A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI

Dissertation submitted to

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI-600032

With partial fulfillment of the requirements for the award of

M.S DEGREE IN

GENERAL SURGERY - BRANCH I

REGISTER NUMBER : 221711316

COIMBATORE MEDICAL COLLEGE HOSPITAL

COIMBATORE

MAY 2020

DECLARATION BY CANDIDATE

I here declare that this dissertation entitled **"A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI"** is the bonafide and genuine research work carried out by me under the guidance of Professor **DR.V.LEKSHMI NARAYANI M.S, DGO,** Department of General Surgery, Coimbatore Medical College Hospital, Coimbatore

Date: Signature of candidate

Place: DR.J.L.VAIRAVAN

REGISTER NO 22171316

CERTIFICATE BY GUIDE

This is certify that this dissertation entitled **" A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI"** is the bonafide work of research done by DR.J.L.VAIRAVAN in partial fulfillment requirement for the degree of M S in GENERAL SURGERY.

Date:

Place:

Signature of the Guide

Prof Dr.V.Lekshmi Narayani M.S., DGO

Department of General Surgery

Coimbatore Medical college Hospital,

Coimbatore

ENDORSEMENT BY THE HEAD OF THE DEPARTMENT AND HEAD OF THE INSTITUTION

This is certify that this dissertation entitled **"A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI"** is the bonafide work of research done by **DR.J.L.Vairavan** under the guidance of **Prof. Dr.V.Lekshmi Narayani M.S, DGO.,** Department of General Surgery, Coimbatore Medical College Hospital, Coimbatore.

Prof .Dr.A.Nirmala M.S.,DGO
Professor and Head
Department of General Surgery
Coimbatore Medical college Hospital
Coimbatore

Dr.B.Asokan MS, MCH.,
Dean
Coimbatore medical college hospital
Coimbatore.

Place :
Date :

INSTITUTIONAL HUMAN ETHICS COMMITTEE
COIMBATORE MEDICAL COLLEGE, COIMBATOR – 14

EC Reg No. ECR/892/Inst/TN/2016
Telephone No: 0422 – 2574375/76
Fax : 0422 – 2574377

CERTIFICATE OF APPROVAL

To
Dr.Vairavan J L
Post Graduate,
Department of General Surgery,
Coimbatore Medical College & Hospital
Coimbatore -18.

Dear **Dr.Vairavan J L**

The Institutional Ethics Committee of Coimbatore Medical College, reviewed and discussed your application for approval of the proposal entitled **"A Comparative study of use of gentamicin soaked mesh over routine IV gentamycin in hernial surgeries for the prevention of surgical site infections."**No.0108/2017.

The following members of Ethics Committee were present in the meeting held on 30.11.2017.conducted at MM - II Seminar Hall, Coimbatore Medical College Hospital Coimbatore-18

1	Dr.S.Ramalingam MD, Dean, PSG IMS&R, Cbe	Chairman
2	Dr.Usha MD., Professor of General Medicine, CMCH, Cbe	Member Secretary
3	Dr.R.Manonmani MD., Professor of O&G, CMCH, Cbe	Clinicians
4	Dr.N.Renganathan MS., Professor of General Surgery, CMCH,Cbe	Clinicians
5	Dr.Sudha Ramalingam MD., Professor of SPM, PSG IMS&R, Cbe	Clinicians
6	Dr.R. Shanmugavadivu MD., Professor of Physiology, CMC, Cbe	Basic Medical Scientist
7	Dr.N. Shanthi MD., Professor of Pharmacology, CMC, Cbe	Basic Medical Scientist
8	Dr.A.Dhanalakshmi MD., Assoc. Professor of Pathology, CMC,Cbe	Basic Medical Scientist
9	Dr.L.Madhan MD., Professor of Pharmacology, CMC, Cbe	Basic Medical Scientist
10	Dr.N.Paramasivan MD., Professor of Pharmacology, Sri Ramakrishna Dental College, Coimbatore	Basic Medical Scientist
11	Mrs.A.Sharmila BA., BL., Advocate	Legal Expert
12	Dr.K.P.Sampath Kumar M.Pharm, Ph.D., Asst. Prof. of Pharmacy, CMC, Cbe	Scientific Member
13	Dr.G.Vani Ganesh M.Sc.,Ph.D., Tutor in Medical Surgical Nursing, CMCH, Cbe	Scientific Member
14	Mr.V. Balasubramani MA,MA,MBA,LLB,M.Phil,PG.D.M, DLLAL, Chief Executive, Avinashilingam JSS Self Finance Courses, Cbe	Social Worker
15	Mr.V.A.Shahul Hameed, +2	Lay-Person

We approve the Proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL HUMAN ETHICS COMMITTE
COIMBATORE MEDICAL COLLEGE
COIMBATORE - 641 014.

