"A COMPARATIVE STUDY OF SUBCUTANEOUS SINGLE CLOSED SUCTION DRAIN VERSUS SIMPLE CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUNDS"

Dissertation Submitted to

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

In partial fulfilment of the regulations for the award of the degree of

M.S. GENERAL SURGERY

BRANCH - I

GOVERNMENT VELLORE MEDICAL COLLEGE

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

TAMILNADU, INDIA

APRIL 2020

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This is to certify that the dissertation titled "**A COMPARATIVE STUDY OF SUBCUTANEOUS SINGLE CLOSED SUCTION DRAIN VERSUS SIMPLE CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUNDS**" is a genuine work done by **DR.KARTHICK.R**, Reg. No. 221711655 Post Graduate student (2017 – 2020) in the Department of General surgery, Government Vellore Medical College, Vellore under the guidance of **Prof. Dr.R.RAJAVELU.M.S.FRCS**, Professor, Department of General surgery,Government Vellore Medical college, Vellore in partial fulfilment of the regulations of Tamil Nadu Dr.M.G.R. Medical University, Chennai. I forward this to the Tamil Nadu Dr.M.G.R. Medical University, Chennai Tamil Nadu, India.

Prof. Dr. R. SELVI, M.D.,

The Dean,

Government Vellore Medical College,

Vellore – 632 011

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Title of the Study	–	A COMPARATIVE STUDY OF SUBCUTANEOUS SINGLE CLOSED SUCTION DRAIN VERSUS SIMPLE CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUNDS
Principal Investigator	–	Dr.R.Karthick,I Year PG, MS General Surgery
Guide	–	Dr.R.Rajavelu,MS.,FRCS., Professor of General Surgery

The request for an approval from the Institutional Ethical and Scientific Committee (IEC) was considered on the IEC meeting held on 03.10.2018 at the Conference Hall, Govt. Vellore Medical College, Vellore-11.

The Convenor, Chairperson, Member Secretary and committee members decided to approve the proposed work mentioned above submitted by the Principal Investigator.

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Senior Professor
126TT Biomedical Genetics Research Lab (DMCRL)
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School of Biosciences & Technology
Vellore Institute of Technology
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Prof. **Dr.D. LOGANATHAN .M.S.**

Professor& HOD,

Tamil Nadu Department of General surgery,

Govt. Vellore Medical College,

Vellore.

BONAFIDE CERTIFICATE

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GUIDE

PROF. **Dr.R.RAJAVELU,M.S, FRCS,**
Professor of General surgery,
Govt. Vellore Medical College,
Vellore

CO-GUIDE:

Dr.M.JAGADESAN M.S.
Assistant Professor of General surgery,
Govt.Vellore Medical College,
Vellore.

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This is to certify that this dissertation work titled "**A COMPARATIVE STUDY OF SUBCUTANEOUS SINGLE CLOSED SUCTION DRAIN VERSUS SIMPLE CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUNDS**" of the candidate **Dr.KARTHICK.R** with registration number**: 221711655** for the award of **M.S.** Degree in the branch of **GENERAL SURGERY**. I personallyverified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 21% of plagiarism in the dissertation

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DECLARATION

I, certainly declare that this dissertation titled **"A COMPARATIVE STUDY OF SUBCUTANEOUS SINGLE CLOSED SUCTION DRAIN VERSUS SIMPLE CLOSURE IN EMERGENCY MIDLINE LAPAROTOMY WOUNDS"** represents a genuine work of me. The contributions of any supervisors to the research are consistent with normal supervisory practice and are acknowledged.

I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other university board, either in India or abroad. This is submitted to The Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfilment of the rules and regulations for the award of Master of Surgery Degree Branch-I (General Surgery).

DATE:
PLACE:

Dr. KARTHICK. R
(POST GRADUATE)

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Last but not the least, I thank all my patients for their kind cooperation in this study

CONTENTS

INTRODUCTION

Wound healing is major concern after surgical procedure, because of itsassociation with quality of life and morbidity of patients.

Infections that occur in the wound created by an invasive surgical procedure are generally referred to as Surgical Site Infections (SSIs). Wound infection continues to be a major problem both in terms of how they affect the outcome of surgical procedure and their impact in the length of hospital stay.

Patients requiring Emergency laparotomy procedure has increased risk of surgical site infection and delayed wound healing.

Complications following the closure of abdominal layers after correcting the pathology and peritoneal washings are surgical site infections, wound dehiscence, burst abdomen, wound seroma and wound hematoma.

Wound dehiscence is difficult to manage as re closure frequently leads to respiratory compromise and hypoxia. If left open, there is increased risk of nosocomial infection in the wound. There are number of methods have been used to reduce these complications from time to time.

Negative suction in the subcutaneous plane decreases infection by removal of serum or debris and by elimination of dead space in the plane.

This study is to compare the subcutaneous single closed suction drain and conventional simple closure of skin and subcutaneous tissue in emergency laparotomy cases.

AIM AND OBJECTIVES OF THE STUDY

The primary outcome of study is to determine whether the insertion of a subcutaneous closed suction drain at incisional site reduces the incidence of post operative surgical site infection in emergency laparotomy cases.

The secondary outcome is to find the effect of closed suction drain in reducing the duration of hospital stay when compared to simple closure.

ANATOMY OF ABDOMEN:

Superficial fascia

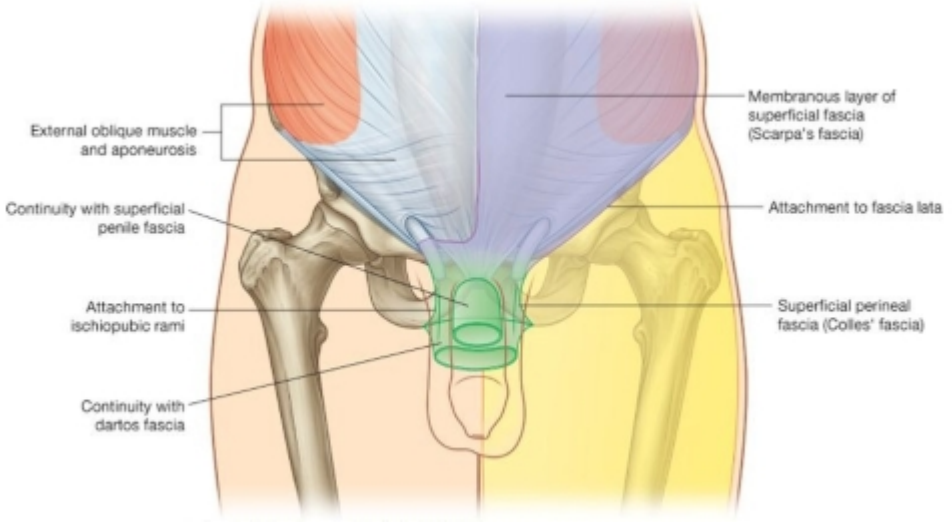
- Single layer of fascia.(1)
- It contains two layers namely superficial and deep layer.
- It contains arteries,veins,and lymph nodes between its superficial and deep layers.

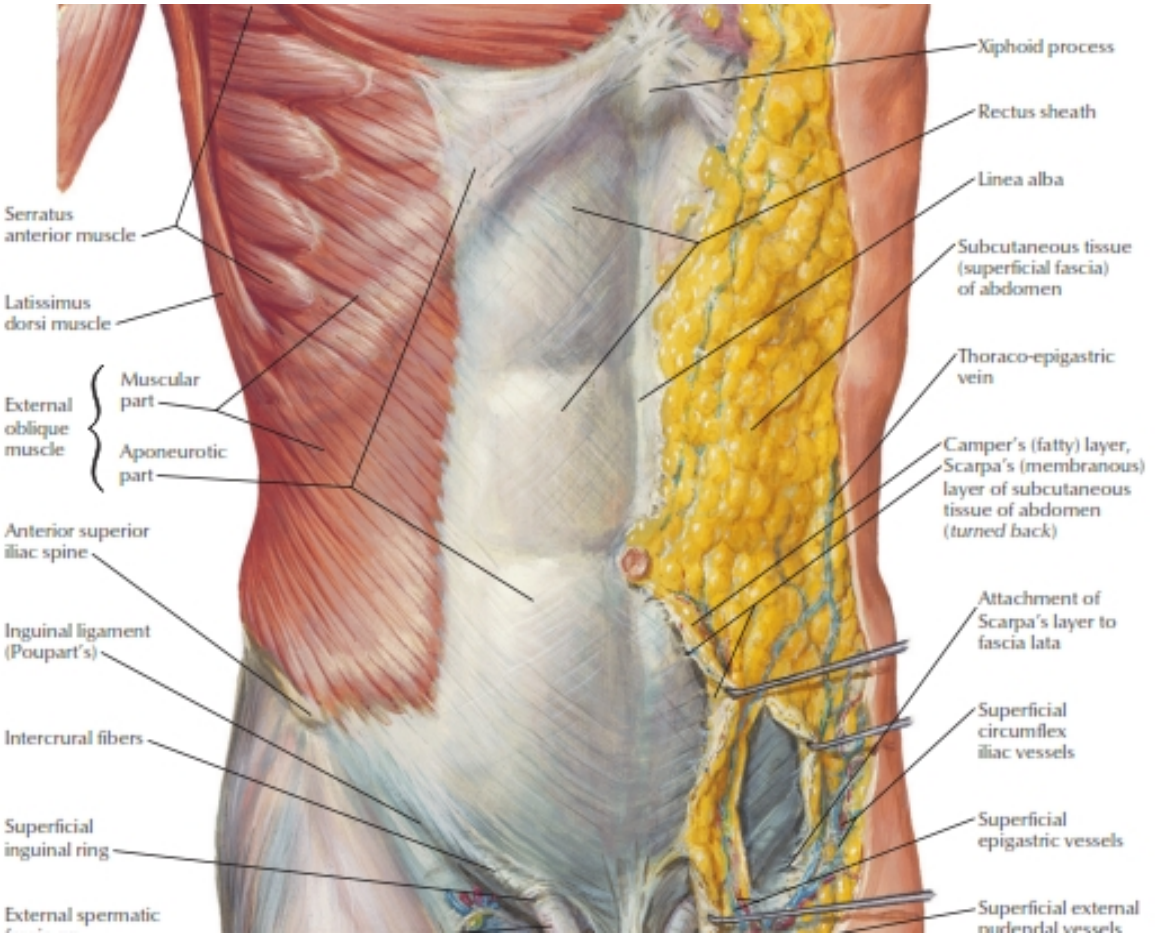
Superficial layer;

- Superficial layer is a fatty layer and is usually thick.
- It continues with its counterpart layer into thigh and perineum.
- It extends over the penis and into scrotum and forms the dartos muscle in males.
- It extends into labia majora and perineum in females.

Deep layer/Membranous layer:

- Deep layer is a membranous layer filled with elastic fibres mostly.
- It forms the superficial ligament of penis.
- It fuse with its counterpart in thigh and perineum.
- It forms superficial inguinal pouch with external oblique.(2)


External oblique muscle and aponeurosis
Membranous layer of superficial fascia (Scarpa's fascia)
Continuity with superficial penile fascia
Attachment to fascia lata
Attachment to ischiopubic rami
Superficial perineal fascia (Colles' fascia)
Continuity with dartos fascia


Xiphoid process
Rectus sheath
Linea alba
Serratus anterior muscle
Subcutaneous tissue (superficial fascia) of abdomen
Latissimus dorsi muscle
Thoraco-epigastric vein
External oblique muscle
Muscular part
Aponeurotic part
Camper's (fatty) layer, Scarpa's (membranous) layer of subcutaneous tissue of abdomen (turned back)
Anterior superior iliac spine
Attachment of Scarpa's layer to fascia lata
Inguinal ligament (Poupart's)
Superficial circumflex iliac vessels
Intercrural fibers
Superficial epigastric vessels
Superficial inguinal ring
Superficial external pudendal vessels
External spermatic

Transversalis fascia(3)**;**

- This fascia lies between transversus abdominis and extraperitoneal fat.
- It continues with thoracolumbar fascia,iliac fascia and pelvic fascia.
- It also joins the inferior surface of diaphragm.
- Its aponeurosis strengthens the inguinal region
- It also forms anterior part of femoral sheath, where it is strengthened by arched fibres extending between anterior superior iliac spine, rectus abdominis and conjoint tendon and ultimately forms the deep crural arch, the inferomedial part of deep inguinal ring.
- It continues as internal spermatic fascia which covers the testis and joins the parietal layer of tunica vaginalis.

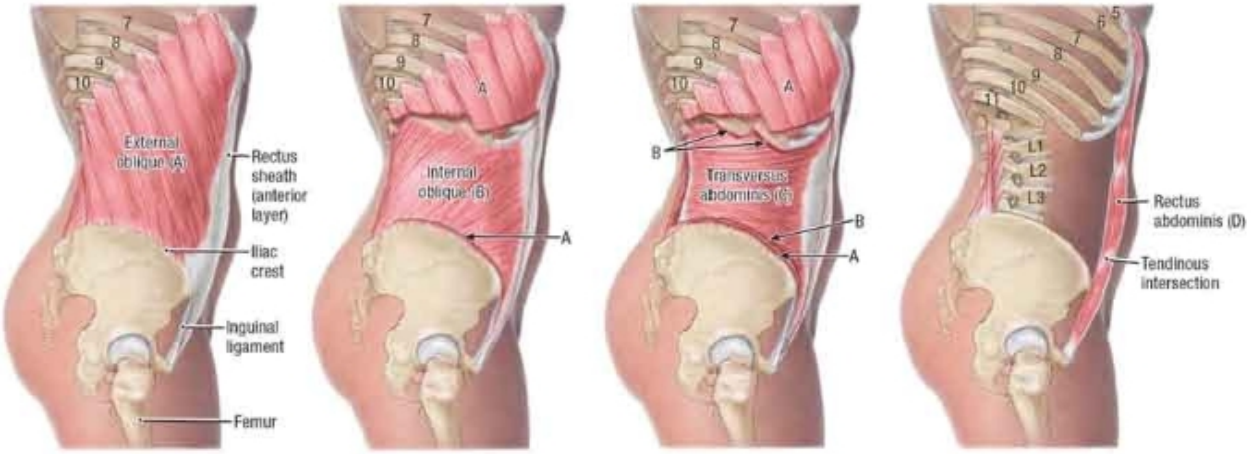
Extraperitoneal connective tissue:

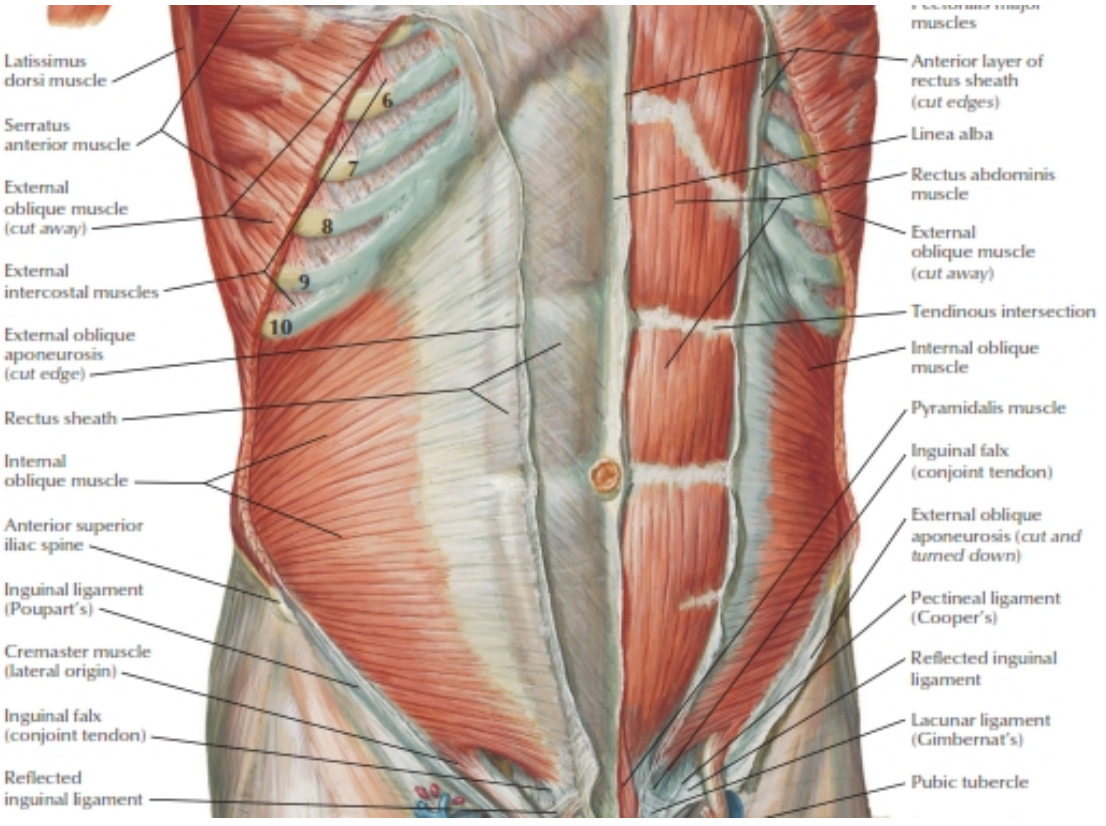
- It is a loose areolar tissue between peritoneum and abdominal fascia which is of varying thickness.
- It is thin in young and is thickened in heavy individuals.

