



RESEARCH ARTICLE

PROSPECTIVE STUDY OF CLOSURE TECHNIQUES IN PATIENTS UNDERGOING EMERGENCY LAPARATOMIES IN A TERTIARY CARE CENTRE

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ABSTRACT

The healing of incision takes place by a dense fibrous scar that unites the opposing faces of laparotomy wound enmasse, this study is intended to show that continuous enmasse closures of laparotomy wounds is preferred to conventional layered closure. This study is a prospective comparative study between mass closure versus conventional layered closure of abdominal wounds with midline and paramedian incisions. It concludes that less time consumption, minimal complications, reduced hospital stay and leaving a reasonably aesthetic scar. Justify the use of single layered closure technique in place of conventional layered closure technique in ventral abdominal incision.

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INTRODUCTION

In abdominal surgery, wisely chosen incision, correct method of making and closing such wounds are factors of great importance. The ideal method of abdominal wound closure should be technically so simple that the results are as good in the hands of trainee as in those of master surgeons. It should be free from complications of burst abdomen, incisional hernia and persistent sinuses. It should be comfortable to the patient and should have a reasonably aesthetic scar.

It is now fully realized; both from clinical observation and animal studies, that healing of incision takes place by a dense fibrous scar that unites the opposing ends of laparotomy wound enmasse.

This study is a prospective comparative study between mass closure versus conventional layered closure of abdominal wounds with midline and paramedian incisions.

Objectives of the Study

The study aims to show that mass closure of laparotomy wounds:

- Is easier, faster and cost effective.
- Has a lesser rate of complications like burst abdomen, incisional hernia and sinus formation.
- Has better patient compliance.
- Leaves a reasonably aesthetic scar.

Surgical Anatomy of Abdominal Wall

The abdominal wall is a musculoaponeurotic structure through which the surgeons can often feel diseased organs that lie within the abdominal cavity. An intact abdominal wall is essential for the support of the abdominal contents. A

defect or malfunction of the wall can allow the abdominal contents to bulge forward and form an incisional hernia. The abdominal wall also provides the surgeon with a site for access to deep lying diseased structures.

The anatomic principle governs the incisions used for laparotomy. Thus prevention of herniation of abdominal contents through the incisional wound, resulting in burst abdomen or herniation through a weak scar, resulting in incisional hernia are the main aims of a surgeon closing laparotomy incisions. During respiration, coughing, sneezing, a temporary rise in intra abdominal pressure occurs, following surgery can result in any of the above complications, if due attention is not paid to prevent them.

Across the abdominal wall stretch the linea transversae, tendinous intersections which in more muscular persons, produce palpable transverse depressions. These depressions are accentuated in active rectus contractions or in reflex muscle spasm associated with irritation of the peritoneum.

At the lateral margin of each rectus muscle is a depression, linea semilunaris, directed towards the symphysis, the pubic tubercle are palpable at the medial attachments of the inguinal ligaments, located about two fingers breadth above the suspensory ligament of penis and about 2.5 cm lateral to midline.

The abdominal wall is composed of nine layers

1. Skin
2. Subcutaneous fatty layer
3. Scarpa's superficial fascia
4. External oblique muscle
5. Internal oblique muscle
6. Transversus abdominis muscle
7. Transversalis fascia (endoabdominal fascia)

8. Extra peritoneal adipose and loose areolar tissue
9. Peritoneum

Abdominal Incisions and Closure

A wisely chosen incision, correct methods of making and closing such wounds are factors of great importance. A badly placed incision cutting the motor nerves supplying abdominal musculature, inept methods of suturing, ill judged selection of suture materials and bad technique of closure may all result in serious complications like haematoma formation, infection, stitch abscess, ugly scar formation, incisional hernia or worst of all the complete disruption of wound.