URKUND

Urkund Analysis Result

Analysed Document:	FINAL DRAFT.docx (D57351429)
Submitted:	10/21/2019 10:37:00 AM
Submitted By:	drvairavanlakshmanan@gmail.com
Significance:	2 %

Sources included in the report:

https://link.springer.com/article/10.1007/s00464-015-4149-2
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5095278/
https://woundsdressingmaterial.files.wordpress.com/2012/04/pdf_wounddressingmaterials.pdf
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5596036/
https://core.ac.uk/download/pdf/81111959.pdf
https://link.springer.com/article/10.1007/s00464-019-06908-6
https://en.dyna-mesh.com/literature-gb/
https://www.researchgate.net/publication/303739085_Predictors_of_mesh_infection_and_explantation_after_abdominal_wall_hernia_repair
https://emedicine.medscape.com/article/1534281-overview

Instances where selected sources appear:

13

COPYRIGHT DECLARATION

I hereby declare that the Coimbatore Medical college Hospital Coimbatore shall have the rights to preserve, use and disseminate this dissertation in print or electronic format for academic/research purpose.

Date:

Place:

DR.J.L.VAIRAVAN
Post Graduate in MS General Surgery
Coimbatore Medical college Hospital
Coimbatore.

ACKNOWLEDGEMENT

Success and final outcome of this study required a lot of guidance and assistance from many people and I am grateful to have got all this assistance all till the completion of my study.

I express my gratitude to **Dr.B.Asokan MS, MCH., Dean,** Coimbatore medical college hospital ,Coimbatore ,for her invaluable support in conducting this study.

I acknowledge my sincere thanks to **Prof. Dr.A.Nirmala M.S.,DGO** Professor and Head of Department of General Surgery for her valuable advice and encouraging the study.

I wish to express my heartfelt respect and gratitude to my guide and unit chief, **Prof. Dr.V.Lekshmi Narayani M.S, DGO.,** Professor, Department of General Surgery for this constant advise , invaluable suggestions and words of encouragement.

I am extremely thankful to **Dr.Sreenivasan, M.S., Dr.Venkatesan MS,DA., Dr. Narayanamoorthy, MS** for their support.

I am extremely thankful to my Assistant professors **Dr.R.Radhika MS,DGO., Dr.R.Jayakumar MS,** AND **Dr.P.Sumitra** MS,DGO., for their valuable guidance throughout my postgraduate study.

I also thank my colleagues **Dr.Abirami, DR.Santhosh Kumar, Dr.Silambarasan, Dr.Kishor, Dr.Vivek, Dr.Ramya Lakshmi** For their Support and encouragement.

I am extremely thankful to my sister **Varshini** and **Dr.Sangeetha Priya** for extending her support in helping me with the script

Last, but not the least, I am extremely thankful to my patients who willingly cooperated for this study.

DR.J.L.VAIRAVAN

CONTENTS

ABBREVIATIONS

BT	:	Bleeding Time
CXR	:	Chest X-ray
CT	:	Clotting Time
CVS	:	Cardiovascular System
DM	:	Diabetes Mellitus
GIT	:	Gastrointestinal Tract
Hb	:	Hemoglobin
IV	:	Intra Venous
LFT	:	Liver Function Test
MRSA	:	Methicillin Resistance Staphylococcus Aureus
MIC	:	Minimum inhibitory concentration
PA	:	Per Abdomen
RS	:	Respiratory System
SSI	:	Surgical Site Infection
SPO2	:	Partial Pressure of Oxygen
TC	:	Total Count
UTI	:	Urinary Tract Infection
USG	:	Ultrasound
URTI	:	Upper Respiratory Tract Infection

INTRODUCTION

Surgical site infections are one of the common cause that leads to post-operative morbidity. The introduction of antibiotics in 20 century has paved way for the reduction in this cause of morbidity. Every day in practice antibiotics are used and over used sometimes in a way. The idea of giving a proper health care depends mostly upon the post-operative period for surgeons.

And infection of surgical site in surgeries that occurs following hernia surgeries are unacceptable. But with the judicious use of antibiotics there came their own set of problems like antibiotic resistant strains, and other complications that happened because of this use. The recent incidence of mass casualty due to tainted antibiotic in a mass sterilization camp being one of them.

This follows to careful reobservation of use of post-operative antibiotics. Compared to many of the westernized countries the use of antibiotics here is not justified appropriately so many of the times we are stuck with the prolonged use of antibiotic regimens. This study focuses on use of gentamycin as an antibiotic, and comparing its efficacy given intravenously post operatively and introducing a new idea of application of gentamycin impregnated meshes in hernia surgeries.

AIMS AND OBJECTIVES OF THE STUDY

AIM:

- The primary aim of this study is to compare the incidence of surgical site infections between two groups of patients, one who underwent the implantation of gentamycin impregnated mesh to another group of individuals who received conventional IV gentamycin in immediate post-operative period for the period of three days.

- The results are tabulated and different parameters are analysed and the outcomes are compared with each other

OBJECTIVES

- To apply the novelty of using gentamycin impregnated meshes for hernia surgeries .
- To assess the practicality and usefulness of this technique
- To validate this tool
- To bring this effectiveness to nearly total level in sterility of procedures
- To avoid judicious use of post-operative antibiotics
- To eliminate surgical site infections in clean surgeries, in which the infection rate can become highly unacceptable
- To slowly implement this technique even for emergency procedures
- To increase the efficacy in clean surgeries using merely easy and acceptable techniques

REVIEW OF LITREATURE

WOUND HEALING

ANATOMY OF SKIN

Composed of several thin layers

- Stratum basale
- Stratum spinosum,
- Stratum granulosum,
- Stratum lucidum,
- Stratum cornium.

Several thin layers of epidermis contain the following.

