesthesia or in the postoperative period.

Immediately after the patient being transferred to the recovery room, in some cases, patients tend to cough at the time, when the endotracheal tube is withdrawn from the throat. And in other times irritation in the throat may bring the cough in the postoperative period.

If the burst abdomen is imminent, there will be serous discharge leaking through the wound that would be an early signal occurring a few days prior to burst abdomen being encountered. And it has been noticed that it occurs usually 10-12 postoperative days and after lunch.

The risk of wound dehiscence would be much less or not at all, in those cases in which the laparotomy wound is closed in line with the above principle in all elective and emergency abdominal operations.<sup>1,2</sup>

Hence, undue tension of the sutures should be avoided, and this could be done, if the sutures are inserted with equidistance from each other and without leaving a too much gaping between the sutures thus sharing the total tension among these sutures. For the uniform distribution of the tension among the sutures, the cut edges of the peritoneum should be closed by the continuous suture that should be 1cm apart from each other and between 0.5 cm and 1 cm away from the wound margin.

For the closure of the rectus sheath, same principle should be followed. Chromic catgut should not be used. And size of the suture should be no.1. And each suture bite should be between 0.5 and 1 cm away from the cut edge of the rectus sheath and 1 cm apart between the two sutures bites.

For the closure of the rectus sheath, a loop prolene suture or polydioxin sutures should be used, instead of other absorbable suture materials. Mass closure of the midline wound involving the peritoneum and the rectus sheath is safe, without compromising the principle of suturing the wound, in that rectus abdominis muscles should be avoided in the mass closure.

It is also recommended that dead space between the rectus sheath and skin wound should be closed with continuous or interrupted absorbable sutures, using a 35 mm atraumatic curved needle.

Collection of serous fluid or blood may occur in the space between the fatty layers, particularly in the dependent part. This keeps the fatty layer apart under the skin wound, exerts tension upon the sutures, inhibits primary healing, and causes pain because of tension, built up within the wound.

In addition therapeutic level of antibiotic was found far less in the serous fluid, thus enhancing the bacterial colonisation in the pool of inflammatory fluid. But closure of the dead space takes away undue tension of the sutures applied to the rectus sheath or the skin wound. Many surgeons do not comply with this principle. One should not hurry in closing the wound, instead, it is closed methodically with due care.

Tension sutures for the major abdominal operations used to be common practice, but these did not prevent the wound dehiscence. On the contrary, it causes necrosis around the suture ports and ugly scar may develop after the patient being discharged. It is now rarely used in the wound closure, since the technique of wound closure has been changed and since the synthetic suture materials are available in closing the wound.

Skin wound could be closed by various ways. For cosmetic result, skin edges are apposed closely by subcutaneous continuous sutures. Fine white dexton or vicryl suture (2/0 or 3/0) should be used. Alternatively 2/0 prolene suture could be used. The prolene suture may not glide smoothly under the sub-cutaneous tissue, when it needs to be pulled out.

In some cases when the nylon thread needs to be pulled out, it may be snapped off, leaving behind a residual segment under the skin wound.

Therefore, thicker thread should be used, or this should be avoided. If vicryl or dexton suture is used it may cause hypertrophy scar or roughness of the scar in some instances. For breast and facial surgery, this possibility has to be highlighted with the patient.

Skin wound could be closed with interrupted prolene, vicryl, or dexton sutures, but they should be removed in 5 days for small wound, and 10 days for laparotomy or larger wound. Other alternative material is the auto-sutures. They are very quick to finish the job and they are removed as and when necessary.

For thyroid surgery or closure of the skin wound in the neck, platysma is apposed together with interrupted absorbable sutures, the skin wound is closed with metal clips, but they are removed on the second day.

Silk sutures should be avoided. It induces inflammation and ugly sutures mark over the skin. Despite all these principles being followed, hypertrophy or ugly scar can develop in certain anatomical sites and in certain patients. Keloid is prone to develop among the certain people or in certain anatomical sites, such as around the face, neck, chest and the joint areas. These delayed complications should be discussed with the patients.