MUSCLES OF THE ABDOMEN:

ANTEROLATERAL MUSCLES OF THE ABDOMEN:

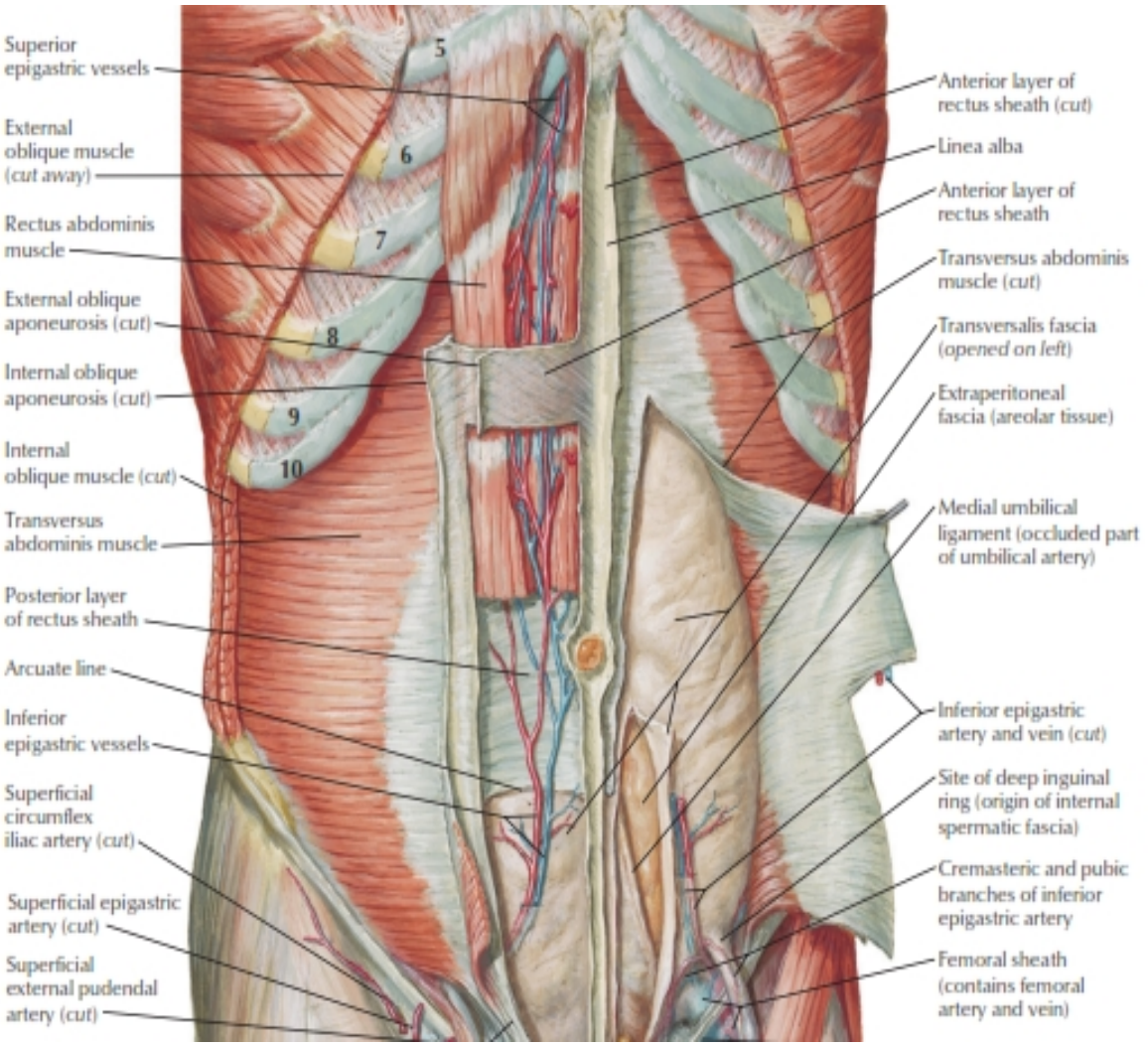
MUSCLES:	FUNCTION:
• Rectus abdominis(4) • Pyramidalis • external oblique • internal oblique • transversus abdominis	• Generation of positive intraabdominal pressure. • Maintenance of abdominal tone • Prevent displacement of viscera • Body movements like standing and sitting • Respiratory movements. • Anterior flexion of trunk • Lateral flexion and rotation


External oblique (A)
Rectus sheath (anterior layer)
Iliac crest
Inguinal ligament
Femur
Internal oblique (B)
Transversus abdominis (C)
Rectus abdominis (D)
Tendinous intersection


Latissimus dorsi muscle
Serratus anterior muscle
External oblique muscle (cut away)
External intercostal muscles
External oblique aponeurosis (cut edge)
Rectus sheath
Internal oblique muscle
Anterior superior iliac spine
Inguinal ligament (Poupart's)
Cremaster muscle (lateral origin)
Inguinal falx (conjoint tendon)
Reflected inguinal ligament
Anterior layer of rectus sheath (cut edges)
Linea alba
Rectus abdominis muscle
External oblique muscle (cut away)
Tendinous intersection
Internal oblique muscle
Pyramidalis muscle
Inguinal falx (conjoint tendon)
External oblique aponeurosis (cut and turned down)
Pectineal ligament (Cooper's)
Reflected inguinal ligament
Lacunar ligament (Gimbernat's)
Pubic tubercle

Rectus abdominis:(4)

- It is a midline muscle separated by linea alba, with three or more fibrous tendinous transverse insertions.
- It is attached to umbilicus and xiphoid process.
- Linea semilunaris extending between ninth costal cartilage and pubic tubercle lies laterally.
- It is attached laterally to pubic crest and medially it is attached to pubic symphysis and linea alba and also to costoxiphoid ligaments.
- It is supplied by superior and inferior epigastric arteries.
- Minor supply arises from subcostal artery, lumbar artery, deep circumflex artery and posterior intercostal artery.
- It can be used as myocutaneous flap for reconstructive procedure.
- Nerve supply is through thoracic spinal nerves through lower intercostal nerves and subcostal nerves..
- Its primary action is flexion of trunk and maintenance of tone during straining.

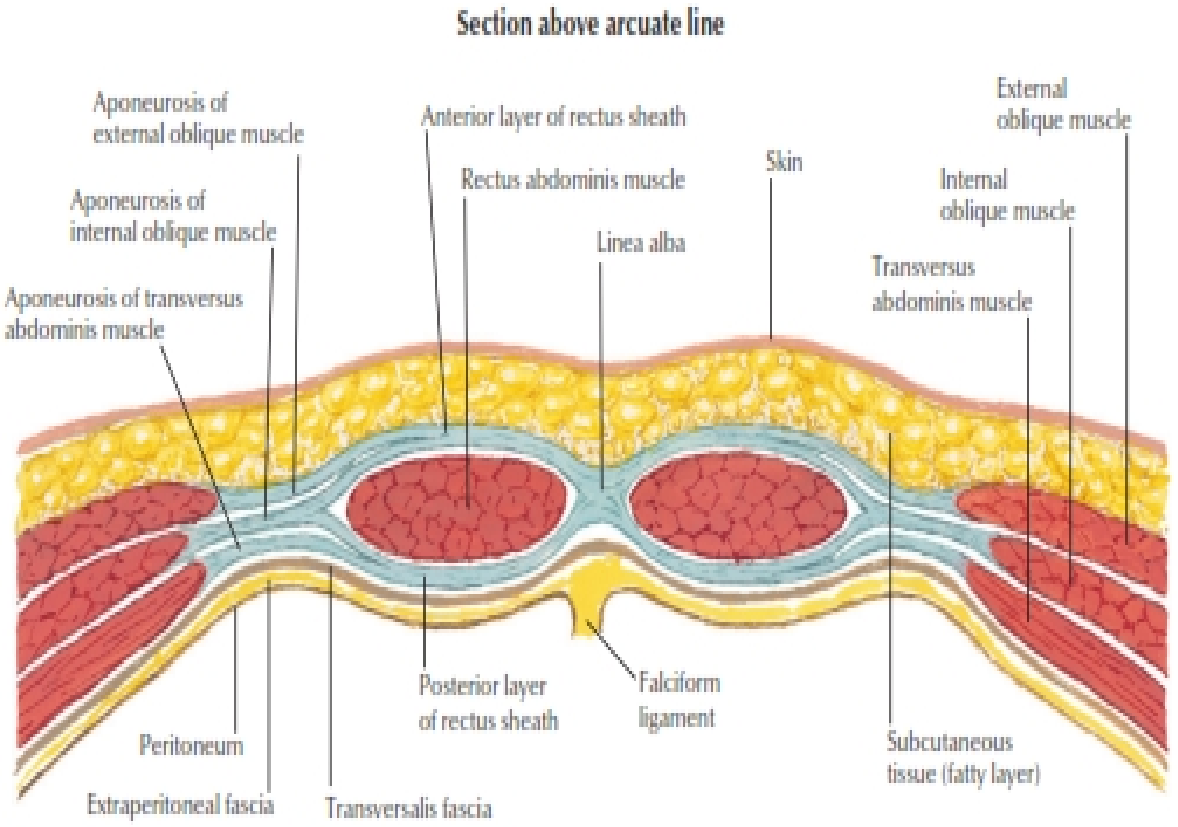

Superior epigastric vessels
External oblique muscle (cut away)
Rectus abdominis muscle
External oblique aponeurosis (cut)
Internal oblique aponeurosis (cut)
Internal oblique muscle (cut)
Transversus abdominis muscle
Posterior layer of rectus sheath
Arcuate line
Inferior epigastric vessels
Superficial circumflex iliac artery (cut)
Superficial epigastric artery (cut)
Superficial external pudendal artery (cut)
5
6
7
8
9
10
Anterior layer of rectus sheath (cut)
Linea alba
Anterior layer of rectus sheath
Transversus abdominis muscle (cut)
Transversalis fascia (opened on left)
Extraperitoneal fascia (areolar tissue)
Medial umbilical ligament (occluded part of umbilical artery)
Inferior epigastric artery and vein (cut)
Site of deep inguinal ring (origin of internal spermatic fascia)
Cremasteric and pubic branches of inferior epigastric artery
Femoral sheath (contains femoral artery and vein)

Rectus sheath:

Rectus sheath is a fibrous sheath which encloses the muscle rectus abdominis

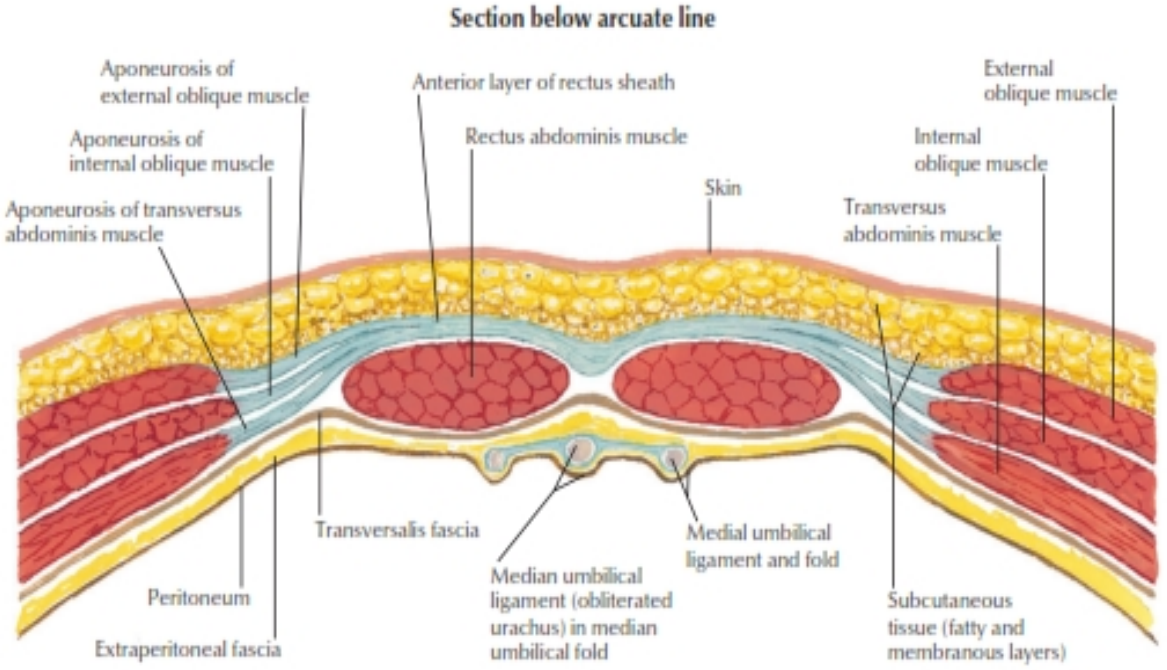
Its anterior and posterior leaves are divided by arcuate line in three types as shown in diagram shown below.

The aponeurosis of external oblique,internal oblique and transversus abdominis contributes the formation of anterior and posterior layer of rectus sheath,where the linea alba is the central insertion segment. Above and below the arcuate line theseaponeurosisinsert in varying manner as shown in the diagram.

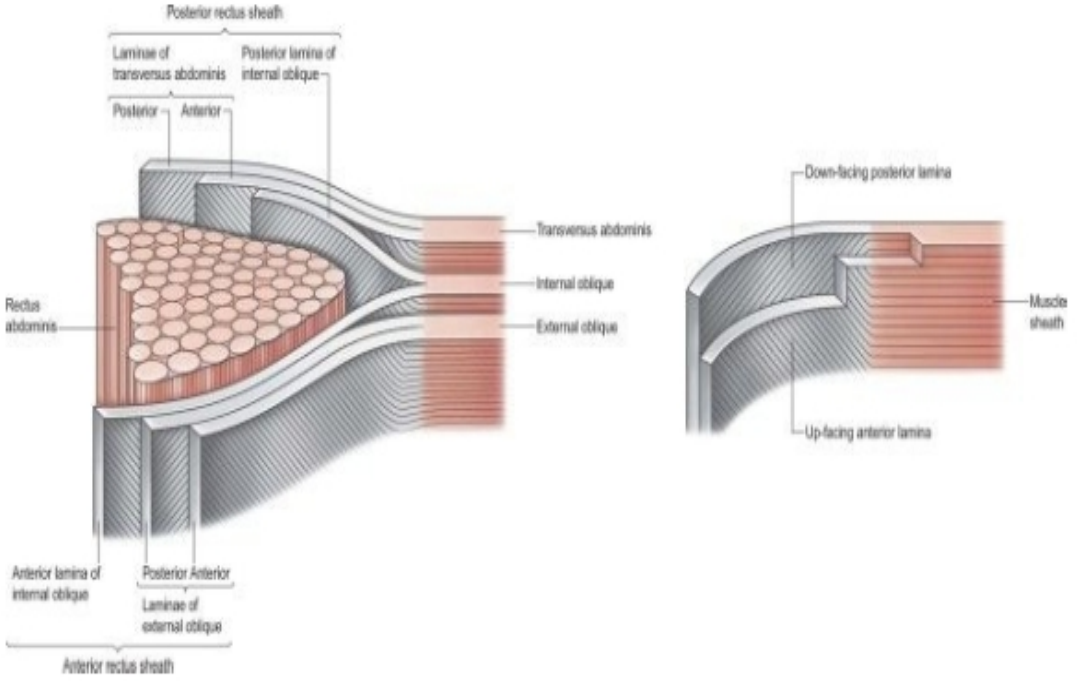


Aponeurosis of internal oblique muscle splits to form anterior and posterior layers of rectus sheath. Aponeurosis of external oblique muscle joins anterior layer of sheath; aponeurosis of transversus abdominis muscle joins posterior layer. Anterior and posterior layers of rectus sheath unite medially to form linea alba.

	RECTUS SHEATH	
	ANTERIOR SHEATH	**POSTERIOR SHEATH**
ABOVE ARCUATE LINE	External oblique and anterior layer of internal oblique aponeurosis.	Posterior layer of internal oblique aponeurosis and transversus abdominis aponeurosis.
BELOW ARCUATE LINE	External oblique, internal oblique and transverse abdominis aponeurosis	Absent



Aponeurosis of internal oblique muscle does not split at this level but passes completely anterior to rectus abdominis muscle and is fused there with both aponeurosis of external oblique muscle and that of transversus abdominis muscle. Thus, posterior wall of rectus sheath is absent below arcuate line, leaving only transversalis fascia.



Linea alba:

- Linea alba is an median raphe which is attached between xiphoid process and symphysis pubis and pubic crest.(5)
- Adminiculumlineaealbae is posterior attachment of linea alba.
- Medial umblical ligaments is formed by obliterated umblical arteries(6).
- Urachus forms the median umbilicalligament.
- Thinning of linea alba presents as a mild midline bulge known as divarication of recti which is not a true herniation as all layers below are intact.

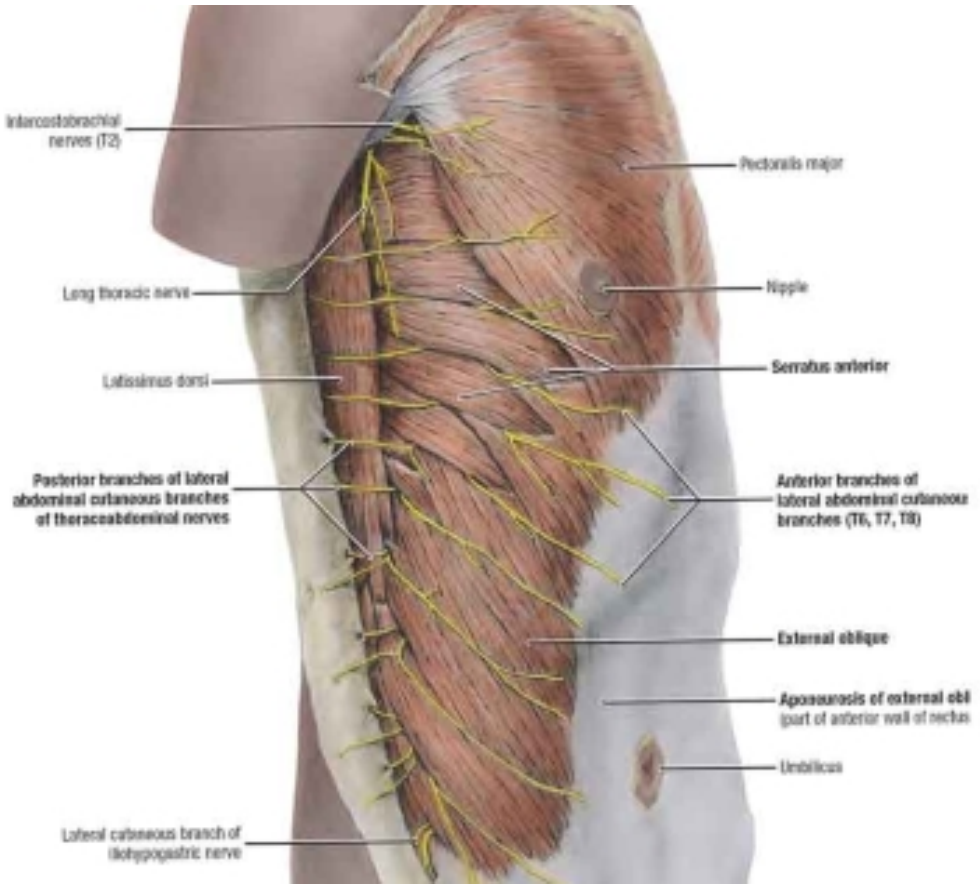
Pyramidalis:

- Triangular muscle in the lower abdomen enclosed in the rectus sheath.
- It is attached to linea alba and pubis.
- It is supplied by inferior epigastric artery
- Minor supply is from deep circumflex iliac vessels.
- Nerve supply is from subcostal nerve(T12).
- It tenses the linea alba.