Melanocytes which produce melanin, a pigment that gives skin its color and protect it from damaging effects of UV rays.

Keratinocytes which produce keratin, a water repellant protein that gives epidermis its tough protective quality.

HEALING OF WOUNDS:

INFLAMMATORY STAGE:

At the vascular inflammatory response stage, the lesional blood vessels contract and leaked blood then coagulates contributing to maintenance of integrity. The coagulation consists of an aggregation of thrombocytes and platelets in a fibrin network, depending on the action of specific factors through the activation and aggregation of these cells. The fibrin network, in addition to re establishing homeostasis and forming a barrier against the invasion of microorganism and pathogens, organizes the necessary temporary matrix for cell migration, which in turn restores the skin function as a protective barrier.

Cells responsible for inflammatory stage are characterized by influx of leucocytes into wound area. Such a response is quick and coincides with key signs of inflammation which are revealed by the edema and erythema at the site of lesion. Normally cell response is established within first 24 hours and can extend for upto 2 days. A quick activation of immune cells in tissue may also occur, as that happens with mastocytes, gamma delta cells, langerhan cells, which secrete chemokines and cytokines. Inflammation is a localized and protective tissue response that is unleashed by the lesion.

PROLIFERATIVE STAGE:

Aim of this stage is to diminish the lesioned tissue area by contraction and fibroplasia ,establishing a viable epithelial barrier to activate keratinocytes. This stage is responsible for the predominantly the closure of lesion itself, which include angiogenesis, fibroplasia, re-epithelialization. These processes begin with micro environment of the lesion within the first 48 hrs and can unfold up to 14^{th} day after the onset of lesion.

Vascular remodeling prompts blood flow changes. Angiogenesis is a coordinated process involving endothelial cellular proliferation, rupture and rearrangement of basal membrane, migration and association in tubular structure and recruitment of perivascular cells.

The subsequent development of blood vessels involves the production of collateral veins through mechanism of germination and cell division. The resulting vascular plexus is remodeled to be differentiated in large and small blood vessels. The endothelium is the filled with both accessory and smooth muscle cells. The newly formed microvasculature makes it possible to transport fluid, oxygen, nutrients and immune competent cells to stroma.

REMODELING STAGE:

It begins from two to three weeks after the onset of lesions and can last for one year or more. The aim of this remodeling is to bring about maximum tensile strength by reorganisation, degradation, resynthesis of extra cellular matrix. In this final stage of lesion healing, propensity to bring back normal tissue structure occurs and granulation tissues gradually remodeled forming scar tissue that is less cellular and vascular and that exhibits a progressive increase in its concentration of collagen fibres.This stage is marked by maturing of elements with deep changes in the extracellular matrix and resolution of initial inflammation.

During the maturation and remodeling processes, the majority of blood vessels, fibroblasts and inflammatory cells disappear from the wound area due to migration process, apoptosis or other unknown mechanism of cell death. This fact leads to formation of scar with a reduced number of cells. At later stage fibroblast of granulation tissue change their phenotype and begin to temporarily express the smooth muscle actin,which have received the specific name of myofibroblasts.

CLASSIFICATION OF WOUNDS:

CLEAN WOUND:

Operative incisional wounds that follows non penetrating (blunt) trauma

CLEAN / CONTAMINATED WOUND:

Uninfected wound in which no inflammation is encountered but the respiratory, gastrointestinal, genital or urinary tract have been entered.

CONTAMINATED WOUND:

Includes open with traumatic wounds or surgically inflicted wounds that involve a breach in sterility of techniques that presents with evidence of inflammation.

INFECTED WOUND:

Untidy wounds with features and signs of infection showing purulent discharge.

CRITERIA FOR DEFINING SURGICAL SITE INFECTION:

SUPERFICIAL INCISIONAL SSI:

That presents within 30days after the surgery that involves the skin and subcutaneous tissue infection.

With one of the following features:

Purulent drainage with or without lab confirmation

Organisms that is isolated from an aseptically obtained culture of fluid or tissue from superficial incision.

Atleast with one of the signs of inflammation like pain or tenderness, localized swelling, redness or heat and superficial incision that is deliberately opened by surgeon.

Diagnosis confirmed by surgeon or attending physician

Are not reported if

Minimal signs of inflammation and discharge confined to point of suture penetration.

Infection over episiotomy wound site.

Infected burns wound

Incisional SSI that extends deeper.

Deep incisional SSI:

Signs of infection that occurs within 30 days after surgery without any implant or within year if implant is in place and the infection appears to be related to with infection dwelling into deeper fascial and muscle layers of incision.

With atleast one of the following:

Purulent discharge from deep incision but without any organ/space involvement. Fascial dehiscence or fascia is deliberately separated by surgeon due to signs of inflammation.

Deep abscess that is identified by direct examination, during reoperation, by histopathology or by radiologic examination(or) surgeon or attending declares deep incisional infection is present.

Organ/space SSI:

Infection occurs within 30days of operation or within 1 year if any implant is present.

Infection that involves anatomical structure that is not operated or manipulated by operation and atleast one of the following:

Purulent discharge from a drain placed by a stab wound into organ / space. Organisms isolated from organ/space by aseptic culturing technique.

Identification of abscess in the organ/space, the by direct examination during reoperation or by histopathological or radiological examination or diagnosis of organ/space SSI by the surgeon.