The surgeons aim is to employ the type of incision depends on the surgery being performed. However the three essentials of an incision are that it should have Accessibility, Extensibility and Security

General Principles

- The incision must give ready and direct access to the anatomy to be investigated. It must also provide an adequate room for the procedure performed.
- The incision should be extensible, if need arises in a direction that will allow for any probable enlargement of the scope of operation. However it should interfere as little as possible with the function of abdominal wall in future.
- The security is the most important principle governing any abdominal surgery. Hence closure of abdominal wound must be reliable. Ideally it should leave abdominal wall as strong after operation as before.
- Strict aseptic precautions taken would prevent contamination of wound and thus infection.

Usual Techniques of Closure of Incisions

Closure of midline incision

Mass closure

The mass closure technique of midline incision consists of suturing of the cut edges of peritoneum and linea alba together, care is taken to take wide bites of the cut edges at least 1 cm from the edge of the incision and a hand held 5/8 cutting needle is used and continuous locking sutures taken using polypropylene no. 1. The skin is sutured with fine interrupted nylon; deep tension sutures are not used

Layered closure

In this technique the peritoneum is closed with chromic catgut no1-0 by continuous interlocking sutures. The linea Alba is closed similarly with polypropylene no 1 by continuous interlocking sutures.

Closure of Paramedian incisions

Mass Closure

In this technique the peritoneum, endo abdominal fascia, posterior layer of rectus sheath, rectus abdominus and anterior layer of rectus sheath are all sutured as a single layer. The bites are taken at least 1 cm from the edge of the incision and a hand held 5/8 cutting needle is used. Continuous locking sutures were employed using polypropylene no 1

Layered Closure

In this technique the peritoneum and the posterior layer of rectus sheath were closed with chromic catgut no 1 by continuous interlocking sutures. The anterior layer of rectus sheath was closed with chromic catgut no1 by continuous interlocking

Drains when used are inserted through a stab wound away from the incision, and a colostomy or ileostomy, when performed is always fashioned through a separate incision. Following surgery the wounds were cleaned with spirit and dressed. No local antibiotic dressings were employed. Time taken for closure of abdomen was recorded in all cases.

It is now fully realized, that healing of incised wound takes place by formation of dense fibrous scar that unites with opposing faces of the laparotomy wound enmasse. The purpose of the suture is to coat the wound edges and to act as a splint while this dense fibrous scar deposits and matures. Wide bites must be taken at a minimum 1cm from the wound edge and placed at the interval of 1 cm or less. The suture length should measure at least 4 times the wound length to ensure an adequate reserve of suture length in the wound when the suture is placed on tensions as may occur during abdominal distension.

Wound Healing

"If you cut well and sew well your patient will get well"

Tissue healing is a topic of intense importance in every branch of surgery. Without this remarkable living phenomenon surgery as we know would course be impossible. Tissue injury on frank necrosis heals by forming scar tissue. There is no return to the primary status quo. Humans have no ability to regenerate organs, with the exception of bone, liver and epithelium.

Wound closure types are divided into:

1. Primary Repair or first intension closure: are those wound that are immediately sealed with simple suturing, skin grafting or flap closure. E.g. repair of an incised or a lacerated wound.
2. Secondary repair: involves no active intent to seal wound. This may be a wound that was too highly contaminated to allow a surgical intervention. This wound will close by re-epithelisation and contraction of the wound
3. Delayed Primary (tertiary) repair: A wound that is known to be infected is first treated with repeat debridement and systemic or topical antibiotics. When it is ready for closure, surgical interventions such as suturing, skin graft placement or flap design is performed. A wound left open will fill with granulation tissue and contractions will enhance wound closure by pulling the surroundings uninjured tissue over the defect. A fibrin clot will seal the wound, which is permanently sealed with epithelisation. Tensile strength is achieved by deposition of collagen.