External oblique:

- It is the largest abdominal wall muscle
- It is attached to ribs 5 to 12, iliac crest, attachments of serratus anterior &lattismus dorsi.
- Its aponeurosis forms the inguinal ligament which is attached to pubic tubercle and anterior superior iliac spine.
- It is supplied by many arteries namely
    - Posterior intercostal vessels
    - Subcostal vessels
    - Superior epigastric vessels
    - Inferior epigastric vessels
    - Circumflex arteries
    - Posterior lumbar arteries.

- ❖ It is supplied by last five intercostal nerves and subcostal nerves.
- ❖ Its action include
    - Abdominal tone
    - Intra-abdominal pressuremaintainance
    - Lateral flexion of trunk



Transversus abdominis:

- ❖ It is the lowermost abdominal muscle.
- ❖ It is attached to:
    - Inguinal ligament
    - Iliac crest
    - Iliac fascia
    - Thoracolumbar fascia
    - Costal cartilages 7-12
    - Pubic crest
- ❖ It forms the conjoint tendon and inter foveolar ligament.
- ❖ Its blood supply include:
    - Posterior intercostal vessels
    - Subcostal vessels
    - Superior epigastric vessels
    - Inferior epigastric vessels
    - Circumflex vessels
    - Posterior lumbar vessels.

❖ It is supplied by

- Intercostal nerves 7 to 11
- Subcostal nerve
- Iliohypogastric nerve
- Ilioinguinal nerve

❖ Its action include abdominal tone and intra-abdominal pressure.

ANTISEPSIS AND ASEPSIS

Major surgeries would require “antisepsis(7), asepsis” to preventsevere complications. Joseph Lister introduced systematic, scientifically based antisepsis to treatthe wounds and use in surgical operations. According to him,excessive heat could not be applied for the surgical patient.

Scrubbing hands created crevices in the palm which can “harbour bacteria and cause infection”,so he didn’t advocate hand scrubbing.

All his ideas were poorly perceived and utilised as they were complex, time consuming many surgery, Autoclavinginstruments, use drains to avoid collection the “surgical wounds.

WOUND HEALING

DEFINITION – Wound healing(8)defined as restoring anatomical and physiological integrity of damaged tissues by blood corpuscle

TYPES OF WOUND HEALING

Primary healing- first intention. It occurs in clean wounds, which leads to a linear smooth scar.

- ✓ Secondary healing –

Secondary healing -second intention. It occurs inextensive tissue loss.Wound healsby fibrosis. Results inhypertrophied scar, contracted scar and disability.

- ✓ Tertiary healing - Delayed primary closure

WOUND HEALING INCLUDES

1. Inflammatory reaction
2. Granulation
3. Epithelialization.
4. Scarring
5. Maturation.

PHASES OF WOUND HEALING

INFLAMMATORY PHASE

Inflammatory phase begins immediately after the injury and lasts upto60-72 hours. It usually comprises of coagulation and chemotaxis. First vasospasm & thrombus formation and followed by vasodilation. The five cardinal features of inflammation are rubor, calor, tumor, dolor and loss of function.

PROLIFERATIVE PHASE

Also known as collagen or fibroblastic phase. It starts from 3rd day and last for 4-6 weeks, comprises of

- ✓ Granulation tissue formation which is made of fibroblast, capillaries, collagen andfibronectin,Angiogenesis response for VEGF(9)
- ✓ Fibroplasia due to Fibroblast proliferation and type 3 collagen. Basal layer of epidermis migrates tothe surface and proliferates, differentiate and stratifies to promote wound closure.

REMODELING PHASE

Maturation phase.

From Six weeks andlast upto 1 year. The tensile strength is due to maturation, cross linking and alignment of the collagen fibres

Myofibroblast causes contraction of the wound.

Type 1 collagen(10)– seen in maturation, final scar, and normal skin

Type 3 collagen -Granulation

Matured scar is avascular and acellular

Collagen production reduces after 4 weeks of wound healing. A normally healed wound gains 50% of the tensile strength after 6 weeks

SURGICAL WOUND COMPLICATIONS

SEROMA

The collection of serum, liquefied fat or lymphatic fluid under the incision in the subcutaneous layer is called seroma(11).Occurs after raising large skin flaps.

Manifest as a localized swelling causing discomfort or discharge of clear liquid from the immature wound.Suction drains can prevent formation of seroma under the flaps.

Wound closure with a suction drain should be done for surgeries with synthetic mesh

HEMATOMA

Abnormal collection of blood in the subcutaneous layer in a recent incision. Hematomas are more prone for secondary infection. Hematoma(12) can present as

- Pain,
- Localizedswelling with skin discoloration
- tenderness on palpation
- Drainage of dark red fluid through the fresh wound.

Closed suction drains placed in subcutaneous spaces.Removal of drain depends on the quantity of drainage.

WOUND DEHISCENCE:

Burst abdomen refers to the postoperative separation of the abdominal muscleaponeurotic layers is called wound dehiscence (13)or acute wound failure

It carries the risk for

- evisceration,
- wound separation
- SSI
- Its convert into future incisional hernia

Incidence is 1-3% in emergency abdominal operations. It occurs within 7-10 days (POD)

The factors associated with wound dehiscence includes

- emergencysurgery,
- intra-abdominal infection,
- obesity,
- wound infection,
- hematoma,
- seroma,
- compartment syndrome,
- chronic corticosteroid use,
- previous wound dehiscence,
- malnutrition,
- Radiation therapy and chemotherapy.

Wound dehiscence initially managed conservatively with abdominal binder and saline moistened gauze. Healthy wound can be closed primarily. Wound infected mayrequire debridement & closure.

NEGATIVE PRESSURE WOUND THERAPY:

Negative pressure(14), works on the principle of wound suction. A vacuum assisted closure device is used. The device consists of a

- vacuum pump,
- canister with connecting tubing,
- open pore foam,
- Semiocclusive dressing.

The advantage of negative pressure wound dressing includes

- immediate coverage of the wound,
- acts as the temporary dressing,
- does not require suturing to the fascia, infection control,
- less chance for Intraabdominal Hypertension .

Suction drain pressure 100-500 mm Hg applied to the wound.Open-pore foam “decreases in size and transmits the negative pressure to the surrounding tissue”This leads to the contraction of the wound,removal of extra cellular fluid and decrease in wound size. It stabilizes the wound environment, microdeformation of the foam wound interface. These effects willlead to cellular proliferation and angiogenesis,thus accelerating the wound healing.

SURGICAL SITE INFECTION (SSI):

Surgical site infections(15)are major problem and an important cause of postoperative morbidity, prolong the duration of stay. If “uncontrolled it can lead to profound sepsis and even death”. It accountsto 45% of the hospital acquired infections in postsurgical patients. The surgical wound encloses both internal and external area of the body that involves entire surgical wound.

The categories of surgical wound complications are as follows:

1. Superficial layer - skin and subcutaneous tissue

2. Deep layer - fascia and muscle

3. Organ space infection.

Chronic SSI can arise from bacterial bio film.Surgical site infection is a very common surgical complication; culture negative SSI is a major problem in management. Removal of sutures and efflux of wound collection helps in resolving.

Defining an “SSI is based on evidence of clinical signs and symptoms of infection rather than microbiological evidence” alone. SSI affect only the superficial tissues, but serious infections affect the deeper tissues or other parts of the body. SSIs become evident within a month of an operative procedure mainly between 5th to 10th post operative days

SUPERFICIAL INCISIONAL INFECTION:

Incisional site Infection <30 days affects skin &subcutaneous tissue with purulent discharge. Diagnosis of superficial site infection by a surgeon or with features of rubor, calor and tender.

DEEP INCISIONAL INFECTION:

Incisional site Infection < 30 days without implant or soft tissue involvement or infection occurring in less than one year after surgery with an implant or involving fascia and muscle along with purulent discharge without involving deep organs, abscess found in deep space on direct, radiological examination or reoperation, diagnosis of deep space infection by symptoms of fever, pain, tenderness leading to dehiscence.

ORGAN SPACE INFECTION:

Incisional site Infection(16)<30 days or<1 year post surgery with an implant infection; involves any part of operation, that is openedmanipulated along with purulent discharge.

Surgical site infections occur due to dirty wound with bacteria .bacteriacould be from an endogenous source present in the wall of bowel and its form enterocutaneous fistulas. The exogenous sources are mainly due to contaminated equipment’s, implants, gloves or operating room. The source of surgical site infections can be identified by culture.

Response to injury includes:

- Autonomic nervous system activation
- HPA axis activation
- Peripheral insulin resistance
- Formation of pro-inflammatory and anti-inflammatory cytokines
- nitrogen intermediates(17)
- C reactive protein level high,
- Recruitment and activation of neutrophils, monocytes, macrophages &lymphocytescoagulation abnormality(18)

Port of entry is required for the potential pathogens to invade the normal tissue of the body which include “injured tissue, incision, puncture site or indwelling catheter”.

Injury leads to the following immune dysfunction:

- Lymphopenia which causes downregulation of proliferation of T& B lymphocytes, NK cell activity, decreased interleukins expression.
- Monocytosis which causes upregulated acute phase proteins, increased production of
- inflammatory cytokines production and increased production of eicosanoid
- Downregulation of neutrophil function.

HORMONAL RESPONSE TO SURGICAL STRESS:

Hormones like Corticotrophin, growth hormones, Arginine, vasopressin, cortisol & aldosterone increases.

Hormones like insulin & thyroid hormones decreases.

IMMUNE CELL RESPONSE WITH EFFECT TO HYPERGLYCEMIA(19)

- Decreased alveolar macrophages.
- Decreased stimulation of chemokinesis due to decreased insulin.
- Glucose induced activation of protein kinase C.
- Increased production of adherence molecules
- Neutrophil activation.

EFFECTS OF STRESS ON CARBOHYDRATE

Increase peripheral carbohydrate uptake, increase glucose synthesis, decrease glycogen metabolism, peripheral insulin resistance these all factor post op SSI

Risk of postoperative infection increases in the following medical conditions:

- <1 year and >65yr
- Malnourished
- Morbid Obesity
- Uncontrolled DM
- irradiation therapy

- Hypothermia
- Immunocompromised state
- Chronic inflammation
- Decreased cholesterol levels.

INTERACTIONS BETWEEN THE HOST AND THERAPY:

The infection by microorganisms occur due to defect in host defence mechanism

- Exposure to lowintraoperative or postoperative temperature in theatre and ICU,
- Unwarmed fluid infusion in large volume,
- Evaporative losses during intracavitary surgery.

Peripheral and cutaneous vasoconstriction tries to preserve the lost heat. But this leads to decrease in microcirculatory blood flow. Hypothermia has immunosuppressive effects & affects cardiovascular performance which may increase mortality. Tissue hypoxia also leads to SSI.

Oxygen supplementation promotes wound healing.

Transfusion of blood and blood products in altered host mechanism leads to

- Source of infection
- Altered leukocyte antigen presentation
- Shift to the T helper cell phenotype leading to immunosuppression.

- Impaired erythrocyte deformability due to prolonged blood storage,
- Microcirculatory disruption and
- Impaired oxygen offloading.
- Organ dysfunction in severe sepsis.

CONTROL OF BLOOD SUGAR:

Surgical stress causes hyperglycemia due to increasedcatabolism and insulin resistance. It impairs host immune mechanism.Perioperative glycemic controlreduces the risk of infections in surgical patients.

Postsurgical nutritional support is mandatory to restore anabolic activity. Calories in excess of basal requirements of 25-30 kcal/day and protein in excess of 1g/kg/day will be required in the postoperative period to restore the anabolism. Starting of early enteral feeds will be beneficial.

INFECTION CONTROL:

Infection control plays the most important aspect in control of surgical site infections. Indwelling catheters like central line and foley's catheter are to be inserted under strict aseptic precautions.

Hand hygiene →most important and effective way of reducing surgical wound infection.

Common source of bacterial pathogens are normal flora from skin, respiratory tract and gut lumen. So If any break in natural epithelial barriers due to incisions, percutaneousor urinary catheters creates a portal for pathogen entry.

CATHETER CARE:

- Avoidance of catheter wherever not necessary.
- Proper catheter selection such as antimicrobial or antiseptic coated
- Adequate skin preparation and barrier protection during insertion
- Proper dressing of indwelling catheter

Central venous catheters,endotracheal tubes, intercostal thoracotomy catheter& urinary catheters all carry the risk of infection.

Chlorhexidine in combination with alcohol is bactericidal, viricidal and fungicidal. Chlorhexidine disinfectant is used for vascular catheter insertions, bathing of critically ill patients. Surgical skin preparation can be done with povidine iodine solution and allowed to dry for its microbicidal action to occur.

RISK FACTORS FOR POST SURGICAL WOUND INFECTIONS:

- Patient factors
- Preoperative factors
- Operative factors
- Postoperative factors
- Other factors

PATIENT FACTORS:

- Age, sex, smoking
- Nutritional indices
- Anticancer therapy
- Metabolic factors(DM, hepatorenal failure)
- Morbid obesity

PRE OPERATIVE FACTORS

- Nasal decontamination
- Mechanical bowel preparation
- Skin preparation

OPERATIVE FACTORS:

- Previous surgery
- Antiseptic-impregnated incise drapes
- Length and complexity
- Operating surgeon
- Blood loss
- Antimicrobial sutures
- Diathermy

POST OPERATIVE FACTORS

- Antiseptic lavage of wounds and cavities
- Antimicrobial dressing
- Supplemental oxygen in recovery

OTHER FACTORS

- Theatre environment
- Theatre wear
- Wound drainage

CLASSIFICATION OF SURGICAL WOUNDS(20)**:**

1) Clean wounds– hollow viscusnotentered, primary wound closure done.Infectivity rate of 1-3%. Eg: herrnioraphy, excision.

2) Clean-contaminated wounds – hollow viscus entered but controlled, no inflammation, primary wound closure, minor break in antiseptic technique, mechanical drain used, and bowel preparation preoperatively. Infectivity rate of 5-8%. Eg; appendicectomy, bowel surgeries.
3) Contaminated wounds – uncontrolled spillage from viscus, inflammation apparent, open or traumatic wound, major break in aseptic technique. Infectivity rate of 20-25%.Eg:Acute abdominal condition, open fresh accidental wounds.

4) Dirty wounds – untreated, uncontrolled spillage from viscus, pus in operative wound, open suppurative wound, severe inflammation. Infectivity rate around 30-40%. Eg: abscess drainage,pyocele.

ORGANISMS CAUSING SURGICAL SITE INFECTIONS:

Gram positive organisms:-

- ✓ Staphylococcus aureus (most common),
- ✓ coagulase-negative staphylococcus,
- ✓ Enterococcus spp..
- ✓ Hemolytic streptococcus
- ✓ Clostridium perfringens

Gram negative organisms such as

- ✓ Escherichia coli,
- ✓ Pseudomonas aeruginosa and
- ✓ Klebsiella
- ✓ Proteus

National Nosocomial Infections Surveillance (NNIS) System the risk of patients is stratified according to three factors such as

- ✓ Operation classification as contaminated or dirty,
- ✓ Duration of the operation, defined as procedureexceeds the 75^{th} percentile in NNIS survey,
- ✓ Patients with American Society of Anesthesiology score of 3,4 or5.

PRESENTATION OF SURGICAL SITE INFECTIONS:

Symptoms occur within 30 days of the operative procedure. Major and minor surgical site infections are characterized by pain, discomfort, erythema, significant drainage and delay in return home.Site of infection will be soft or even fluctuant

According to the Joint Commission, the wound is said to be infected when

- Grossly purulent material drains from wound
- Burst opening of woundwith purulent discharge
- Microbiological culture positive for organisms from discharge fluid.

TREATMENT MODALITIES:

Surgical site infections prevention relies on changing modifiable risk factors.

Non modifiable risk factors

- age,
- morbid obesity and
- complexity of the surgical procedure

Modifiable risk factors

- Abstinence from smoking for 30days
- Glycemic control in Diabetes
- Nutritional supplement for severely malnourished patients

- Weight reduction
- Skin preparation and application of antiseptic solution.
- Prophylactic antibiotics is used when there is risk of wound contamination. A first generation cephalosporin such as cefazolin in the case of hernioplasty. Administration of a second generation cephalosporin such as cefoxitin or a beta lactamase inhibitor for patients undergoing upper gastrointestinal surgery or complex biliary tract operations, elective colonic resection. Ertapenemfor lower gastrointestinal surgeries.
- Prophylactic antibiotic is administered 30 minutes prior to surgical incision.

Precautions at the time of surgery

- Hand wash by operating personal
- Patient's parts preparation
- Sterile draping
- Meticulous dissection, hemoastasis and debridement of unhealthy tissue
- Avoid spillage of bowel contents
- Precautious dissection of blood vessels
- strict aseptic precautions
- Peritoneal lavage
- Avoid hypothermia

TREATMENT OF SURGICAL SITE INFECTIONS

Superficial and deep infections –

- ✓ Skin sutures or staples are removed over the area of infection
- ✓ Efflux of purulent material or pus.