SURGICAL MICROBIOLOGY

Surgical infections are usually caused by bacteria, but fungal and viral Infections can also occur especially as post-operative infections in immuncompromised hosts.

ROUTE OF ANTIBIOTIC ADMINISTRATION

Intravenous administration of prophylactic antibiotic is recommended. This route of antibiotic administration can achieve necessary concentration of drug in blood and tissues during surgical procedure.

The absorption of drug after oral or intramuscular administration varies individually.

TIMING OF ANTIBIOTIC ADMINISTRATION

Antibiotic should optimally be given half an hour before incision, when the patient has stabilized after anesthesia induction.

Vancomycin should be given in a slow infusion which should terminate one hour before incision, that is, the infusion should start within 3 hours from incision.

DURATION OF PROPHYLAXIS

A critical period for the development of surgical site infections is 4 hours from bacterial entrance into the wound.

Perioperative antimicrobial prophylaxis has to ensure an optimal drug concentration in the plasma and extracellular fluid of potentially contaminated tissues during the procedure itself and for several hours after wound closure.

One dose of antibiotic 1/2 hour before skin incision is considered sufficient . The administration of an additional dose of antibiotic should be Considered if the procedure lasts longer than the double antibiotic half life

ANTIBIOTIC DOSAGE

The dose of antibiotic for prophylaxis is in most circumstances the same as it would be use in therapy.

Antibiotic dose should be proportional to the patient‘s body mass index, i.e. the patient‘s weight.

Studies in patients over 85 kg have indicated the need for a double dose in perioperative prophylaxis in order for drug concentrations in blood and tissues to be above the minimal inhibitory concentration.

BLOOD LOSS FLUID REPLACEMENT AND ANTIBIOTIC PROPHYLAXIS

In adult patients, the influence of blood loss or fluid replacement on serum concentration of the prophylactic drug is negligible.

An additional dose of prophylactic antibiotic should be given if blood loss is greater than 1500 ml, or haemodilution is up to 15 ml/kg.

Classification of operative wounds based on degree of microbial contamination

Classification	Criteria
Clean	Elective, not emergency ,non-traumatic, primarily closed; no inflammation; no break in technique; respiratory, gastrointestinal, biliary and genitourinary tracts not entered
Clean-contaminated	Urgent or emergency case that is otherwise clean; elective opening of respiratory , gastrointestinal , biliary or genitourinary tract with minimal spillage (e.g. appendectomy) Not encountering infected urine or bile; minor technique break
Contaminated	Non-purulent inflammation; gross spillage from gastrointestinal tract; entry into biliary or genitourinary tract in the presence of infected bile or urine; major break in technique; penetrating trauma <4 hours old; chronic open wounds to be grafted or covered
Dirty	Purulent inflammation (e.g. abscess) ; preoperative perforation of respiratory , gastrointestinal , biliary or genitourinary tract; penetrating trauma > 4 hours old

DEFINITIONS OF PERIOPERATIVE AND PERIPROCEDURAL SURGICAL PROPHYLAXIS

Perioperative prophylaxis implies the use of the antibiotics in elective surgical procedures in patients without previous signs of inflammation or infection aimed at preventing the occurrence of surgical site infection.

Periprocedural prophylaxis implies the use of antibiotics aimed at preventing the spread of infection after invasive diagnostic-therapeutic procedures in surgery and other nonsurgical medical areas (e.g. endoscopic procedures).

Primary goal of antimicrobial prophylaxis is to reduce microbial contamination in surgical site in order to prevent infection.

Perioperative and peri procedural prophylaxis are primarily intended for prevention of surgical site infections, but not any other infections that may occur as a consequence of hospitalization (e.g. hospital acquired pneumonia

RISK ASSOSCIATION WITH ASA CLASS

According to the preoperative score devised by the American Society of Anesthesiologists (ASA), the risk for wound infection is associated with general assessment of the patient's physical status.

ASA CLASSIFICATION OF THE PATIENT'S PHYSICAL STATUS

1. Normal healthy patient ,
2. Patient with mild systemic disease
3. Patient with severe systemic disease that limits activity , but is not incapacitating
4. Patient with an incapacitating systemic disease that is constant threat to life,
5. Moribund patient not expected to survive 24 hours with or without operation.