Phases of wound healing

- Inflammatory phase
- Proliferative phase
- Maturation phase

Relative ability of tissue to regenerate

1. There is complete regeneration of epithelium except for specialized tissues such as hair follicles and sweat glands
2. Subcutaneous fat is replaced by cicatrix
3. Fascia is almost perfectly regenerated
4. Striated muscles are almost always replaced by cicatrix, rarely by striated muscles.
5. Peritoneum first heals by fibrous union and then is covered by endothelium

Factors responsible for poor healing of tissue

- Local factors: Blood supply, local infection, apposition, absence of movement, absence of tension, Irradiation, technique of wound closure
- Possible General factors: Age, anemia, malignant disease, diabetes, systemic infection, jaundice, uremia, steroids, cytotoxic drugs, protein deficiency, vitamin deficiency
- Classification of factors responsible for poor wound healing
- Patient factors: Age, sex, anemia, jaundice, uremia, diabetes, obesity, malnutrition, protein deficiency, vitamin deficiency, use of steroids
- Disease factors: Intra-abdominal sepsis, Malignant disease, wound infection, chest infection, prolonged paralytic ileus
- Surgical factors: Type of incision, type of closure, emergency, sutures, tension, type of anesthesia, trauma to tissues, ostomies in incision site

Surgical Technique

In order to confirm wound healing meticulous attention must be paid to surgical technique. The following are well known but bear emphasis (a) use sharp dissection (b) ensure hemostasis (c) non strangulated interrupted sutures induce less tissue reaction than continuous sutures (d) select sutures of the smallest sizes in order to induce as little suture material (foreign bodies) into the wound as possible. The tensile strength of the suture need not be greater than twice that of the tissue it is to suture.

Sizes of Sutures Ordinarily Required

| Hemostasis | 4-0 or 3.0 | 3-0 |
|--|------------|------------|
| Peritoneum and posterior rectus sheath | 2-0 | 3-0 or 2-0 |
| Muscle | 3-0 | 3-0 |
| Fascia and anterior rectus sheath | 3-0 or 2-0 | 2-0 |
| Sub cutaneous tissue | 3-0 | Mar-00 |
| Skin | 2-0 | - |

To sum up, prevention of post operative wound complications depends on improving the health of the patient pre operatively to optimum level in elective surgery, reasonably good surgical technique.

Surgical Wound Infection

Definition

The infection that follow surgical procedures that occur in the pre operative wound or at a distant site.

Infection occurs at an incisional site usually within 30 days after operation and involves skin or sub cutaneous tissue above the facial layer and from the following:

- Purulent discharge from the incision or drain located above the facial layer
- An organism isolated from culture of fluid that has been aseptically obtained from a wound that was closed primarily.

Classification

- Clean wounds
- Clean contaminated wounds
- Contaminated wounds
- Dirty wounds

Wound Dehiscence

The abdominal wound may disrupt either completely or partially.

The pathognomic of dehiscence is a pink serosanguinous discharge of the dressing.

METHODOLOGY

Patients with ventral abdominal incision i.e. surgery with midline and paramedian incision undergoing either elective or emergency surgery. We excluded patients undergoing surgery where in the abdomen is opened by transverse or other non vertical incisions. Thus, all the patients who were included in the study had their incisions closed by either single layer closure or by conventional technique of layered closure. Out of 109 patients, 53 were randomized to have the abdominal wall closed by single layered technique and remaining 56 by conventional layered closure technique. They were grouped as Group I and Group II respectively.

In group I, ventral abdominal incision were closed in single layered using polypropylene no 1. In case of mid-line incisions linea alba and peritoneum were closed in single layered by continuous inter-locking, and in case of paramedian incisions the peritoneum, posterior layer of rectus sheath, rectus abdomens and anterior layer of rectus sheath were closed in one layer by continuous inter-locking.

In group II, ventral abdominal incisions were closed in layers using chromic catgut no.1 for peritoneum and polypropylene no. 1 for other layers. In case of mid line incisions peritoneum was closed with chromic catgut no. 1 by continuous interlocking and linea Alba was closed with polypropylene no. 1 by continuous interlocking sutures.

In case of paramedian incisions peritoneum and posterior layer of rectus sheath was closed with chromic catgut no. 1 and anterior layer of rectus sheath was closed with polypropylene no. 1 by continuous interlocking sutures.

Skin was closed with non-absorbable material like no. 1-0 Cotton thread or mersilk, using interrupted mattress sutures in both groups of patients.

Operative Techniques

In the operation theatre, the part was prepared and draped. General anesthesia was used in most of the cases. Drains were used wherever necessary, through a separate stab incision, away from the main incision.