Debridement of non-vitalized tissue in case of intact fascial layer. Wound irrigation with saline and saline moistened gauze promotes healing from base.Premature skin closure is to be avoided

Antibiotics of choice is decided bysensitivity of organisms.Antibiotics is not the sole treatment of SSI, needs open drainage and debridement

By secondary intention, post surgical wound heals. In case of clean wound, primary closure or negative pressure wound therapy can be attempted.

OBESITY AND SURGICAL WOUND:

Obesity is defined as “body mass index more than 30kg/m^2 based on the formula given as weight in kg divided by the height in metre square”.

The degree of obesity(21)

Normal weight – 18.5-24.9

Overweight -25-29.9

Obesity grade I – 30-34.9

Obesity grade II- 35-39.9

Obesity grade III - >40

(a) Body mass index (BMI): method to measure obesity

(b) Skin fold thickness (biceps, triceps, suprailiac and subscapular): it measures the subcutaneous fat which indicates the distribution of body fat.

(c) Waist circumference: it is the common method to measure the risk of cardiometabolic affection .

(d) Waist-to-hip ratio: it determines fat distribution and it is not used frequently.

(e) Waist-to-height ratio: waist-to-height ratio is a better screening tool compared to waist circumference and BMI to assess cardiometabolic risk factors in both sexes.

DRAINS IN SURGERY:

A drain is a created channel which allows any collected fluid to come out after closure of the main wound. Subcutaneous drain is used to

- remove the collected fluid,
- obliterates the dead space
- prevents fluid collection in subcutaneous space.

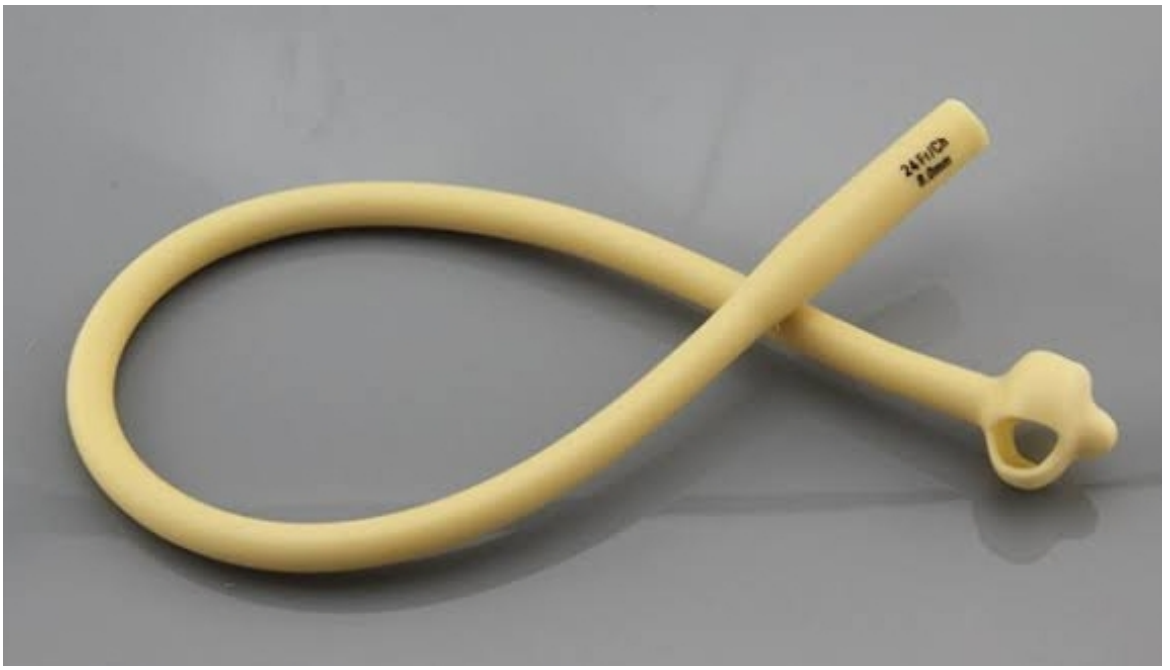
TYPES OF DRAINS

TYPES	FEATURES
Corrugated rubber drain	principle of capillary action and gravity
Glove drain	
Sump drain	parallel air vent is present, so it never gets blocked.
Tube drains	Malecot catheter drain Penrose soft latex rubber tube drain multiple perforated tubes.
Closed suction tube drain.	
Wick drain	

CLASSIFICATION OF DRAIN SYSTEM:

DRAINS	FEATURES
Static or open drains	corrugated drains &penrose drains. Higher Infection rate.
Closed siphon drains	Connected to a sterile bag. Decreased Infectivity rate.
Closed suction drain	Secretions drained by negative pressure
Sump suction drains	Negative suction along with air vent.
Water seal drain	

MALECOT CATHETER



DRAIN MANAGEMENT

Indications using surgical drain

- Collapse the dead space in areas of excessive redundant tissue.
- Enable focused drainage of pus in abscess, thereby preventing premature closure of abscess cavity.
- Ensure the warning of surgical leak (faeces, urine). Hence it is known as sentinel drain.
- Control an established fistula.

ADVANTAGES OF TUBE DRAINS:

- Measure the Volume of fluid drained.
- Used for longer duration
- Skin excoriation can be avoided
- Comfortable to the patient.
- Less chance of Infection.
- Easy removal.
- Position confirmation by C-ARM.

USES

- In enterocutaneous fistula to collect irritant discharge
- In pancreatic fistula, for collection of activated enzymes.
- In tracheoesophageal fistula to drain proximal stump

CORRUGATED RUBBER DRAIN:drains by capillary action and gravity.

Advantage:Cheap and technically easier.

Disadvantage: soakage of dressing causes discomfort to the patient.

Sialastic drains are inert and has minimal tissue reaction.

Red rubber drain induces an intense inflammatory tissue reaction around the tube and have more chance for permanent tracteg:biliary T-tubes.

DRAIN CARE

. 1) Daily sterile dressing should be done around the drain site.

1)The drain should be emptied daily by measuring the quantity and nature of the drain. Drain can be removed according to the amount of fluid drained.

This picture showes without drain

Drains can get blocked or occluded by flakes or clot. If they are occluded it results in retaining of fluid that can contribute to infections. The patency of the drain should be checked frequently. Once the drain is blocked the drain should be removed immediately. Rate of infection is increased if the drain is dislodged. When the drain is dislodged it may not drain adequately and it gives a false impact. Sometimes drain may delay the healing process inside


REDMI NOTE 7 PRO
48MP DUAL CAMERA

REVIEW OF LITERATURE

1. M Vashist, A Singla, V Malik, M Verma., ABDOMINAL WALL CLOSURE IN THE PRESENCE OF SEPSIS: ROLE OF NEGATIVE SUCTION. The Internet Journal of Surgery. 2013 Volume 29 Number 1.

   They conducted study on 100 cases of perforation peritonitis. In Group A, 50 Patients had abdominal wall closure with suturing of the sheath with continuous suture and the subcutaneous space drained by negative suction drain. In Group B, 50 patients treated with conventional closure of the sheath with interlocking continuous suture without negative suction drain. They observed that the incidence of wound dehiscence, wound infection and respiratory complications was much lower with group A pts. Wound healing time was faster for patients who had abdominal wall closure with negative suction drain.

2. Rakesh Kagita, Sameer Ahmed Mulla, B. Srinivas Pai, Mallikarjun Desai., SUBCUTANEOUS NEGATIVE PRESSURE VERSUS SIMPLE CLOSURE OF SKIN INCISION FOLLOWING AN EMERGENCY LAPAROTOMY: A RANDOMIZED CONTROL STUDY. International Surgery Journal 2019 Apr;6(4):1230-1237. Conducted study on 76 patients who underwent emergency laparotomy and concluded that subcutaneous negative pressure prevents post-operative SSIs with statistical difference ($p<0.05$) and reduces hospital stay.

3. Yagnesh Vaghani, Jeeten Chaudhari, Sudhir Navadiya., A STUDY OF SUBCUTANEOUS NEGATIVE PRESSURE CLOSURE VERSUS SIMPLE CLOSURE IN LAPAROTOMY WOUND OF ILEAL PERFORATION. Int J Med Sci Public Health 2014;3:24-26. In the study population of 60 cases, they observed the average rate of wound infection, hospital stay and the need for second surgery in the form of secondary suturing and burst abdomen repair are significantly lower in the group with negative pressure closure. More over negative pressure closure avoids wound infection by removing the collection and helps in reducing hospital stay and morbidity.

4. Zuo Jun Zhen, Eric C.H. Lai, Qing Han Lee, Huan Wei Chen, Wan Yee Lau, Feng Jie Wang., CONVENTIONAL WOUND MANAGEMENT VERSUS A CLOSED SUCTION IRRIGATION METHOD FOR INFECTED LAPAROTOMY WOUND – A COMPARATIVE STUDY. International Journal of Surgery 9 (2011) 378-381. There were 70 patients in study group and 60 patients in control group. The hospital stay and time of wound healing were significantly better in study group. The re-infection rate is lower in study group.

5. Jyothi Bindal, Geetanjali Munda., A CLINICAL STUDY TO COMPARE DRAIN VERSUS NO DRAIN IN POST CESAREAN SECTION. International journal of Reproduction, Contraception, Obstetrics and Gynecology.2017 Sep;6(9):3903-3906 A prospective study done on 100 patients admitted in Department of Obstetrics and Gynaecology, Kamla Raja Hospital, G.R.M.C., Gwalior between November 2015 to March 2016. Study divided into two groups: group I, women who had no subcutaneous drain and group II, women who had a subcutaneous drain left before closure of the skin; Each group has 50 patients. The study included term pregnant women with pre-operative Hb >9 gm%, BMI >30 kg/m2. The mean hospital stay in patients without drain were 9.4 days and patients with drain were 8.2 days. Mean haemoglobin in patient with drain was 8.6 gm% and patients without drain was 9.4 gm%. Wound seroma in 13 cases and superficial breakdown in 4 cases in non-drain group versus 5 cases and 2 cases in drain group. Patients with drain have reduced rates of wound seroma, postoperative pain, shorter hospital stay, but insignificant benefit regarding post-operative fever, superficial SSI, wound breakdown and hemoglobin concentration.

MATERIALS AND METHODS

STUDY CENTRE: The study was conducted in the General surgery department of Government Vellore Medical College & hospital, Vellore after obtaining Institutional Ethics Committee approval.

STUDY PERIOD: May 2018 – July 2019

SOURCE OF DATA: All patients undergoing emergency laparotomy procedure at Government Vellore Medical College, Vellore.

SAMPLE SIZE: 100 patients, 50 in each group

T Tests - Means: Difference between two independent means (two groups)

Analysis: A priori: Compute required sample size

Input:	Tail(s)	= One
	Effect size d	= 0.5041
	α err prob	= 0.05
	Power (1-β err prob)	= 0.80
	Allocation ratio N2/N1	= 1

Output: Non centrality parameter δ =2.5205000

Critical t = 1.6605512

Df = 98

Sample size group 1 = 50

Sample size group 2 = 50

Total sample size = 100

Actual power = 0.8046047

STUDY DESIGN: A randomized control study

STUDY POPULATION: All patients undergoing emergency laparotomy procedure, who fulfilled the inclusion criteria were selected for the study. The procedure was explained to them in detail and written consent was obtained.

INCLUSION CRITERIA:

- Patient undergoing emergency laparotomy with midline incision
- Patient aged between 20-59 years of both sex
- Patients with BMI >31
- Females and males

EXCLUSION CRITERIA:

- Patients age<20 and>60 years
- Patients who are previously operated
- Patient refusal

- Patients who are immunocompromised
- Patients with Diabetes mellitus,
- Patients with jaundice,
- Patients with anaemic Hb<10 gms,
- Patients on steroid intake, radio therapy,
- Patients with hepatic and renal insufficiency
- Pregnant and lactating mother.

PROCEDURE

A prospective comparative study in which patients where randomized before surgery into two groups by systemic random sampling.

Group A 50 patients with subcutaneous closed suction drain,

Group B 50 patients without drain

Patients received in emergency department. Diagnosis made clinically and confirmed by various diagnostic modalities. Vital parameters are checked. Initial resuscitation done with crystalloids and blood products whenever necessary. Study procedure was explained to patient and patient relatives, informed written consent was taken. Study group was randomly allocated.

In operation theatre, surgical site was cleaned with povidine iodine and alcohol. Sterile draping done. Abdomen opened by midline incision using scalpel. After surgical procedure, thorough peritoneal wash given. Rectus sheath closed by non absorbable suture material.

A suction drain (mini-vac 8f) was positioned with its tip lying over the subcutaneous layer and brought out through healthy skin by separate stab incision away from the wound and connected to a closed suction drain. For all patients, incision line was closed using polyamide 2.0 mattress sutures and dressed.

METHODOLOGY

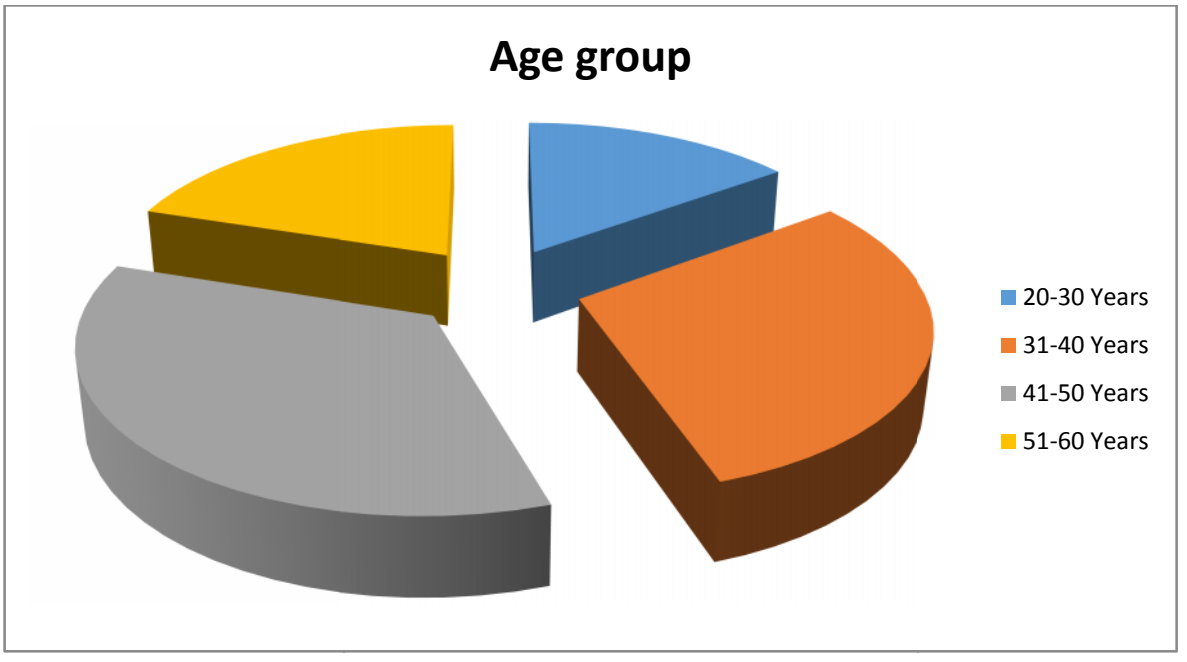
- Quantity of drainage from mini vac 8f drain was noted after every 24hrs. Sterile dressing done every day
- If collection present on the surgical site,it will be evaluated for culture/sensitivity.
- Sensitive antibiotics was started.
- Amount of drainage was recorded daily.
- Drain was removed when the output is less than 5ml(24hr)
- Sutures were removed (alternate on 8^{th}&10^{th} day) before discharge from hospital. Patients discharged only after the removal of drain.

RESULTS

Frequency Table

Table 1 - SHOWS AGE WISE DISTRIBUTION OF PATIENT IN THE STUDY

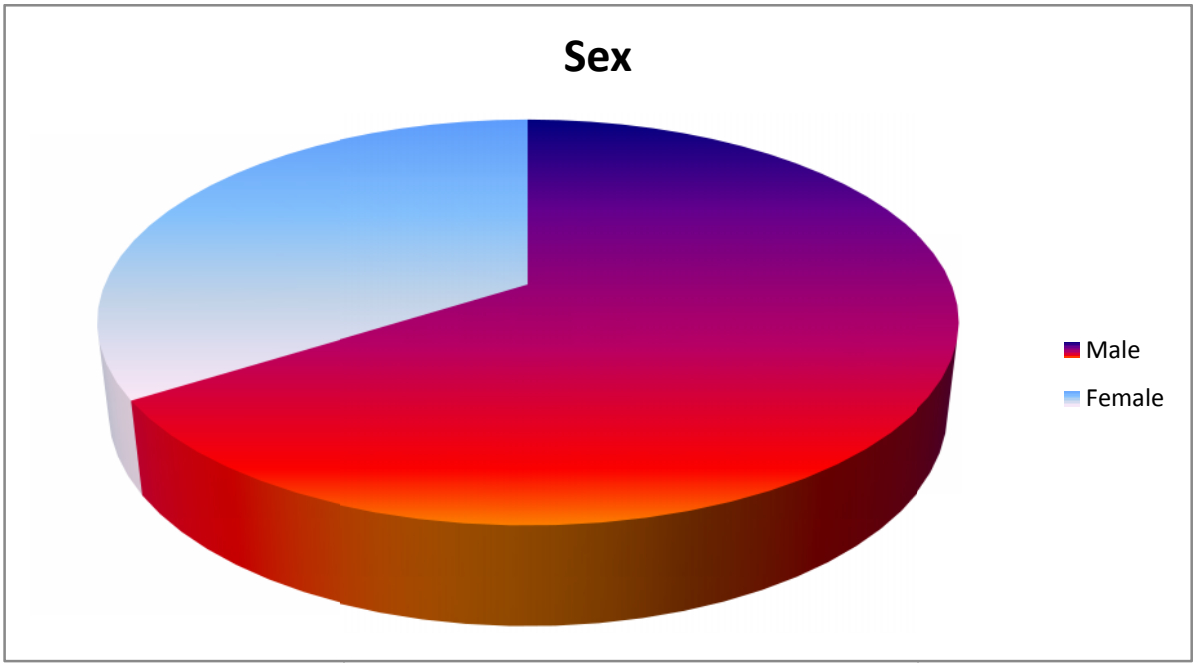
Agegroup	Frequency	Percent
20-30 Years	15	15.0
31-40 Years	30	30.0
41-50 Years	35	35.0
51-60 Years	20	20.0
Total	**100**	**100.0**



Total study population is 100 patients. Age wise distribution from 21-30 years was 15 patients. 30 patients between 31-40years. 35 patients in the age group of 41-50 years. 20 patients in 51-60 years.