If ASA score >2, the risk for wound infection is increased

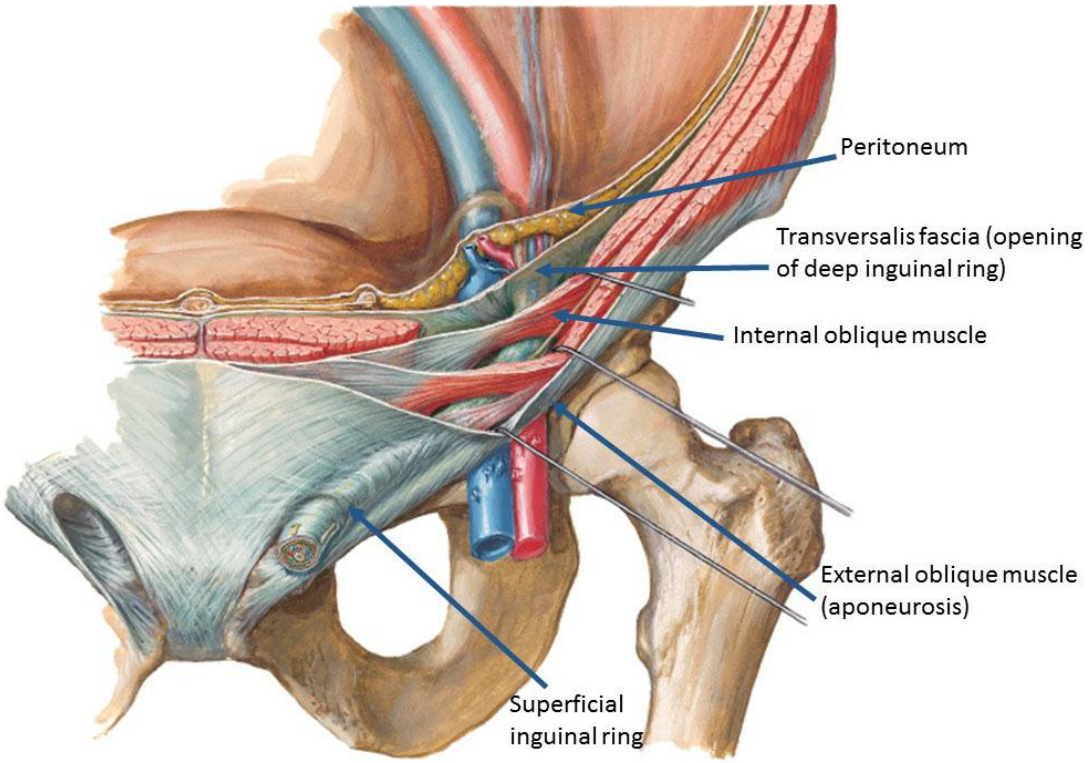
Surgical anatomy of anterior abdominal wall

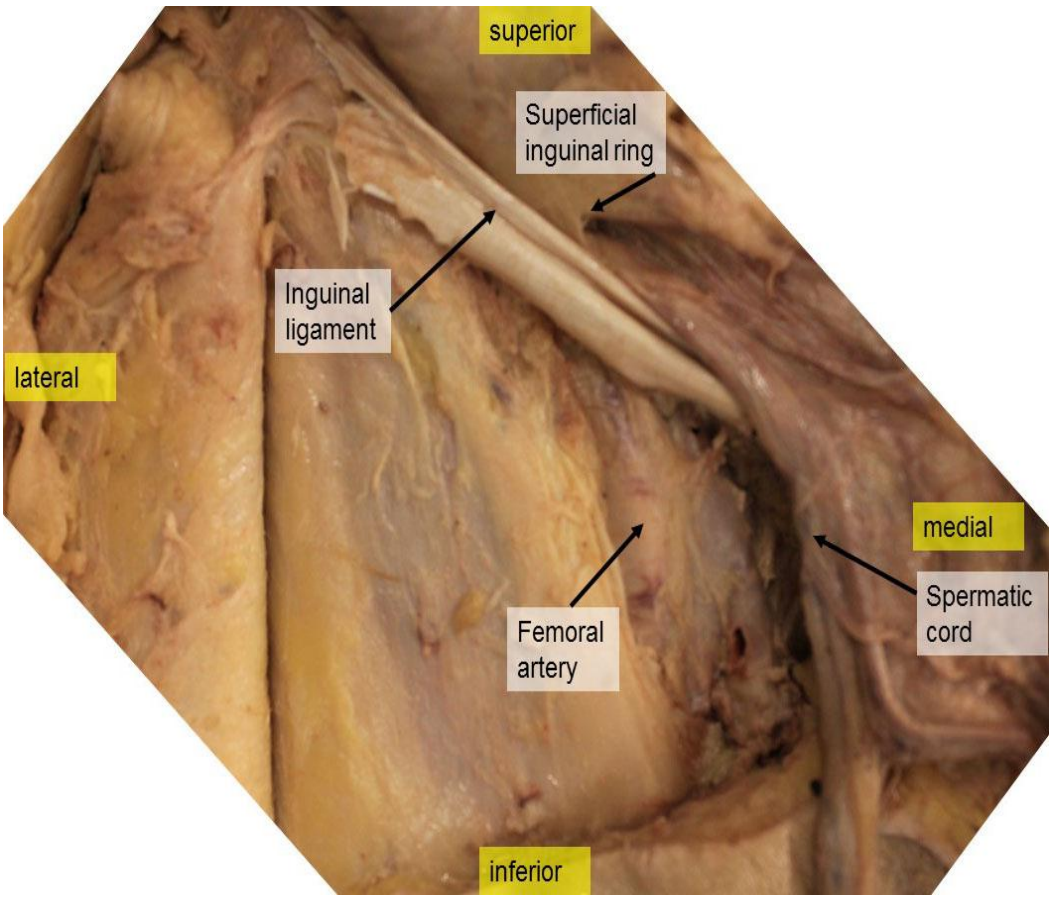
Muscles that is flat in abdomen and rectum that are arranged in order to form an elastic and contractile layer around the abdominal cavity that covers the content. The broad muscle cross each other by an arrangement designed to strength the abdominal wall that diminishes the risk of ventral hernias between separated muscle bundles.

The normal musculo fascial layers of abdominal wall that serves well in keeping all its contents. Visceras are maintained in position by tone of muscles. Protect viscera from external injuries.