The following parts were paid special emphasis on: The type if incision: Midline and paramedian.

The type of closure: Mass closure and two-layered closure.

Technique of Closure

Group 1

Midline incisions

Closure performed by suturing the cut edges of the peritoneum and linea alba together as a single layer. Bites were taken about 1.5 cm from the cut edges and about 1.5 cm from the previous bite. Continuous locking sutures using polypropylene no.1.

from the cut edges and about 1.5 cm from the previous bite. Continuous inter locking sutures employed using polypropylene no.1.

Group 2

Midline incisions

The peritoneum was closed with chromic catgut no.1 by continuous interlocking.

Table 1 Age and Number of Layers

| age | single layered numbers | single layered % | conventional layered numbers | conventional layered % | total number | total % |
|-----------|---|------------------|------------------------------|------------------------|--------------|---------|
| 10 | 0 | 0 | 1 | 1.8 | 1 | 0.9 |
| 11 to 20 | 6 | 11.3 | 6 | 10.7 | 12 | 11.1 |
| 21 to 30 | 16 | 30.2 | 13 | 23.2 | 29 | 26.6 |
| 31 to 40 | 8 | 15.1 | 15 | 26.8 | 23 | 21.1 |
| 41 to 50 | 9 | 16.9 | 12 | 21.4 | 21 | 21.1 |
| 51 to 60 | 6 | 11.3 | 5 | 8.9 | 11 | 19.3 |
| 61 to 70 | 7 | 13.2 | 2 | 3.6 | 9 | 10.1 |
| >70 | 1 | 1.9 | 2 | 3.6 | 3 | 8.3 |
| total | 53 | 100 | 56 | 100 | 109 | 2.8 |
| mean -SD | 39.51-16.80 | | 38.04-15.04 | | 38.75-15.87 | |
| inference | Age between the two groups is statically similar with p=0.630 | | | | | |

Table 2 Sex Distribution

| Sex Distribution | | | | | | |
|------------------|--|------|----------------------|------|--------|------|
| Sex | Single Layered | | Conventional Layered | | Total | |
| | number | % | number | % | number | % |
| Male | 40 | 75.5 | 48 | 85.7 | 88 | 80.7 |
| Female | 13 | 24.5 | 8 | 14.3 | 21 | 19.3 |
| Total | 53 | 100 | 56 | 100 | 109 | 100 |
| Inference | Age between the two groups is statistically similar with p=0.630 | | | | | |

Table 3 Primary Etiology

| Primary Etiology | Type of Closure | | | |
|---------------------------------|-----------------|------|----------------------|------|
| | Single Layered | | Conventional Layered | |
| | Number | % | Number | % |
| A. Perforation | | | | |
| Gastric | 1 | 1.8 | | |
| Duodenal | 12 | 22.6 | 2 | 3.6 |
| Jejunal | 2 | 3.8 | 14 | 25 |
| Ileal | 5 | 9.4 | 3 | 5.4 |
| Appendicular | 2 | 3.8 | 11 | 19.6 |
| B. Malignancy | | | 4 | 7.1 |
| Colorectal | 5 | 9.4 | | |
| C. Hepatobiliary | | | 2 | 3.6 |
| Ruptured Liver Abscess | 1 | 1.9 | | - |
| Stab Liver Laceration | 1 | 1.9 | 3 | 5.4 |
| Psuedopancreatic Cyst | 3 | 5.7 | | - |
| Acute Hemorrhagic pancreatitis | 1 | 1.9 | | - |
| D. Splenic Abscess | 1 | 1.9 | | - |
| E. Pyloric Stenosis with GOO | 3 | 5.7 | 5 | - |
| F. Small Bowel Obstruction | 5 | 9.4 | 8 | 8.9 |
| G. Small Bowel Gangrene | 4 | 7.5 | | 14.3 |
| H. Obstructed Inguinal Hernia | 1 | 1.9 | 2 | - |
| I. Strangulated Inguinal Hernia | 1 | 1.9 | 1 | 3.6 |
| J. Acute Intussusception | 4 | 7.5 | | 1.8 |
| K. Appendicular Abscess | 1 | 1.9 | 1 | - |
| L. Large Bowel Gangrene | - | - | | 1.8 |

Paramedian incision

The peritoneum and posterior layer of rectus sheath were closed with chromic catgut no. 1 by continuous interlocking. The anterior layer of rectus sheath was closed using polypropylene no. 1 by continuous interlocking sutures.