Table 2. SHOWS GENDER DISTRIBUTION

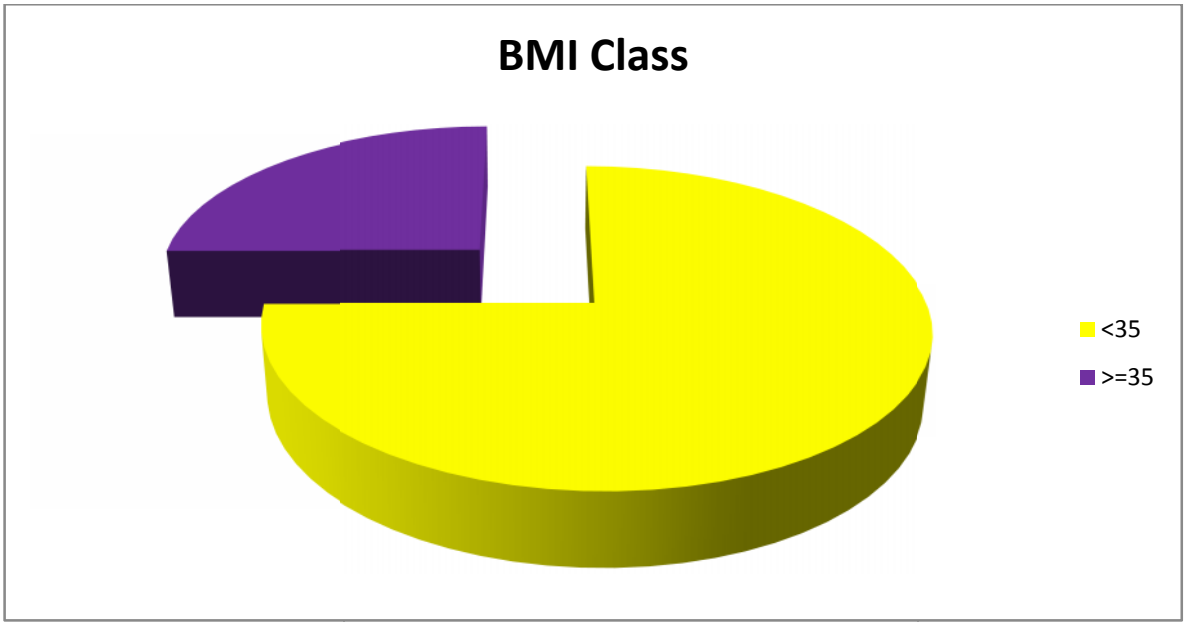
SEX	Frequency	Percent
Male	66	66.0
Female	34	34.0
Total	100	100.0



Among 100 patients in the study population, 66% were male patients and 34% were female patient

Table 3. BMI CLASS

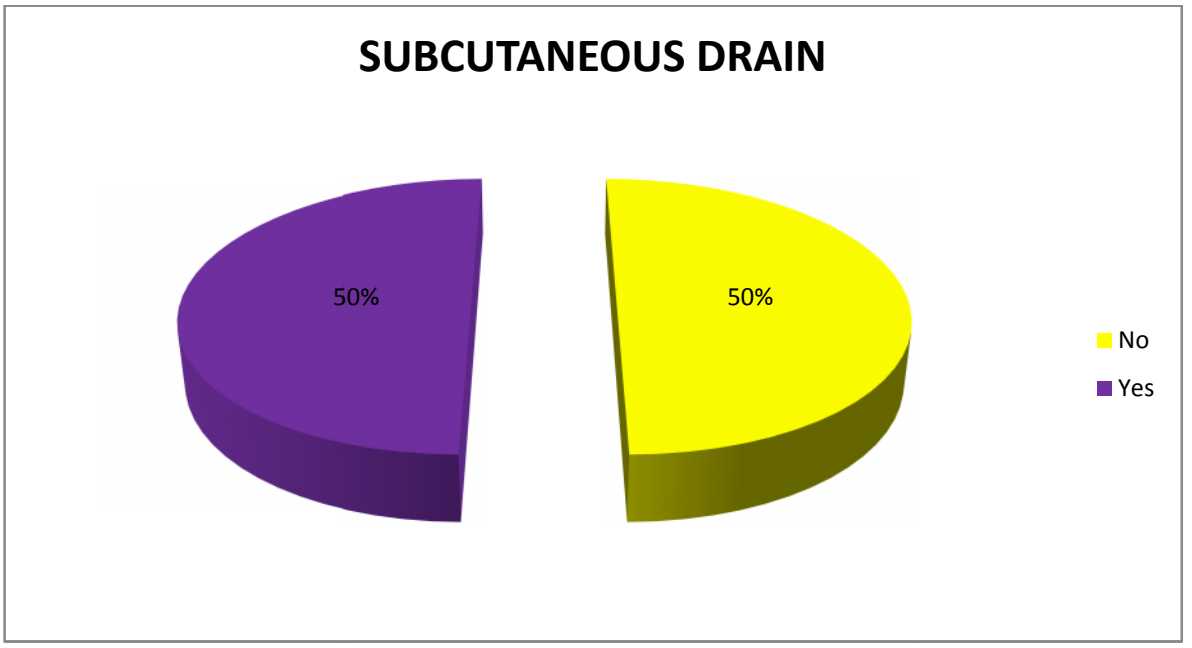
BMI CLASS	FREQUENCY	PERCENT
<35	75	75.0
>=35	25	25.0
Total	100	100.0



Study was done in obese patients with study population of 100 cases. Among this 75 patientshave BMI <35 and 25 patients with BMI> = 35.

Table 4. SUBCUTANEOUS DRAIN

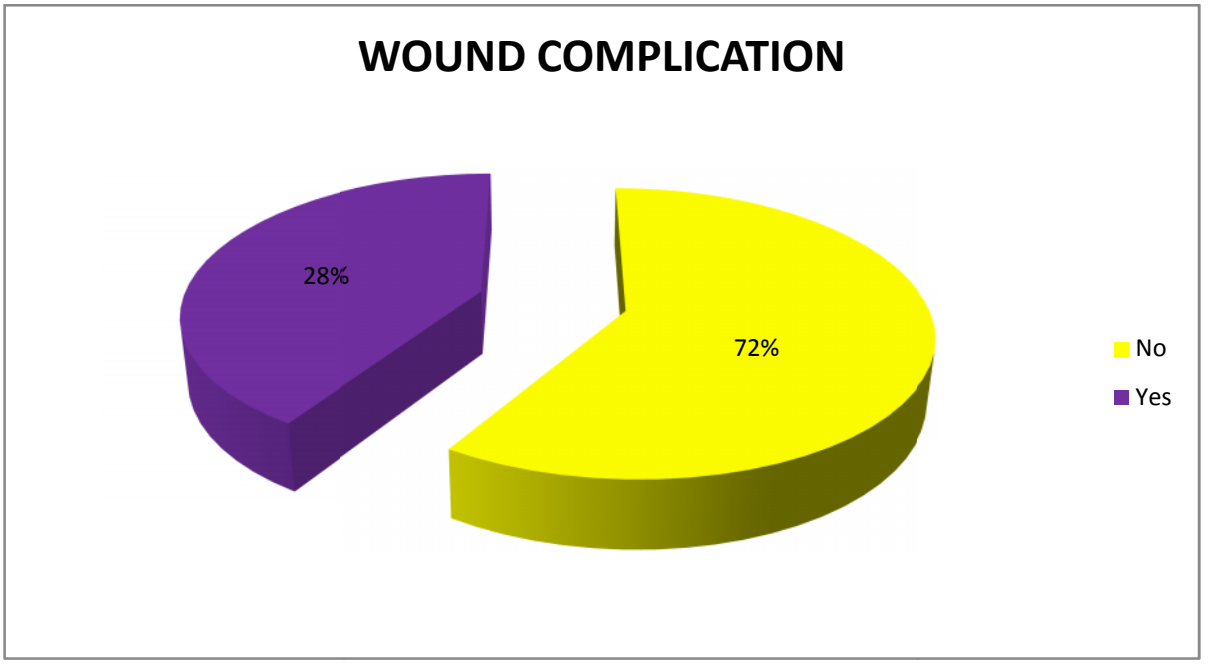
SUBCUTANEOUS DRAIN	FREQUENCY	PERCENT
No	50	50.0
Yes	50	50.0
Total	**100**	**100.0**



This table shows equal distribution of cases had subcutaneous drain placement. Patients with subcutaneous drain 50% and without drain 50%.

Table 5. FREQUENCY OF WOUND COMPLICATION

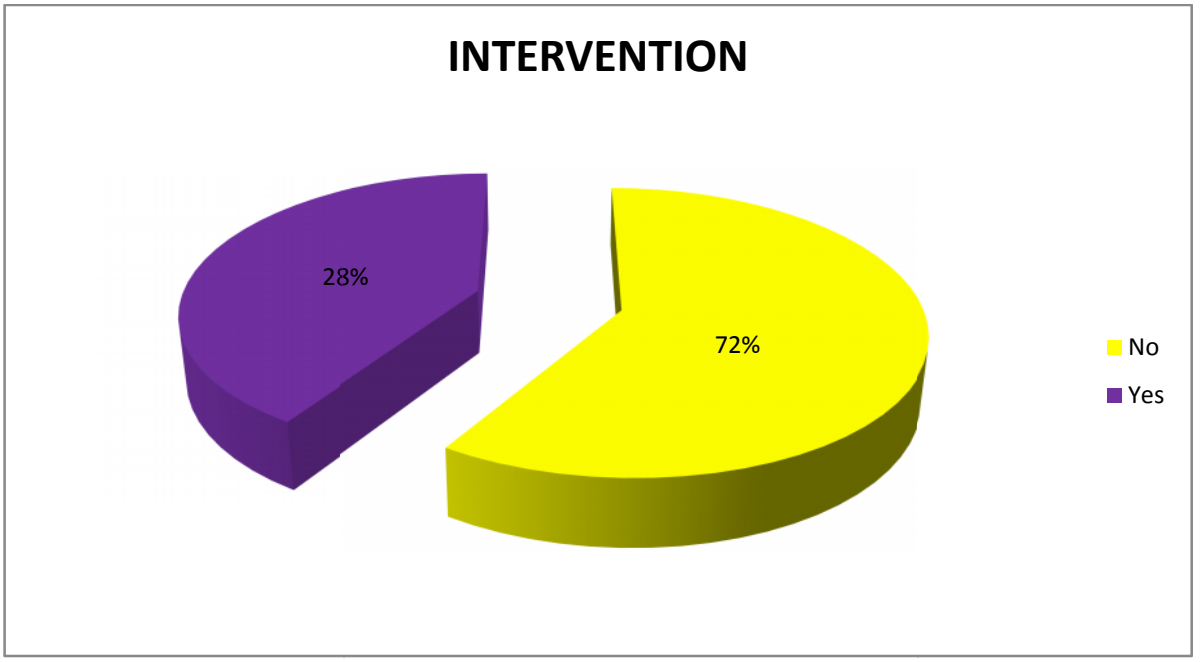
WOUND COMPLICATION	FREQUENCY	PERCENT
No	72	72.0
Yes	28	28.0
Total	**100**	**100.0**



Among 100 patients, Wound complication was encountered in 28% of patients and remaining 72% had wound healing without complications.

Table 6. INTERVENTION

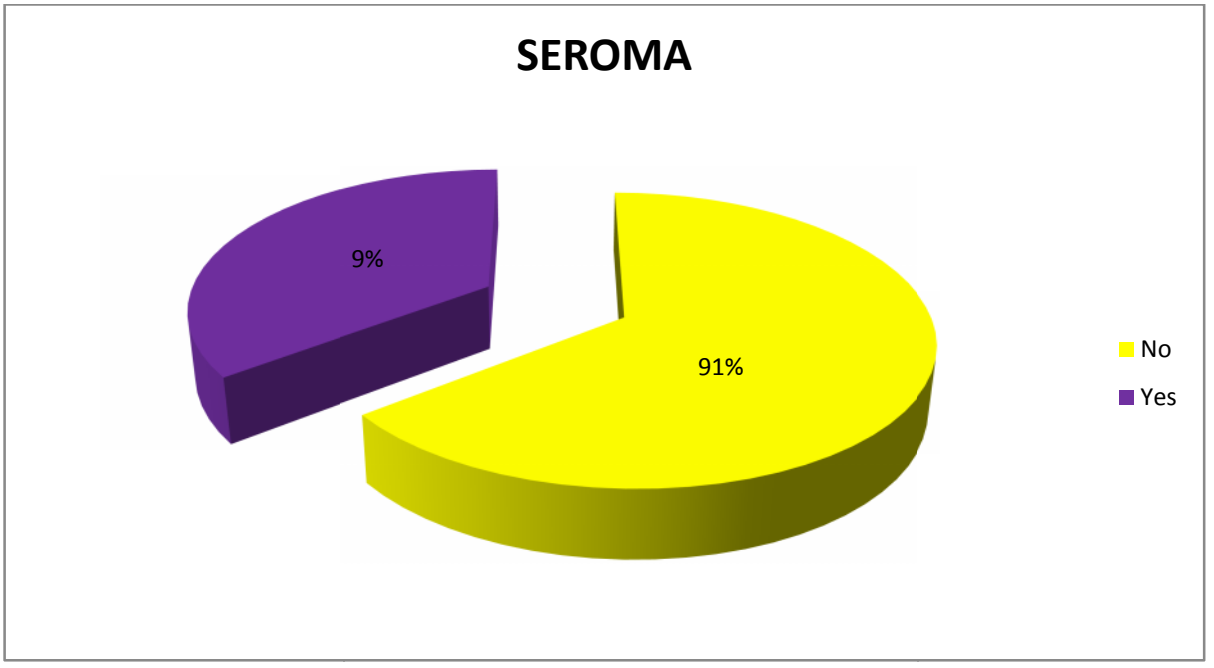
INTERVENTION	FREQUENCY	PERCENT
No	72	72.0
Yes	28	28.0
Total	**100**	**100.0**



Intervention done for all wound infected patients. 28% required intervention for wound healing.

Table 7. SHOWS INCIDENCE OF SEROMA

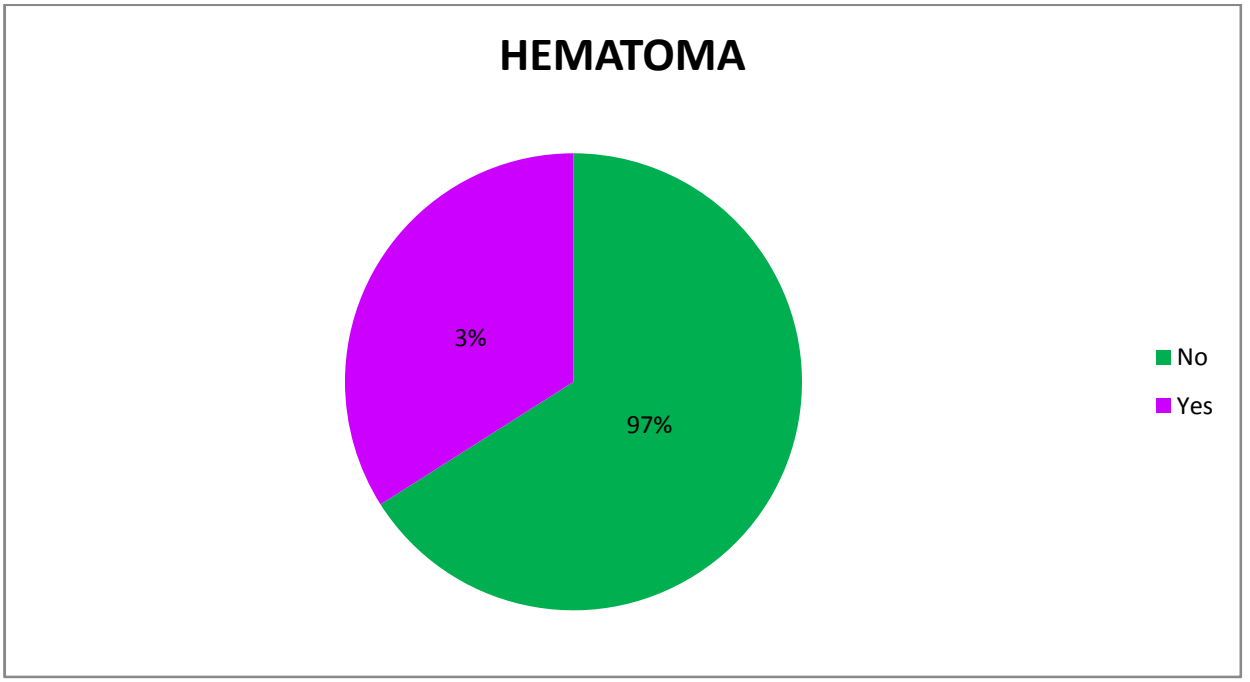
SEROMA	Frequency	Percent
No	91	91.0
Yes	9	9.0
Total	**100**	**100.0**