Anterior abdominal wall from outside to inside consist of eight layers.

1. Skin
2. Superficial fascia
3. External oblique aponeurosis
4. Internal oblique aponeurosis
5. Fascia transversalis
6. Extra peritoneal fatty layer
7. Parietal peritoneum


Peritoneum
Transversalis fascia (opening of deep inguinal ring)
Internal oblique muscle
External oblique muscle (aponeurosis)
Superficial inguinal ring


superior
Superficial inguinal ring
Inguinal ligament
lateral
medial
Spermatic cord
Femoral artery
inferior

Skin:

Langers line run in transverse in direction. Incision that parallel to langers line seem to heal with a very narrower more cosmetic sear because of minimal forces that pull the skin edges apart.

Longitudinal or oblique incision that heal with comparatively by broader scar because they cut across the line of tension.

Superficial fascia:

Below anterior superior iliac spine it contains fatty layers of camper fascia and deep membranous layer of scarpa.

There is no deep fascia in abdomen in orders to facilitate movements of respiration.

Muscles:

- External oblique muscle:

  Originating from lower ribs and courses downwards and forwards that medially inserts to the iliac crest to pubic tubercle.

- Internal oblique muscle:

Originating below the lateral 2/3 rd of inguinal ligament iliac crest and intermediate lip iliac crest, course opposite to external oblique muscle.

- Transverse abdominis muscle:

  Takes origin from below inguinal ligaments thoraco fascia,lower six ribs, insertion into conjoint tendon, form aponeurosis and merges with linea alba.

- Rectus abdominis muscle

  Two muscles lie on edge to edge in the lower part but broader out above and separated from each other by linea alba. Three intersections are found in muscle are at umbilical, xiphisternum and one between them. The muscles are formed by fusion of mesodermal somites indicated by regular segmental innervations. At tendinous intersection fibers blend in seperately with the anterior layers of rectus sheath, prevents retraction of rectus in transverse incision. The muscles may be retracted laterally but not medially because of segmental nerves enter through lateral border.

Rectus sheath:

Aponeurotic envelopes the rectus abdominis muscle one each side of linea alba that act as retinaculum and prevents muscle from low stringing .

Above coastal cartilage only external oblique aponeurosis.

Below arcuate line-no posterior fascia.

posterior wall-posterior layer of internal oblique aponeurosis and transverse abdominis aponeurosis. Arcuate line posterior free margin of rectus sheath concave upward. Linea semilunaris from tip of 9^{th} costal cartilage to pubic tubercle.

Transversalis fascia:

Cover the deep fascia of transverse abdominal muscles and form a complete fascial envelope around the abdominal cavity. This general fascial serves to bind together the muscle and aponeurotic fasciae into a continuous layer and inforce weak areas.

Linea alba:

Strong midline fibrous, structure in between two rectus, producing by interlacement of aponeurotic fibers three flat muscles of abdomen

which is attached to xiphoid process above and pubic symphysis below, widened above the level of umbilicus but below the umbilicus it is difficult to recognize.

Nerve supply:

Anterior semi of thoracic nerves T7-T12

Iliohypogastric and ilioinguinal nerves of anterior abdominal wall.

Blood supply:

Superior and inferior epigastric arteries, deep circumflex iliac arteries and lumbar arteries. Neurovascular bundle lie in between transverse and internal oblique muscles and within rectus sheath, it passes between posterior aspect of rectus abdominis muscle and posterior wall of rectus sheath.

Suture materials:

The basic mechanism of wound healing is very vital in knowing the importance of suture materials and its prevention in role for reoccurrence. There should not be tensile strength in wound during 1st week. Rapidity in increase of strength of surgical wounds in 10days.Though the maximum strength can be obtained in the first year,

the original presurgical strength couldn’t be attained.so the suture materials play a vital role in maintaining the integrity of wound initially.

Ideal Suture Material:

Non absorbable, monofilament with retention of high tensile strength. Mono filament inert doesn’t act as a site of infection. commonly used suture materials for steps of inguinal hernioplasty,

Posterior wall strengthening by bringing conjoint tendon above with transversalis fascia below-1-0 vicryl.

Polypropylene mesh fixation of appropriate size-2-0 prolene.

External oblique aponeurosis leaflets above and below subcutaneous tissue-2-0 vieryl

Skin-2-0 ethilon

HERNIA- abnormal protrusion of a viscus or a part of viscus through the opening natural or artificial with a sac covering it

PARTS OF HERNIA- COVERING- layers of abdominal wall

SAC - diverticulum of peritoneum with mouth, neck body and fundus

CONTENT- omentocoele/enterocoele/cystocoele/Richter's hernia/litters hernia/ovary withfallopian tube

In enterocoele- first part is difficult to reduce, but the last part is easier. There will be gurgling sound on reduction. Resonant on percussion. Peristalsis might be seen. Bowel sounds may be heard

In omentocoele- first part is easier to reduce where as the last part is difficult to reduce. Dull on percussion with no peristalsis. Bowel sounds are not heard.