The sub-cutaneous fatty layer if thick was closed using no. 2-0 chromic catgut with interrupted sutures. Skin was closed using mattress sutures with mersilk no. 1-0 or cotton thread no. 1-0 in both study groups.

The wounds were cleaned spirit and dressed. No local antibiotics dressings were employed.

Time taken for closure of abdomen was recorded in all cases.

DISCUSSIONS

Closure of abdominal incision has been greatly simplified by realization that all incisions heal by forming a block of fibrous tissue.

The strength of abdominal wall depends on linea alba and anterior rectus sheath. The technique of laparotomy wound closure is an important factor in preventing the post operative wound complications like wound infection, wound dehiscence, suture sinus formation, incisional hernia and scar complications.

The peritoneum, posterior layer of rectus sheath, the rectus abdominis muscle and anterior layer of rectus sheath were sutured as a single layer. The bites were taken about 1.5 cm

Table 4 Types of Surgery

| Type of surgery | | Emergency/Elective distribution | | | | |
|--------------------|--|---------------------------------|----------------------|------|--------|------|
| Emergency/Elective | Single Layered | | Conventional Layered | | Total | |
| | Number | % | Number | % | Number | % |
| Emergency | 40 | 75.5 | 51 | 91.1 | 91 | 83.5 |
| Elective | 13 | 24.5 | 6 | 8.9 | 18 | 16.5 |
| Total | 53 | 100 | 56 | 100 | 109 | 100 |
| Influence | Number of elective cases are significantly more in single layered when compared to conventional layered with p=0.028 | | | | | |

Table 5 Types of Wound

| Type of Wound | | Emergency/Elective distribution | | | | |
|---------------|---|---------------------------------|----------------------|------|--------|------|
| Type of Wound | Single Layered | | Conventional Layered | | Total | |
| | Number | % | Number | % | Number | % |
| Clean | 7 | 13.2 | 6 | 10.7 | 13 | 11.9 |
| Contaminated | 46 | 86.8 | 50 | 89.3 | 96 | 88.1 |
| Total | 53 | 100 | 56 | 100 | 109 | 100 |
| Inference | Frequency distribution of type of wound is equally distributed between the two groups with p=0.6883 | | | | | |

Table 6 Time taken for Closure

| | | Time taken for closure | | | | |
|-----------------|--|------------------------|----------------------|------|--------|------|
| Type in minutes | Single Layered | | Conventional Layered | | Total | |
| | Number | % | Number | % | Number | % |
| 15-20 | 38 | 71.7 | | | 38 | 34.9 |
| 21-25 | 10 | 18.9 | 5 | 8.9 | 15 | 13.8 |
| 26-30 | 4 | 7.5 | 11 | 20.8 | 15 | 13.9 |
| 31-35 | 1 | 1.9 | 36 | 67.9 | 37 | 33.9 |
| 36-40 | | | 4 | 7.5 | 4 | 3.7 |
| Total | 53 | 100 | 56 | 100 | 109 | 100 |
| Inference | Significant proportion of cases in single layered have taken less time to closure (p<0.001). | | | | | |

Table 7 Factors affecting wound healing

| | | Factors affecting wound healing | | | | |
|---------------------------------|---|---------------------------------|----------------------|------|----------------|------|
| Factors affecting wound healing | Single Layered | | Conventional Layered | | Total | |
| | Number (n=53) | % | Number (n=56) | % | Number (n=109) | % |
| Anemia | 12 | 22.6 | 10 | 17.9 | 22 | 20.2 |
| Uremia | 6 | 11.3 | 5 | 8.9 | 11 | 10.1 |
| Jaundice | 4 | 7.5 | 5 | 8.9 | 9 | 8.3 |
| DM | 3 | 5.7 | 2 | 3.6 | 5 | 4.6 |
| Malnutrition | 20 | 37.7 | 18 | 32.1 | 38 | 34.9 |
| Inference | Factors affecting wound healing are equally distributed in Inference both the groups (p>0.05) | | | | | |

However, there may be systemic and local factors responsible for delay in wound healing.