This table shows 9% of patients had seroma as wound complication

Table 8. SHOWS HEMATOMA COMPLICATION AMONG STUDY POPULATION

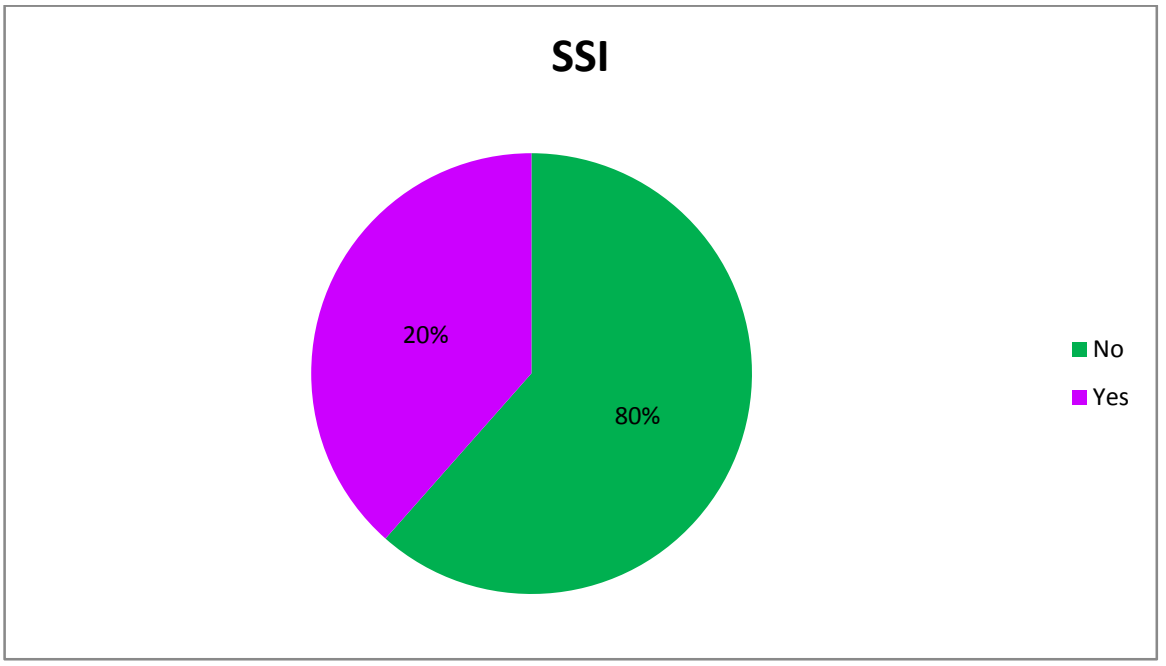
HEMATOMA	FREQUENCY	PERCENT
No	97	97.0
Yes	3	3.0
Total	**100**	**100.0**



This table shows 3% of patients had hematoma among 100 patients.

Table 9. SHOWS SSIS AMONG LAPAROTOMY PATIENTS

SSI	FREQUENCY	PERCENT
No	80	80.0
Yes	20	20.0
Total	**100**	**100.0**



This table shows 20% of patients had surgical site infection

Table 10. THIS TABLE SHOWS 17% PATIENTS HAD PAIN

PAIN	FREQUENCY	PERCENT
No	83	83.0
Yes	17	17.0
Total	**100**	**100.0**

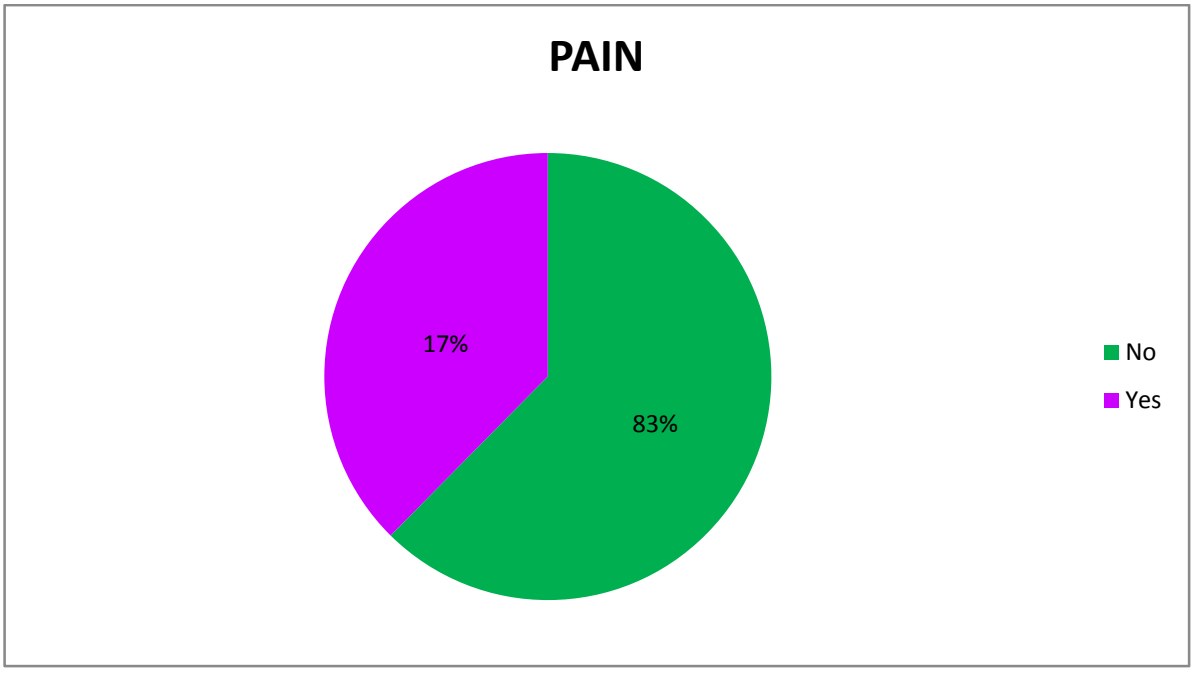


Table 11

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
Agegroup	20-30 Years	Count	8	7	15
		% within SUBCUTANEOUS DRAIN	16.0%	14.0%	15.0%
	31-40 Years	Count	14	16	30
		% within SUBCUTANEOUS DRAIN	28.0%	32.0%	30.0%
	41-50 Years	Count	17	18	35
		% within SUBCUTANEOUS DRAIN	34.0%	36.0%	35.0%
	51-60 Years	Count	11	9	20
		% within SUBCUTANEOUS DRAIN	22.0%	18.0%	20.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=0.429 p=0.934

This table shows age wise distribution of patient with and without drain. 16% had no drain and 14% had drain in age group of 20-30 years. In the age group of 31-40 years, 28% had no drain and 32% had drain. Between 41-50 years 34% had no drain and 36% were without drain. In 51-60 years, 22% had no drain and 18% had subcutaneous drain. In this study p=0.934 and this shows age has no influence in development of wound complication.

Table 12.

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
SEX	Male	Count	**35**	**31**	**66**
		% within SUBCUTANEOUS DRAIN	70.0%	62.0%	66.0%
	Female	Count	15	19	34
		% within SUBCUTANEOUS DRAIN	30.0%	38.0%	34.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=0.713 p=0.398

Among 66 male patients, 31 patients had drain. In females 38% had subcutaneous drain. This is not statistically significant (P>0.05).

Table 13.

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
BMI CLASS	<35	Count	49	26	75
		% within SUBCUTANEOUS DRAIN	98.0%	52.0%	75.0%
	>=35	Count	1	24	25
		% within SUBCUTANEOUS DRAIN	2.0%	48.0%	25.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=28.213** p<0.001

Majority of patients with BMI<35 had no drain. But nearly all patients with BMI>=35 had drain and this is statistically significant (P<0.05).

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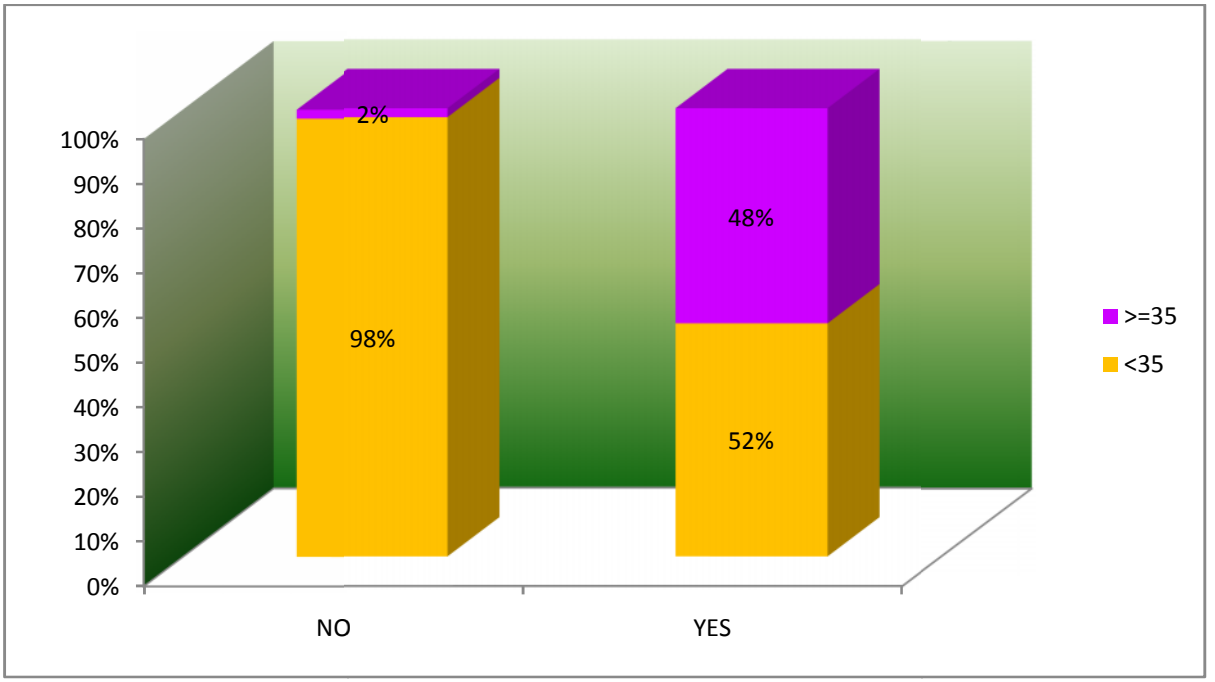


Only 2% of patients with BMI>=35 had no subcutaneous drain…

Table 14

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
WOUNDCOMPLICATION	No	Count	29	43	72
		% within SUBCUTANEOUS DRAIN	58.0%	86.0%	72.0%
	Yes	Count	21	7	28
		% within SUBCUTANEOUS DRAIN	42.0%	14.0%	28.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=9.722** p=0.002

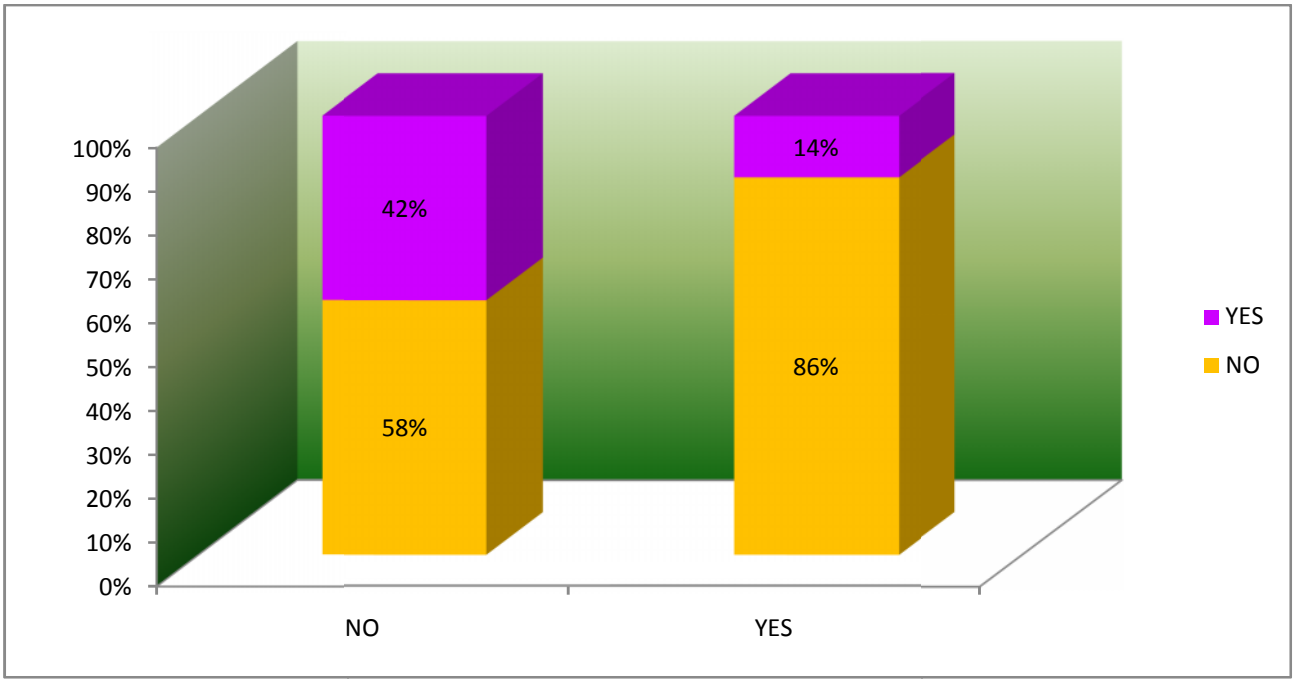
Table 15

Wound complication without subcutaneous drain is 42% and with drain is 14%. This is statistically significant (P<0.05) using chi-square test.

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
INTERVENTION	No	Count	29	43	72
		% within SUBCUTANEOUS DRAIN	58.0%	86.0%	72.0%
	Yes	Count	21	7	28
		% within SUBCUTANEOUS DRAIN	42.0%	14.0%	28.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=9.722** p=0.002



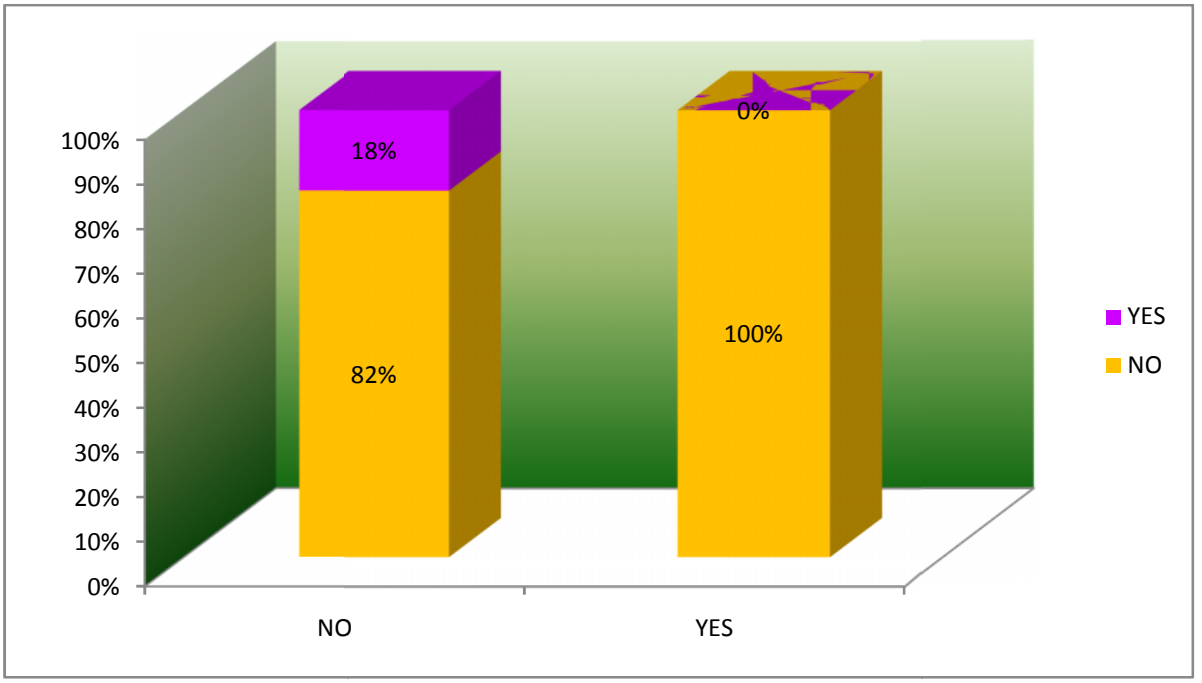
Intervention done among no subcutaneous drain patients was 42% and 58% did not require any intervention. Among subcutaneous drain patients86% did not require any intervention and 14% needs intervention and this s significant statistically as P<0.05

Table 16.