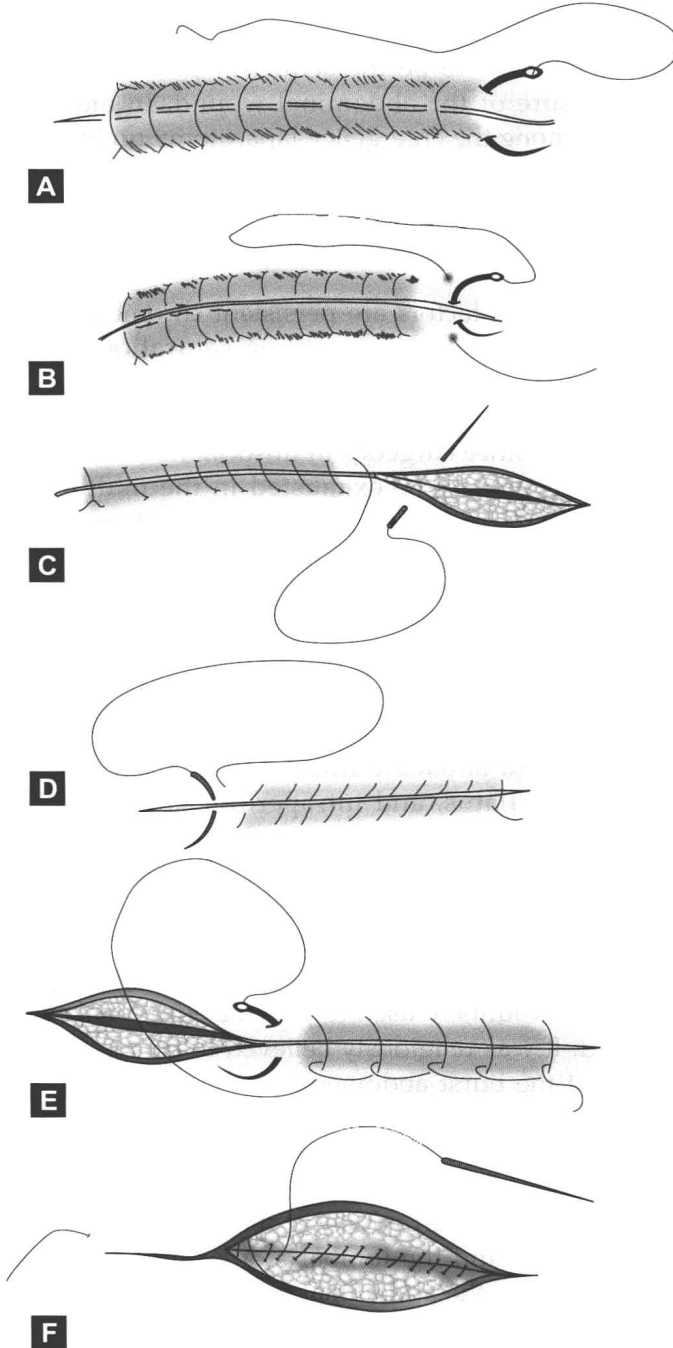
### **Types of Skin Sutures**

*These are*

- a. Interrupted Suture
- b. Interrupted Mattress Suture
- c. Continuous Suture (Overlapping of the skin edges should be avoided)
- d. Continuous Mattress Suture
- e. Continuous Blanket Suture
- f. Continuous Sub-cutaneous Suture (Figs 1.2A to F)  
In this technique, either mono-filament nylon (2/0) or Dexon/Vicryl (white and 2/0 or 3/0) is recommended.  
Nylon or similar type of material is pulled out of the wound after 5 days. There remains a risk of snapping of the thread while an attempt is made to remove it. And the risk would be greater, if fine thread (3/0) is used.
- g. Auto-suture, using clips

### **Precaution in Suturing the Skin Wound**

Over-lapping of the skin edges should be avoided in those cases in which interrupted or continuous sutures are employed. Sutures must not be too tight. All knots should be placed along the side of the skin edge and must not lie across the skin edges.



**Figs 1.2A to F:** Types of skin sutures: (A) Interrupted suture; (B) Interrupted mattress suture; (C) Continuous suture; (D) Continuous mattress suture; (E) Continuous blanket suture; (F) Continuous subcutaneous suture

## CLOSURE OF BURST ABDOMEN

Burst abdomen seems to be the sequel of poor surgical technique used in the closure of the abdominal wound. In most instances, it tends to occur among the emergency laparotomy undertaken, in those cases in which, patients were in poor state of health, tissue perfusion remains inadequate, generalised tissue oedema may develop in postoperative period due to over transfusion, cardiac or renal failure and hypo-albuminaemia.

Other contributing factors are persistent chronic chest conditions, acute pulmonary oedema, poor oxygen saturation, cough, wound infection, diabetes, and other debility health conditions.

Furthermore, emergency operations are usually carried out in hurry and by the trainee surgeons in unsocial hours. They may not be fully experienced or may be exhausted in the middle of the night while undertaking the complicated surgical procedures. Concentration may be lacking in closing the abdominal wound.

Disruption of the peritoneal sutures may occur during recovery from the general anaesthesia when the endotracheal tube is attempted to be taken out from the throat. This may induce a violent cough. It may also occur during the postoperative period, when the abdomen tends to be distended due to swallowing of air or due to persistent para-lytic ileus, and subacute intestinal obstruction. Intermittent vomiting, delayed flatus, and intraperitoneal abscess could cause undue tension upon the sutures. Sero-sanguinous collection, wound haematoma and local infections developed within the parietal wound are other incriminating factors for causing burst abdomen.