CLASSIFICATION OF HERNIA

CLINICAL – reducible/irreducible/obstructed/inflamed/strangulated

CONGENITAL/ACQUIRED

ACCORDING TO CONTENTS- omentocoele/eneterocoele/ritchers hernia/litters hernia/maydyls hernia/sliding hernia

CLSSIFICATION OF INGUINAL HERNIA

ANATOMICAL

INDIRECT- comes out through the internal ring along with the cord.sac is lateral to inferior epigastric artery

DIRECT- occurs through hasselbachs triangle.sac is medial to inferior epigastric artery

GILBERTS CLASSIFICATION

TYPE 1-indirect inguinal hernia through tight deep ring

TYPE2 IIH deep ring admit 1 finger but less than 2 finger breadth

TYPE 3 IIH deep ring more than two finger breadth

TYPE 4 direct hernia with entire defective posterior wall

TYPE 5 direct hernia-with punched out hole or defect in transversalis fascia

TYPE 6 pantaloon /double hernia

TYPE 7 femoral hernia

TYPE 6 &7 ARE ROBBINS MODIFICATION

NYHUS CLASSIFICATION

Type 1-indirect hernia with normal deep ring

Type II-indirect hernia with dilated deep ring without impengements on the floor of inguinal canal

Type III- posterior wall defect/direct/pantaloon/femoral

Type IV- recurrent hernia

ACCORDING TO EXTENT INDIRECT INGUINAL HERNIA

INCOMPLETE- bubonocoele-sac is confined to inguinal ring

Funicular- here the sac come s out through superficial inguinal ring but doesn't reach base of the scrotum

COMPLETE- sac descends down to base of scrotum

TYPES OF REPAIR

PURE TISSUE REPAIR- shouldice,mac vay,modified bassini

PROSTHETIC EPAIR- litchtenstien,rives,gilbert,stopa, TEP,TAPP

REPAIR CAN ALSO BE

ANTERIOR REPAIR- through anterior inguinal approach like bassinis, shouldice, mac vay, lictensteins, rives peritoneal repair

POSTERIOR REPAIR- through supra inguinal preperitoneal approach. nyhus, stoppas, TEP, TAPP, kugels repair

Steps of litchenstiens open inguinal hernioplasty:

Incision is marked at a point of intersection of index fingers that placed superior and lateral to the midpoint of pubic symphysis to a point 4cm that is horizontal and lateral to this intersection point.

The proper determination of incision site is needed for optimal visualization and adequate space for placement of mesh. Incise the marked line down to the deep subcutaneous tissue and cauterize the superficial epigastric vein as the subcutaneous tissue is dissected through width of skin incision for exposing scarpas fascia. After carefully dissecting scarpa fascia with electrocautary until exposing the external oblique fibres of aponeurosis.

After dissection of aponeurosis by small incision is made along the direction of fibres. Digitally dissect the space between the external and

internal aponeurosis sweeping laterally and superiorly up towards the superior iliac spine to create a dissected tissue plane that will subsequently accommodate the tails of prosthesis. The dissection should be performed gently and only using index finger. The finger moves close to the roof of this dissected space, thus avoiding the space that will positioned on floor of this new developed space.

The finger will move under the roof down to meet the pubic bone, where pectin and coopers ligament covered by the transversals fascia are identified with finger. The next step is to isolate the spermatic cord. The cord is elevated from its positon. The finger should go on to the roof of newly created space and bend forward inorder to grab the cord. The median hernia is clearly visualized at this point where lateral hernia is dealt a little differently.

The hernia sac is ideally not opened in the median hernia, as the content might be bladder wall in some cases. The posterior wall is strengthened incase of direct sac, as there is a defect in transversalis fascia. So strengthening is done by bringing conjoint tendon above to the transversalis fascia below.

In case of indirect sac, the spermatic cord is thoroughly explored to look for pearly white sac content, that is separated from rest of structures of cord(more importantly vas deferens)and dissected all the way through the deep inguinal ring where it is ligated, transfixed and excess sac is cut off. Before the sac fixation, the tip of indirect sac is opened and contents have to be properly reduced inside.

Polypropylene mesh of appropriate size is taken, fashioned in such way and have to be fixed, with its first bite taken at pubic tubercle followed by which it is medially fixed using a nonabsorbable suture material preferably 2-0 prolene.

Inguinal ligament is then anchored to the base of the mesh to prevent its migration caudal tail of the mesh is done distally behind the deep inguinal ring and they are fixed adequately so that they don’t overlap.

External oblique aponeurosis is closed ,ideally through running structures using absorbable suture material(2-0 vicryl).Subcutaneous tissues are approximated by using same material. skin is closed using 2-0 ethilon (non absorbable suture material)

Following which wound is cleaned thoroughly and sterile dressing is applied followed by a tight scrotal bandage.

Post operatively patient is kept in nil per oral for 4 hrs in case of direct sac.in case of indirect sac depending on the contents orals are started ideally after the return of bowel sounds

First look of wound site is looked up after 48hrs.following which discharge is advised on the third post-operative day.

Meshes for hernia surgeries:

The concept of mesh repair was used 50years back. Until 1958,almost all hernias are closed by primary suture repair. In 1958,usher published his technique of using a polypropylene mesh that later became as litchensteins tension free repair. In 2002,trails conducted by EU analysed around 58 RCT and confirmed that mesh repair is superior to others.