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
SEROMA	No	Count	41	50	91
		% within SUBCUTANEOUSDRAIN	82.0%	100.0%	91.0%
	Yes	Count	9	0	9
		% within SUBCUTANEOUSDRAIN	18.0%	0.0%	9.0%
Total		Count	50	50	100
		% within SUBCUTANEOUSDRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=9.890** p=0.002



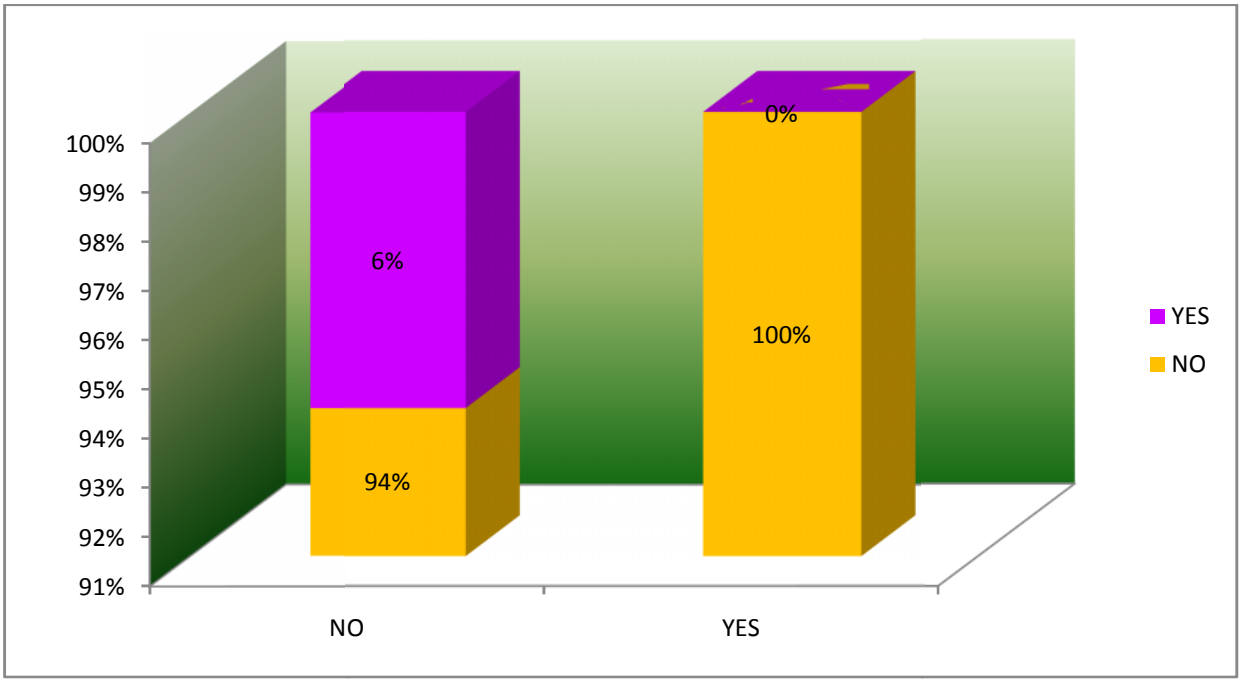
This shows association of patients without subcutaneous drain had seroma of 18% and no such complaints reported in cases with subcutaneous drain. It is statistically significant.

Table 17

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
HEMATOMA	No	Count	47	50	97
		% within SUBCUTANEOUS DRAIN	94.0%	100.0%	97.0%
	Yes	Count	3	0	3
		% within SUBCUTANEOUS DRAIN	6.0%	0.0%	3.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=3.093 p=0.079



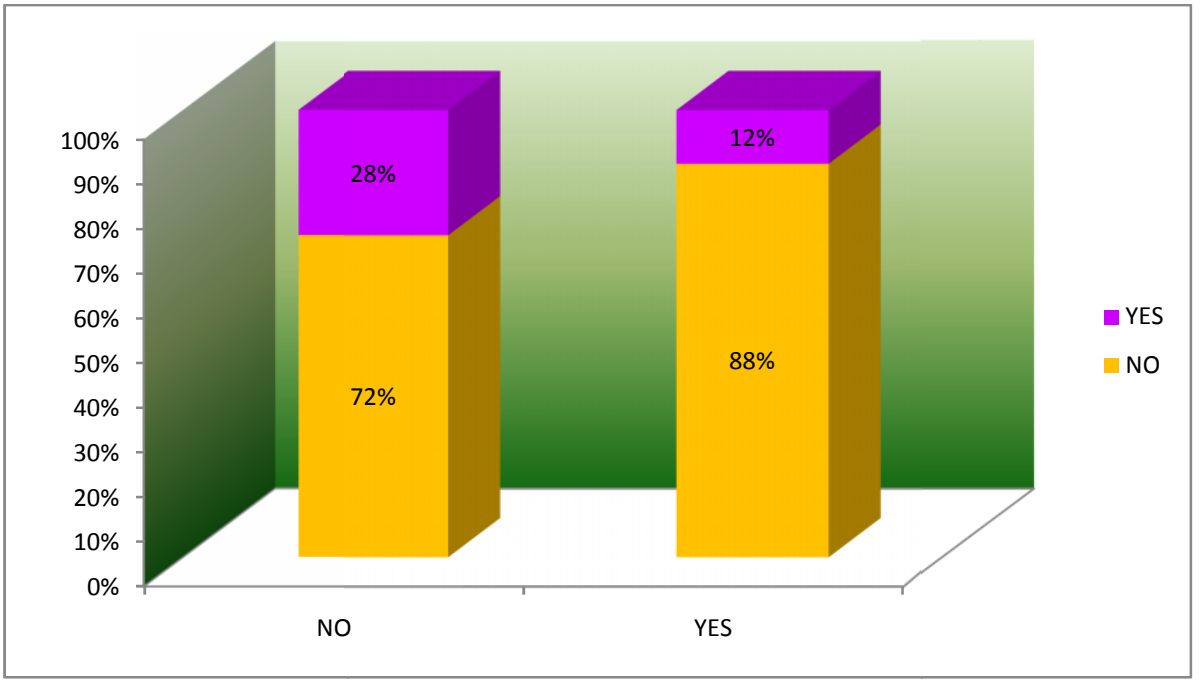
In patients without subcutaneous drain, 6% developed hematoma and 94% were free from hematoma. With subcutaneous drain no one developed hematoma.. this is statistically insignificant(P>0.05).

Table 18

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
SSI	No	Count	36	44	80
		% within SUBCUTANEOUS DRAIN	72.0%	88.0%	80.0%
	Yes	Count	14	6	20
		% within SUBCUTANEOUS DRAIN	28.0%	12.0%	20.0%
Total		Count	50	50	100
		% within SUBCUTANEOUS DRAIN	100.0%	100.0%	100.0%

Pearson Chi-Square=4.00* p=0.046



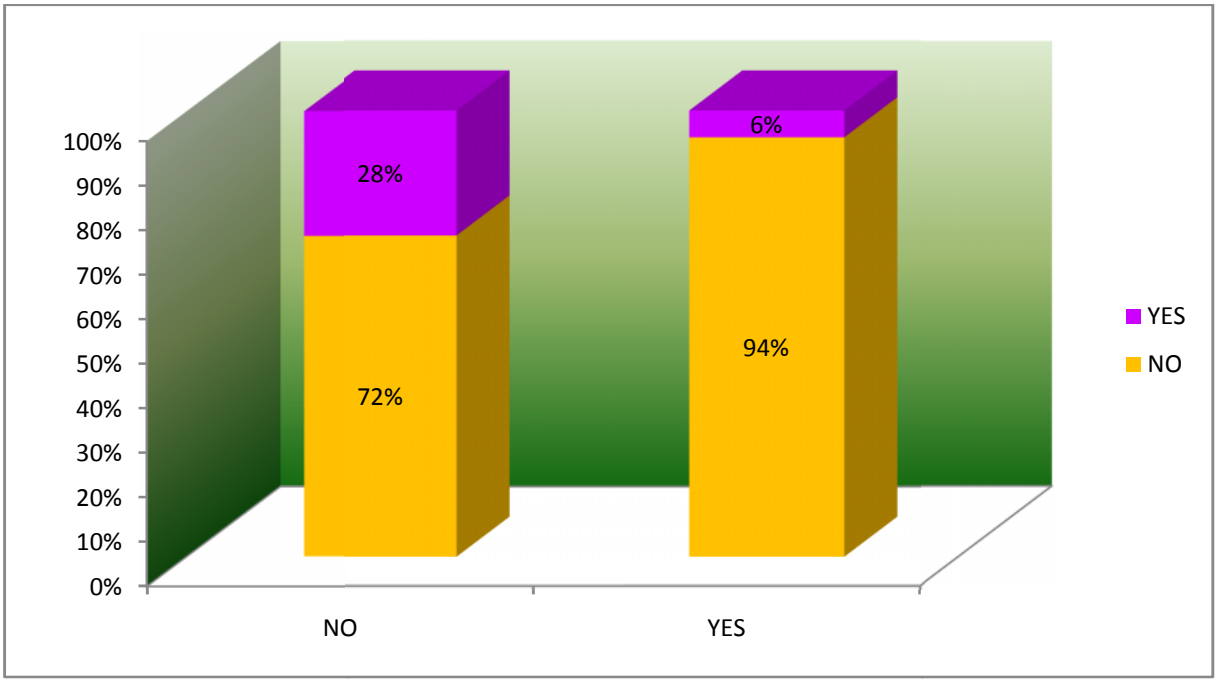
This shows association of SSI in patients with subcutaneous drain. Among patients with subcutaneous drain 12% had SSI and 28% had SSI in the group without subcutaneous drain. Stasitically significant as $P<0.05$

Table 19

Crosstab

			SUBCUTANEOUSDRAIN		Total
			No	Yes	
PAIN	No	Count	36	47	83
		% within SUBCUTANEOUSDRAIN	72.0%	94.0%	83.0%
	Yes	Count	14	3	17
		% within SUBCUTANEOUSDRAIN	28.0%	6.0%	17.0%
Total		Count	50	50	100
		% within SUBCUTANEOUSDRAIN	100.0%	100.0%	100.0%

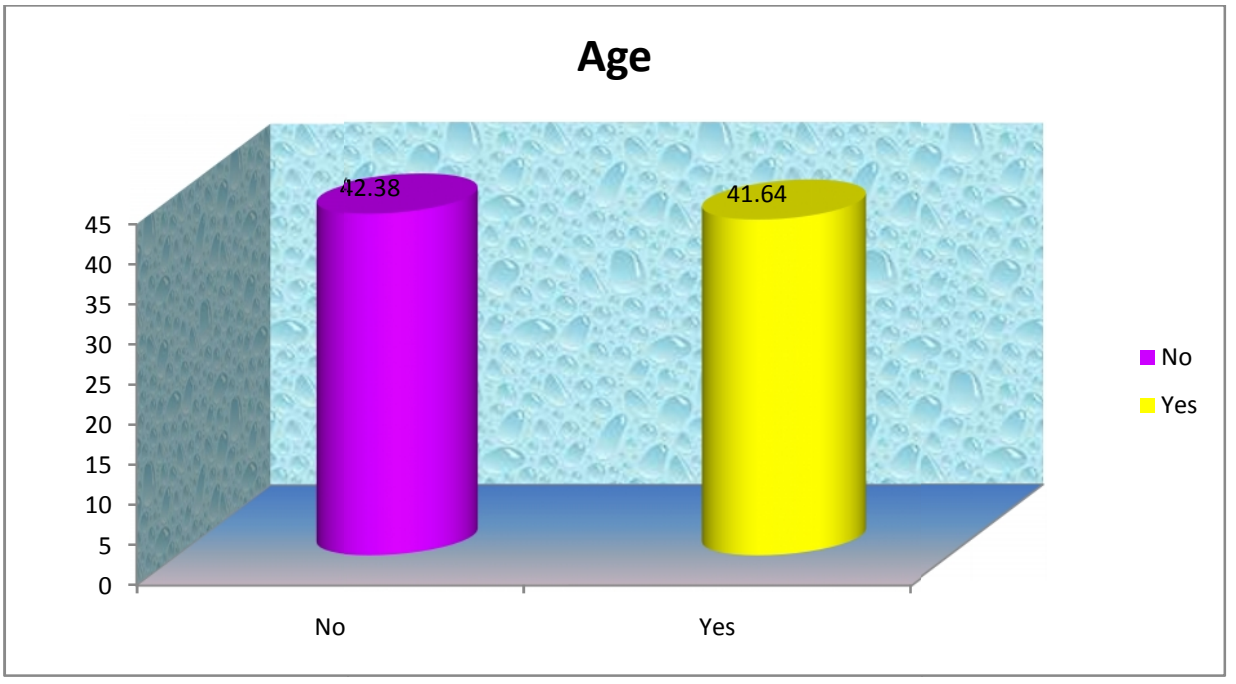
Pearson Chi-Square=8.575** p=0.003



Post operative pain is significantly lower in the group with subcutaneous drain compared to group without subcutaneous drain ($P<0.05$)

Table 20

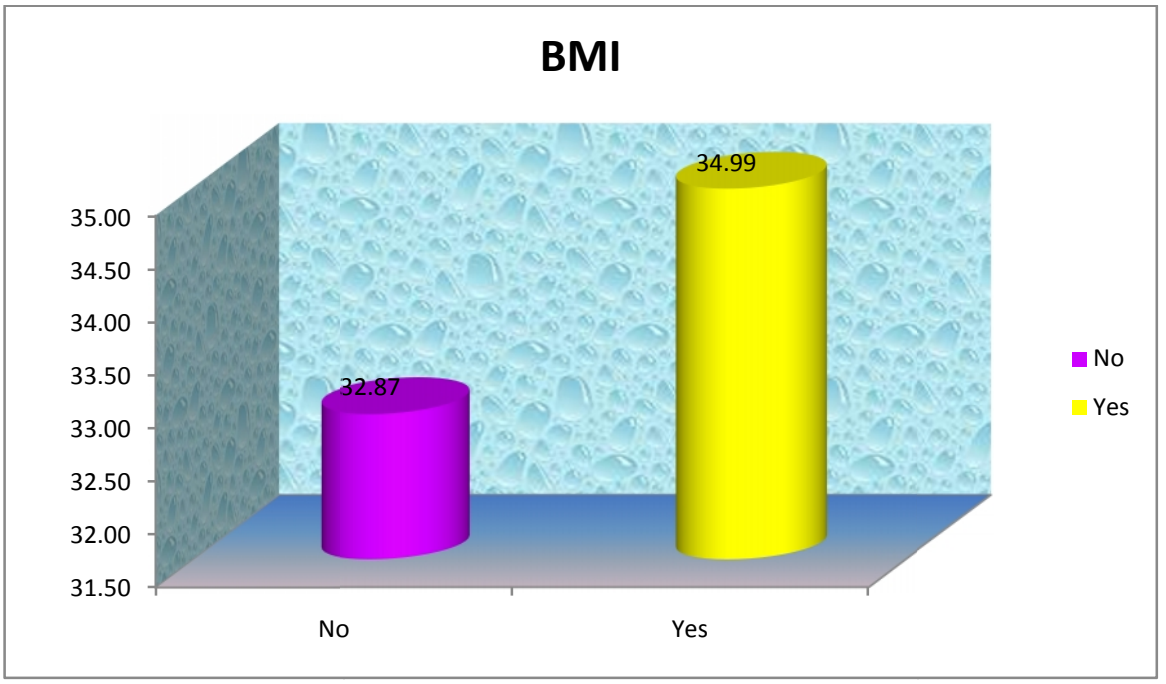
Group Statistics							
	SUBCUTANEOUSDRAIN	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**T value**	**P value**
AGE	No	50	42.3800	9.12697	1.29075	0.402	0.688
	Yes	50	41.6400	9.26208	1.30986		



There was no statistical difference between the mean ages among two groups (42.38±1.29 vs 41.64±1.30; p value 0.688).

Table 21

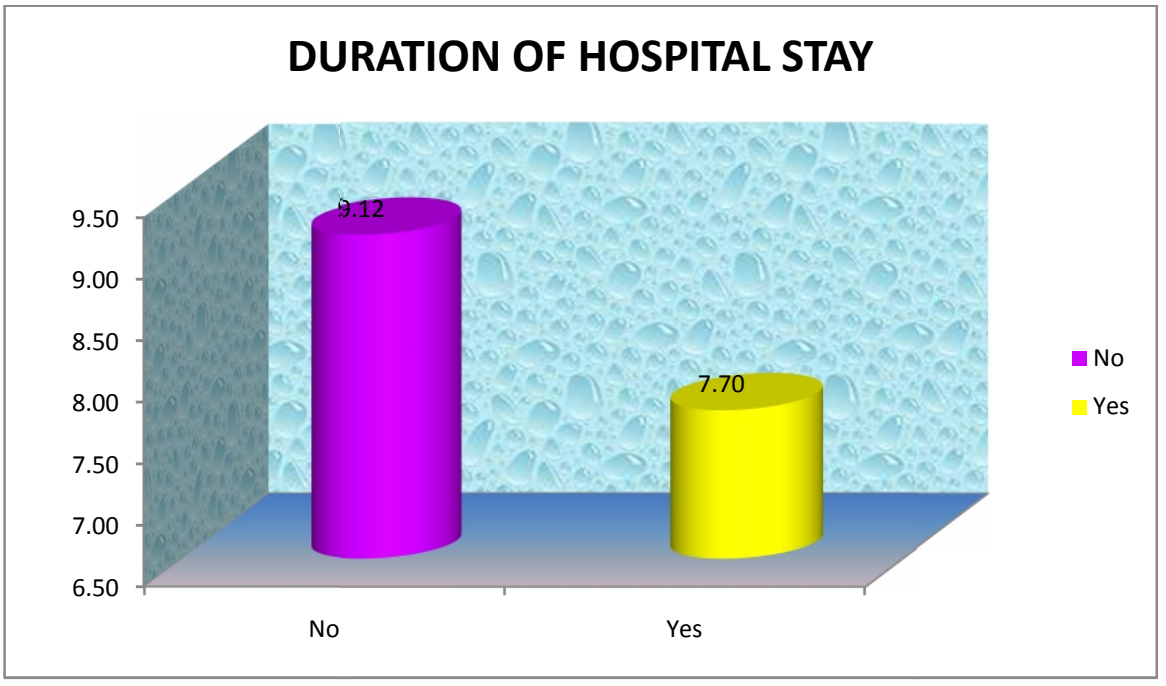
Group Statistics							
	SUBCUTANEOUSDRAIN	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**T value**	**P value**
BODY MASSINDEX	No	50	32.8680	1.00070	.14152	8.329**	p<0.001
	Yes	50	34.9920	1.50005	.21214		



This shows correlation of subcutaneous drain with respect to mean Body mass index of the patients in the study. P value <0.001 and is significant.

Table 22. Shows length of hospital stay.

Group Statistics							
	SUBCUTANEOUS DRAIN	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**	**t value**	**p value**
DURATION OF HOSPITAL STAY	No	50	9.1200	2.51234	.35530	3.464**	p<0.001
	Yes	50	7.7000	1.44632	.20454		



Mean duration of hospital stay of the patients with subcutaneous drain was 7.70±1.44 days and mean duration of hospital stay of patients without subcutaneous drain was 9.12±2.51 days. There is significant decrease in the length of hospital stay in the patients with subcutaneous drain. P value <0.001.