Systemic Factors include - Obesity, jaundice, diabetes, emaciation, deficiency of protein, iron and vitamin, old age, cachexia, toxemia, uremia, alcoholism, malignancy, treatment

with steroids and immunosuppressants and other disease status.

Local factors include - Infection, hematoma formation, foreign body reaction and lack of rest. Mechanical factors such as post operative vomiting, hiccough, explosive

coughing and chest infection, gross gaseous distention, ascites, straining during micturition and constipation.

- Reduces the time consumed for closure. Closure is even more secure in cachectic patients and this

Table 8 Duration of follow up

| Duration of follow up | Single Layered | | Conventional Layered | | Total | |
|-----------------------|--|------|----------------------|------|----------------|------|
| | Number (n=53) | % | Number (n=56) | % | Number (n=109) | % |
| Up to 3 months | 42 | 79.2 | 44 | 78.6 | 86 | 78.9 |
| 4-6 months | 31 | 58.5 | 28 | 50 | 59 | 54.1 |
| 7-9 months | 16 | 30.2 | 17 | 30.4 | 33 | 30.3 |
| 10-12 months | 6 | 11.3 | 4 | 7.1 | 10 | 9.2 |
| Inference | Duration of follow-up is statistically similar between the groups (p>0.05) | | | | | |

Table 10 Postoperative complications and follow up status

| Postoperative complications | Single Layered | | | Conventional Layered | | |
|-----------------------------|---|----------|----------|----------------------|----------|-----------|
| | Emergency | Elective | Total | Emergency | Elective | Total |
| 1.Wound infection | 4 | 2 | 6(11.3%) | 12 | | 12(21.4%) |
| 2.Wound Dehiscence | 1 | | 1(1.9%) | 4 | | 4(7.1%) |
| 3.Incisional hernia | 1 | | 1(1.9%) | 2 | | 2(3.6%) |
| 4.Suture sinus | 2 | | 2(3.8%) | 1 | 1 | 2(3.6%) |
| 5.Pain over the scar | 3 | 2 | 5(9.4%) | 4 | 3 | 7(12.5%) |
| Inference | Wound infection and wound dehiscence are more in conventional layered group with p0.200 and p0.363. | | | | | |

Table 11 Types of closure

| Type of closure | Single Layered | | Conventional Layered | | Total | |
|-----------------|---|------|----------------------|------|--------|-----|
| | Number | % | Number | % | Number | % |
| Midline | 48 | 90.6 | 7 | 12.5 | 55 | 51 |
| Paramedian | 5 | 9.4 | 49 | 87.5 | 54 | 50 |
| Total | 53 | 100 | 56 | 100 | 109 | 100 |
| Inference | Midline closures are significantly more in single layered and paramedian closures are significantly more in Conventional layered with p<0.001 | | | | | |

The time taken for closure in single layered closure (Group I) was 20.18 minutes as compared to conventional layered closure (Group II) was 33.42 minutes. Thus, the time consumed for single layered closure was about 13 minutes lesser than conventional layered closure. Thus, it is proved in our study that the time consumed for closure is reduced by single layered closure as compared to conventional layered closure.

- Reduces the incidence of wound infection, thus decreasing the hospital stay and morbidity.
- Reduces the incidence of wound dehiscence
- Reduces the incidence of incision hernia
- Reduces the incidence of suture sinus formation and scar complications by using monofilament suture material.