In the past, tension sutures were frequently used in the closure of the abdominal wound. In addition, many-tail bandage that goes around the abdomen was routinely used to provide additional support to the parietal wound. It was religiously believed to be a good prophylactic measure against the burst abdomen.

The said bandage, known as many tail bandages is a large thin cloth, rectangular in shape that is placed across the back, but there are long narrow tails like bandages fitted along the each lumbar side of the main cloth. Each tail which is about 2-3 inches wide and 12 inches long goes around the lumbar side of the abdomen and then each one is put across the abdominal wound dressing, but by turn, it is over-lapped by the corresponding tail, bringing from the opposite side. It would look like a double breast and act as an abdominal corset. The end of each tail is held together by the adhesive tape or by safety-pin. In this way, all the tails are put over the abdominal wound.

But this did not make any difference in many cases; on the contrary, it seemed to have made an adverse effect upon the respiration, thus inhibiting the cough or expectoration of sputum. It is rarely used in emergency abdominal operation.

Although instances of burst abdomen seem to have fallen, this improvement could be the result of combination of suture materials and the suture technique used in the closure of the peritoneum and other parietal wound. Closing of burst abdomen requires a greater skill.

It has been noticed that burst abdomen occurs usually after the sutures being removed and after having had the lunch. It requires emergency repair; but patient needs to be fasting for at least 6 hours, prior to general anaesthesia and emergency theatre may not be available for this procedure to be undertaken. So, prolapsed gut and the burst abdomen should be covered with sterile warm saline packs straightaway. This is again wrapped up by sterile towel until the theatre is available.

Therefore, patient is kept nil by mouth and naso-gastric tube is inserted for emptying of the stomach and hourly aspiration. Parenteral infusion with saline and dextrose is commenced. Bladder catheter is to be inserted for recording the fluid balance. And patient should be explained about the operative procedure to be taken, before a consent form is signed.

## **OPERATIVE TECHNIQUE FOR THE CLOSURE OF THE BURST ABDOMEN**

Patient is placed on the supine position on the operating table. Usual skin preparation and sterile towelling are carried out around the wound. All packs are removed. If there were any sutures left across the wound, they are removed. More often, loops of the small intestine could be found herniated through a small area of the burst abdomen but the remaining healed skin edges should be broken apart from top to bottom of the wound.

In most cases, gut could be found lying under the healed skin wound. Therefore, it would be unwise just to close the small part of the burst abdomen without looking into other part of apparently healed skin wound. All the skin edges, the rectus sheath and the peritoneum are opened up.

In the peritoneal cavity, small intestine remains matted together, and the peritoneum may be found receded or retracted away from the rectus abdominis muscles. And whitish fibrinous membrane could



be found covering the loops of the gut or in between the loops of the gut. It should be removed without interfering with the loops of the gut. It would be wise not to separate those adhesions, apart from freeing the fibrinous membrane.

There could be oozing or tear if they are attempted to be separated from the adhesions. Minimum attempt should be made in order to free the peritoneum from the nearby guts. And no attempt should be made to free the torn edges of the peritoneum and to bring the free-edge of the peritoneum closure in order to suture them together. In fact it would cut out, if such attempt is made.

Burst abdomen is closed in one layer, but before proceeding for the mass closure of the wound, it is important to be sure that there was no pocket of abscess or anastomotic leakage. Suspicion should arise if there is evidence of bile discharge or foul smell in the peritoneal cavity.

Loops of the intestine need to be freed from the surrounding the peritoneal wound margin. This would be necessary to protect the gut from being injured, when the long curved needle would be inserted for the tension sutures across the peritoneal cavity. Once adequate room has been made by separating the loops of small intestine or the greater omentum, they are covered with a thin layer of wet swab. This is necessary to protect the gut being injured by the needle. This is a temporary measure, and it would be pulled out after the tension sutures being laid down over the swab across the peritoneal cavity.

If there are necrotic sloughs present along the skin edges, these should be excised. It harbours bacterial colonisation. Mass closure is the basic principle involved in the closure of the burst abdomen and that is done by tension sutures. Strong prolene or nylon suture with a long curved cutting needle is used. Each needle is used for each tension suture and it is inserted one inch away from the skin margin and is pulled out from inside of the abdomen and it is inserted again from inside one inch away from the skin margin of the contralateral abdominal wound margin and it is pulled out from outside of the abdomen. There should be a gap of two inches between the two tension sutures.

The tension sutures could be inserted in various ways. It could be passed across the wound margin, but the thread goes through the plastic tube that would lie across the skin wound, thus protecting the skin from being cut out or from the ugly scar. Alternatively mattress suture could be used differently, in that it lies transversely over the skin one inch apart and one inch away from the wound margin, but the thread goes through the plastic tube thus protecting the skin from