DISCUSSION

Any surgery in patients with high BMI have higher rate complications, that to in emergency procedure. Commonly encountered complications are seroma, hematoma, surgical site infections which increases morbidity of the patient. The length of hospital stay gets prolonged and the cost of treatment cause economical burden to the patient. Local complications may delay wound healing or may lead to wound dehiscence. Many techniques are practised to reduce surgical site infection and one among them is the placement of subcutaneous drain to remove the collection. Drain placement helps to drain out the serous fluid and blood collection underneath and promotes wound healing. This aids to early mobilization of the patients there by reduces the length of hospital stay.

Jyothi bindal et al. conducted a prospective study and concluded that there is no significant difference in age, superficial SSIs, and post operative fever. Significant difference in wound seroma, pain and mean hospital stay. 26% in non drain group had seroma and 10% in drain group, mean hospital stay without drain is 9.4 days and with drain is 8.2 days.

In the study done by Poonam gupta et al., 24% of patients in drain group and 50% of patients in non drain group had SSIs(P value-0.05) and increased risk of SSIs in obese patients. In our study we observed there is no significant difference in age and gender. Mean age group included in the study is around 41.64 years. Mean Body mass index of patients without

drain is 32.87. Mean body mass index of patients with subcutaneous drain is34.99.

Wound complications without subcutaneous drain occurredin 21 patients represents 42% and patients with subcutaneous drain accounts to 14% i.e., 7 cases. All cases with wound complication had undergone intervention for wound healing. Seroma occurred in 9 patients in the group without subcutaneous drain accounts to 18%. No cases in the drain group has reported seroma. It is statistically significant p value (p=0.002).

Hematoma present in 3 patients in the total study population in whom subcutaneous drain was not present, and it represents 6% of those without drain. No patients with drain group has reported hematoma. This is statistically insignificant P=0.079.

Surgical Site Infection occurred in 20 patients of total population. 14 patients without subcutaneous drain reported SSI (28%) and 6 patients in the drain group (12%).this is statistically significant P value 0.046. wound dressing can reduce the incidence of infection. Antibiotics based on culture and sensitivity reduces wound complications.

Post operative pain reported by 14 patients (28%9) without drain and patients with drain group has 3 patients 6%. Significant statistically as $p<0.05$. these patients are treated with paracetamol infusion or tramadol injection.

Length of hospital stay in patients without subcutaneous drain is 9.12±2.51 days and patients with subcutaneous drain is 7.70±1.44 days. It is found that length of hospital stay is reduced in patients with subcutaneous drain.

SUMMARY

In our study, comparing subcutaneous single closed suction drain with simple closure in emergency laparotomy procedures showed

- There is no statistically significant difference with age and sex between two groups.
- Statistically significant in reducing the incidence of surgical site infection, seroma and postoperative pain in patients with subcutaneous drain.
- No significant difference among two groups with patients developing hematoma.
- Statistically significant in reducing the duration of hospital stay in the group with subcutaneous drain when compared to group without subcutaneous drain.

CONCLUSION

In emergency laparotomy procedures, Subcutaneous single closed suction drain reduces postoperative surgical site infection, seroma, postoperative pain and the duration of hospital stay significantly compared to patients in whom negative suction drain was not placed.

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PROFORMA

NAME: I.P. NO:

AGE: SEX: MALE/ FEMALE

OCCUPATION:

DIAGNOSIS:

PROCEDURE:

HEIGHT:

WEIGHT:

BMI:

DIAGNOSIS:

PROCEDURE:

DOA:DOS:

DOD:

COMORBID CONDITIONS	YES/NO
SUBCUTANEOUS DRAIN	YES/NO
INTRA-OP COMPLICATION	YES/NO
SEROMA	YES/NO
HEMATOMA	YES/NO
SSI	YES/NO
PAIN	YES/NO
INTERVENTION DONE	YES/NO

S.NO	NAME	AGE	SEX	BODY MASS INDEX	DIAGNOSIS	Subcu taneous Drain	Wound complication	Intervention	Seroma	Hematoma	SSI	Pain	Duration of hospital stay
1	SUBRAMANIAM	45	M	36.4	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	8
2	LALITHA	38	F	34.7	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	9
3	GOVINDAMMAL	52	F	32.5	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	8
4	RAVI	30	M	32.1	BLUNT INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	9
5	SHANKAR	38	M	34	PENETRATING INJURY	NO	YES	YES	NO	NO	YES	YES	12
6	GANESH	40	M	32.5	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
7	RAMU	54	M	33.1	INTESTINAL OBSRUCTION	NO	YES	YES	YES	NO	NO	YES	11
8	AYYAKANNU	58	M	36.4	HOLLOW VISCUS PERFORATION	NO	YES	YES	NO	NO	YES	NO	13
9	CHINNAPONNU	44	F	35.9	PENETRATING INJURY	YES	YES	YES	NO	NO	YES	YES	10
10	RAJENDRAN	39	M	33.4	BULL GORE INJURY	YES	NO	NO	NO	NO	NO	NO	7
11	SATHYA	25	F	31.2	APPENDICULAR PERFORATION	NO	NO	NO	NO	NO	NO	NO	8
12	MARIMUTHU	53	M	35.6	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	9
13	SIVAGAMI	42	F	32.6	BULL GORE INJURY	NO	NO	NO	NO	NO	NO	NO	7
14	SEKAR	43	M	32.5	STAB INJURY ABDOMEN	YES	NO	NO	NO	NO	NO	NO	8
15	MUNUSAMY	51	M	36.8	BLUNT INJURY ABDOMEN	NO	YES	YES	YES	NO	NO	YES	12
16	GOWTHAM	34	M	36.1	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
17	FATHIMA	29	F	38.4	DUODENAL ULCER PERFORATION	YES	YES	YES	NO	NO	YES	NO	11
18	MURUGESAN	47	M	34.2	PENETRATING INJURY	N0	YES	YES	YES	NO	YES	NO	15
19	DEIVANAI	32	F	32.8	BLUNT INJURY ABDOMEN	YES	NO	NO	NO	NO	NO	NO	6
20	RAVIKUMAR	37	M	32	APPENDICULAR PERFORATION	NO	NO	NO	NO	NO	NO	NO	8
21	SHANMUGAM	41	M	35.2	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
22	PERIYASAMY	39	M	32.7	HOLLOW VISCUS PERFORATION	NO	YES	YES	NO	NO	YES	NO	12
23	NANDHA KUMAR	27	M	32.2	APPENDICULAR PERFORATION	NO	NO	NO	NO	NO	NO	NO	7
24	SIVA	25	M	34.5	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	7

25	YAMUNA	44	F	35.4	INTESTINAL OBSRUCTION	YES	YES	YES	NO	NO	NO	YES	10
26	VINOTH	47	M	33.7	BLUNT INJURY ABDOMEN	NO	YES	YES	NO	NO	YES	NO	12
27	KUMARI	50	F	32.5	BULL GORE INJURY	NO	NO	NO	NO	NO	NO	NO	9
28	DAMODHARAN	33	M	34.5	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
29	LOGESH	31	M	32.8	STAB INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	8
30	SETTU	57	M	37.6	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	8
31	CHINNATHAMBI	43	M	32.4	PERFORATION PERITONITIS	NO	YES	YES	YES	NO	YES	NO	14
32	POTHUM PONNU	48	F	32.8	SIGMOID VOLVULUS	YES	NO	NO	NO	NO	NO	NO	7
33	KATHAR ALI	40	M	31.6	PENETRATING INJURY	NO	NO	NO	NO	NO	NO	NO	8
34	UMA	32	F	34.3	APPENDICULAR PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
35	BALAMURUGAN	55	M	36.2	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	9
36	SEETHA	56	F	33.4	INTESTINAL OBSRUCTION	NO	YES	YES	NO	YES	NO	YES	10
37	PARAMASIVAM	48	M	34.8	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
38	DAVID	38	M	32	BLUNT INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	7
39	SARATH KUMAR	30	M	32.7	SPLENIC LACERATION	NO	NO	NO	NO	NO	NO	NO	6
40	SUNDARAM	49	M	35.4	PERFORATION PERITONITIS	YES	NO	NO	NO	NO	NO	NO	7
41	RAMAN	37	M	32.9	APPENDICULAR PERFORATION	NO	NO	NO	NO	NO	NO	NO	5
42	MEENAKSHI	35	F	34.1	APPENDICULAR PERFORATION	YES	NO	NO	NO	NO	NO	NO	6
43	PRAVIN	29	M	33.9	DUODENAL ULCER PERFORATION	NO	YES	YES	NO	NO	YES	YES	10
44	RAMESH	24	M	35.5	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	6
45	BALARAMAN	43	M	32.2	HOLLOW VISCUS PERFORATION	NO	NO	NO	NO	NO	NO	NO	7
46	MAGESHWARI	34	F	34.1	STAB INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	7
47	RATHNA KUMAR	31	M	35.2	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
48	MANI	58	M	36.4	INTESTINAL OBSRUCTION	YES	YES	YES	NO	NO	YES	NO	10
49	SELVARAJ	55	M	32.4	INTESTINAL OBSRUCTION	NO	NO	NO	NO	NO	NO	NO	8
50	LAKSHMI	52	F	32.7	SIGMOID VOLVULUS	YES	NO	NO	NO	NO	NO	NO	7
51	REVATHI	47	F	32.4	ACUTE ABDOMEN	NO	NO	NO	NO	NO	NO	NO	8
52	YUVARANI	42	F	34.2	BULL GORE INJURY	YES	NO	NO	NO	NO	NO	NO	7
53	MURUGAN	50	M	33.5	MESENTRIC ISCHEMIA	NO	YES	YES	YES	NO	YES	YES	15

54	SENTHIL	51	M	33.8	ILEAL PERFORATION	NO	YES	YES	NO	YES	NO	YES	12
55	BALA	47	M	36.4	PENETRATING INJURY	YES	NO	NO	NO	NO	NO	NO	7
56	VADIVEL	36	M	32.1	APPENDICULAR PERFORATION	NO	NO	NO	NO	NO	NO	NO	8
57	VELMURUGAN	38	M	35.2	DUODENAL ULCER PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
58	SARASWATHI	40	F	36	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
59	THILAGAVATHI	37	F	33.8	PERFORATION PERITONITIS	NO	YES	YES	YES	NO	YES	YES	13
60	SELVAM	48	M	32.4	HOLLOW VISCUS PERFORATION	NO	NO	NO	NO	NO	NO	NO	8
61	THIYAGU	35	M	32.1	DUODENAL ULCER PERFORATION	NO	NO	NO	NO	NO	NO	NO	6
62	GANAPATHI	28	M	34.5	APPENDICULAR PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
63	SARAVANAN	45	M	33.1	INTESTINAL OBSRUCTION	NO	YES	YES	YES	NO	YES	NO	10
64	KUMARAN	36	M	34	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
65	PRIYADHARSHINI	25	F	34.2	APPENDICULAR PERFORATION	YES	NO	NO	NO	NO	NO	NO	6
66	PREMKUMAR	40	M	33.5	BLUNT INJURY ABDOMEN	YES	NO	NO	NO	NO	NO	NO	7
67	MALATHI	29	F	32.6	BLUNT INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	7
68	SAKTHIVEL	51	M	31.6	SPLENIC LACERATION	NO	NO	NO	NO	NO	NO	NO	7
69	SRINIVASAN	48	M	32.7	DUODENAL ULCER PERFORATION	NO	YES	YES	NO	NO	NO	YES	9
70	KAVYA	46	F	35.6	ILEAL PERFORATION	YES	NO	NO	NO	NO	NO	NO	6
71	MALARKODI	50	F	34.6	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	6
72	SUGANTHI	29	F	33.2	APPENDICULAR PERFORATION	NO	YES	YES	NO	NO	YES	YES	11
73	JOHN	33	M	33.5	HOLLOW VISCUS PERFORATION	NO	YES	YES	NO	YES	NO	NO	9
74	BANUMATHY	46	F	34.4	ACUTE ABDOMEN	NO	NO	NO	NO	NO	NO	NO	7
75	PRABHU	38	M	36.2	PERFORATION PERITONITIS	YES	NO	NO	NO	NO	NO	NO	6
76	SIVAM	29	M	31.3	BLUNT INJURY ABDOMEN	NO	NO	NO	NO	NO	NO	NO	6
77	KAMALAKANNAN	36	M	39.2	PENETRATING INJURY	YES	YES	YES	NO	NO	YES	NO	9
78	DURGADEVI	48	F	33.6	BULL GORE INJURY	NO	YES	YES	YES	NO	YES	NO	12
79	SIVALINGAM	52	M	34.8	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	6
80	HEMA	50	F	36.4	INTESTINAL OBSRUCTION	YES	NO	NO	NO	NO	NO	NO	7
81	SIVASUBRAMANIYAM	43	M	33.1	GASTRIC PERFORATION	NO	YES	YES	NO	NO	YES	YES	11
82	JYOTHI	41	F	32.6	PYOPERITONEUM	NO	NO	NO	NO	NO	NO	NO	7

83	RAJAN	48	M	34.7	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
84	KUMAR	38	M	31.5	HOLLOW VISCUS PERFORATION	NO	NO	NO	NO	NO	NO	NO	8
85	PICHANDI	29	M	33.8	APPENDICULAR PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
86	PARAMESHWARI	59	F	32.7	INTESTINAL OBSRUCTION	NO	NO	NO	NO	NO	NO	NO	7
87	RENUGA	36	F	35.6	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	8
88	GOVINDHAN	58	M	34.3	INTESTINAL OBSRUCTION	NO	NO	NO	NO	NO	NO	NO	8
89	SATHYAPRIYA	29	F	37.4	DUODENAL ULCER PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
90	ESWARAN	55	M	33.2	HOLLOW VISCUS PERFORATION	NO	NO	NO	NO	NO	NO	NO	7
91	MUNIYAMMAL	48	F	32.7	DUODENAL ULCER PERFORATION	NO	NO	NO	NO	NO	NO	NO	6
92	CHANDRAN	56	M	34.5	HOLLOW VISCUS PERFORATION	YES	YES	YES	NO	NO	YES	YES	10
93	MANOJ	53	M	33.4	BLUNT INJURY ABDOMEN	NO	YES	YES	NO	NO	YES	YES	13
94	AMUTHAVALLI	50	F	31.2	INTESTINAL OBSRUCTION	NO	NO	NO	NO	NO	NO	NO	8
95	KUPPAN	48	M	34.2	PENETRATING INJURY	YES	NO	NO	NO	NO	NO	NO	8
96	LOGANATHAN	51	M	32.6	INTESTINAL OBSRUCTION	NO	YES	YES	NO	NO	YES	YES	11
97	DIVAKAR	45	M	33.9	HOLLOW VISCUS PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
98	MANIVEL	42	M	35.8	GASTRIC PERFORATION	YES	NO	NO	NO	NO	NO	NO	7
99	DHARMALINGAM	38	M	32.5	DUODENAL ULCER PERFORATION	NO	YES	YES	YES	NO	NO	YES	10
100	SUJATHA	42	F	33.1	DUODENAL ULCER PERFORATION	YES	NO	NO	NO	NO	NO	NO	6

CONSENT FORM

நோயாளிகளுக்கு அறிவிப்பு மற்றும் ஒப்புதல் படிவம்
(மருத்துவ ஆய்வில் பங்கேற்பதற்கு)

ஆய்வு செய்யப்படும் தலைப்பு:
பங்கு பெறுவரின் பெயர்:
பங்கு பெறுவரின் வயது:

		பங்கு பெறுவர் இதனை ✓ குறிக்கவும்
1.	நான் மேலே குறிப்பிட்டுள்ள மருத்துவ ஆய்வின் விவரங்களை படித்து புரிந்து கொண்டேன். என்னுடைய சந்தேகங்களை கேட்கவும், அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டுள்ளது என அறிந்து கொண்டேன்.	☐
2.	நான் இவ்வாய்வில் தன்னிச்சையாக தான் பங்கேற்கிறேன். எந்த காரணத்தினாலோ எந்த கட்டத்திலும், எந்த சட்ட சிக்கலுக்கும் உட்படாமல் நான் இவ்வாய்வில் இருந்து விலகி கொள்ளலாம் என்றும் அறிந்து கொண்டேன்.	☐
3.	இந்த ஆய்வு சம்பந்தமாகவோ, இதை சார்ந்து மேலும் ஆய்வு மேற்காள்ளும் போதும் இந்த ஆய்வில் பங்குபெறும் மருத்துவர் என்னுடைய மருத்துவ அறிக்கைகளை பார்ப்பதற்கு என் அனுமதி தேவையில்லை என அறிந்து கொள்கிறேன். நான் ஆய்வில் இருந்து விலகிக் கொண்டாலும் இது பொருந்தும் என அறிகிறேன்.	☐
4.	இந்த ஆய்வின் மூலம் கிடைக்கும் தகவலையோ, முடிவையோ பயன்படுத்திக் கொள்ள மறுக்க மாட்டேன்.	☐
5.	இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக் கொள்கிறேன் எனக்கு கொடுக்கப்பட்ட அறிவுரைகளின் படி நடந்து கொள்வதுடன், ஆய்வை மேற்கொள்ளும் மருத்துவ அணிக்கு உண்மையுடன் இருப்பேன் என்று உறுதியளிக்கிறேன். என் உடல் நலம் பாதிக்கப்பட்டாலோ, அல்லது எதிர்பாராத, வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ உடனே இதை மருத்துவ அணியிடம் தெரிவிப்பேன் என உறுதி அளிக்கிறேன்.	☐

பங்கேற்பவரின் கையொப்பம் / ..... இடம் .....
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மையம் .....
கல்வியறிவு இல்லாதவற்கு (கைரேகை வைத்தவர்களுக்கு) இது அவசியம் தேவை
சாட்சியின் கையொப்பம் /..... இடம் .....
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