Mean pattern of Hospital stay in days

| Hospital stay in days | Single layered | Conventional layered | Overall |
|-----------------------|---|----------------------|------------|
| Range | 2 to 39 | 1 to 49 | 1 to 49 |
| Mean SD | 16.34 6.96 | 18.18 8.62 | 17.28 7.87 |
| Significance | Duration of hospital stay after surgery is higher for Significance the group with conventional layered with p=0.225 | | |

CONCLUSION

Finally, the observation tabulated from our comparative study proved to be similar to other studies conducted by various authors thus proving that single layer technique had the following advantages in

Thus, this method holds the promise for a safe technique of closure with minimal complication.

Summary

Large clinical experience and experimental findings seem to prove the superiority of single layered closure over conventional layered closure of abdominal incisions. Ideally,

the technique of closure should be so simple that results should be good in the hands of trainee as in those of master surgeon it should be free from the complications of wound infections, wound dehiscence, incision hernia and persistent sinuses, it should be comfortable to the patient and should leave a reasonably aesthetic scar.

In conventional layered closure of abdominal wounds, the time consumed is relatively more, the tissue reaction is more, more pressure is exerted to hold the facial planes leading to avascularity and pressure necrosis which further leads to wound infection and wound dehiscence and therefore produces- weak scar, which results in increased incidence of incisional hernia.

Advantages of single layered closure

Less time is consumed for closure of abdominal wounds. Prevents strangulation of tissue and maintains adequate blood supply by taking larger bites and less force to hold the tissue. This results in a healthy and strong scar, decreased incidence of wound dehiscence and incisional hernia.

The use of non-absorbable monofilament polypropylene, which has less tissue reaction and does not harbor organisms on its surface and thus decreases the incidence of post operative wound infection.

Hence, it can be concluded that less time consumption, minimal complications, reduced hospital stay and leaving a reasonably aesthetic scar. Justify the use of single layered closure technique in place of conventional layered closure technique in ventral abdominal incision.

Reference

1. Harold Ellis. Incisions, closures and management of the wound. Chapter 11 in Maingot's Abdominal Operation. 10111 ed. Vol. 1, McGraw Hill Publications, 395-426.
2. Mimi. Leong, Linda G. Philips. Wound Healing. Chapter 8 in Sabistons Textbook of surgery, 17th ed, 183-207.
3. Sushrutha Samitha; Sushrutha.
4. Meyer W. The rectangular flap incision for operations within the upper abdomen. JAMA 1917; 69: 1677
5. Sprengel D. Arch of Klin Chir 1910; 92: 536
6. Trendelenburg. In Meyer W. Arch F Klin Chir 1885;31:494
7. Martyak SN, Curtis LE. Abdominal incision and closure; a systems approach. AmJSurg 1976;131:476
8. Dudely HAF. Layered and mass closure of the abdominal wall. A Theoretical and Experimental Analysis. Br J Surg 1970;57:664-667
9. Jenkins TPN. The burst abdominal wound; a mechanical approach. Br J Surg 1976;63:873-876.
10. Goligher JC. Visceral and parietal sutures in abdominal surgery. AM J Surg 1976;131:130-140
11. Richard S. Snell. Basic Anatomy. Chapter 4 in clinical anatomy, 7th edition, Lippincott Williams and Wilkins , pg 154-212.
12. Dennis J. Abdominal wall incisions 'Mastery of Surgery' - Nyhus Vol 1; Pg. 444- 452, 2nd edition.
13. Philip A Caulifield. Fundamentals of wound healing. Am J Surg 1953; LXXXVI: 249-254.
14. Mimi, Leong, Linda G. Philips. Wound Healing, Chapter 8 in Sabiston's Textbook of Surgery, hery 17 ed. 183-207.
15. Riou JP, Cohen JR. Johnson H Jr. Factors influencing wound dehiscence after midline laprotomy. Am J Surg 1995; 170: 387-390.
16. Walter L. mersheimer. Abdominal wound disruption. Surg Clin N Am 1961.
17. Harold Ellis. Wound healing. Ann Roy Coil Surg England 1977; 59: 382-387
18. Merril T. Dayton. Surgical Complications, Chapter 14 in Sabistons Textbook of Surgery, Vol -I ; 17th edition: Pg 298-303.