The original logic behind it was fairly simple as they reinforce the abdominal wall in formation of scar tissue, so the rule by a very strong material induces more fibrosis. Unfortunately this reaction brings about pain and complications. Tensile strengths required for any mesh to

withstand the intra-abdominal pressure is usually $1/10^{th}$ of its full capacity. So concept of lighter meshes weighed in.

Introduced in 1998(vypro), they have large pore size and smaller surface area and are accepted. They shrink less and are much better. Now combination of different meshes with composite properties are invented, as they can be used in any intraperitoneal space. Ideally it is always one out of 3 basic materials such as Polypropylene, polyster, PTFE incombination with other. Materials like monocryl, titanium, omega3, PVDF hyaluronate.

Now very recently biological meshes are introduced, that are more physiologically accepted. They consist of acellular collagen matrix derived from human dermis or porcine small intestine submucosa. They allow the development of soft tissues over them and becomes integrated over the process.

Properties of mesh:

Tensile strength:

The maximum intra-abdominal pressure raised by any adult is 170mmhg.This can be easily achieved by any prosthetic meshes which

can be withstand twice this pressure without bursting (burst pressure of vypro-360 mmhg).

Pore size:

Size of pores must be above 75 micro metre, as they allow the infiltration of neutrophils, macrophages, fibroblasts, blood vessels and collagen. Meshes with large pore size are ideally suitable, as they prevent granuloma formation. Bridging is prevented by granuloma and they cover the entire mesh. This leads to stiff scar plate and reduced flexibility.

Weight:

Depends on weight of polymer and amount of material used, Heavy weight mesh-thick polymer, small pore size, high tensile strength, weighs 100g/m*2,causes dense tissue scaring.

Light weight meshes-thinner filaments, large pore size, 33g/m*2, more estactic.

Reactivity/biocompatibility:

Biomaterials are physically and chemically inert. Biologically they are not inert .a foreign body reaction always occurs causing inflammation, fibrosis, calcifications and thrombosis and formation of

granuloma. During the process of fibrosis, the type 3 collagen is replaced by type 1 collagen. This is also predominantly decided by pore size.

Elasticity

Abdominal wall elasticity is 32N/cm that is 38%

Light weight meshes is 20-35% that is 16N/cm

Heavy weight meshes is 4-16% is also 16N/cm

So heavy weight meshes can restrict abdominal distension

Shrinkage is contraction of scar tissue formed around the mesh. This shrinks to 60% of former surface area

Complications of mesh

Infection risk- remains from 0.1-3%,higher in infected fields. They are determined by the type of filament used and pore size. Microporous mesh (ePTFE) are usually at high risk for infection

Adhesion risk- following the popularity of intra peritoneal mesh placement has lead to increased concerns regarding adhesions

Fibrin exudates follow towards the material causing adhesions .they are usually short lived till fibrinolytic system comes into play. The

intense adhesive reaction caused by heavy meshes causes its adhesion to the bowel that results in complications. To overcome this composite meshes are now actively used as they play a role only in regenerating the mesothelial cells in peritoneum rather than causing adhesions.in some types it is also possible for the layers to separate and become adherent to bowels

Reoccurrence- though technical error is attributed to be the main cause of reoccurrence of hernia two thirds of this reoccurrences occur after three years. Defective collagen synthesis must also be equally considered

Pain- entrapment neuropathy following the incarceration of nerves are neuromas can also occur. Chronic pain rates however have increased to 50% percent. Initially after surgery the main cause of pain is due to nerve damage at the time of surgery ,that is present over a period later for one year is commonly due to foreign body reaction

Mesh degradation-may be due to hydrolysis resulting in loss of mechanical strength of the mesh seroma.

TYPES OF PROSTHESIS IN MESH REPAIR

TYPE I- TOTALLY MACROPOROUS PROSTHESIS ,PORES>75 MICRONS,EXAMPLES ARE PROLENE,MARLEX

TYPE II- TOTALLY MICROPOROUS MESH PORES<10 MICRONS EXAMPLES ARE GORTEX OR DUAL MESH

TYPE III-MACROPOROUS PROSTHESIS WITH MICROPOROUS COMPONENETS EXAMPLES LIKE TEFLON,MERSILENE

TYPE IV- BIOMATERIALS WITH SUBMICRONIC PORE SIZE LIKE CILASTIC CELL GARD

IDEAL MESHS PREFERED IN SURGERY

When choosing a mesh the surgeon must consider the context or condition in which it must be used

In most situations, preferences should be given to light weight meshes with considerably large pores and minimal surface areas

Ideally it should be a monofilament one, a polypropylene or polyester meshes are usually preferred. These meshes will be more comfortable and have lower rate of infections

If a mesh is planned to placed intraperitoneally then ideally a mesh of considerably low rate of adhesion with absorbable surface must be preferred.

Despite the claims made by multiple manufacturers the choosing of single mail is considered a tricky one despite multiple options

In case of infected wounds, an absorbable mesh is preferred like vicryl or dexon.

Bio materials can also be very well used if the additional cost can be justified

Finally its mandatory for a surgeon to ideally place the mesh in proper order rather than choosing the mesh

If the mesh is too small or it is fixed highly under tension then the complications are bound to occur no matter what type of material is used

Despite the discovery of so many new material as the hands and technique of the surgeon play the vital role in preventing surgical site infections in hernia

TYPES OF MONOFILAMENT MESHES

MULTI

VICRYL - polygalactin, pore size is 0.4mm, fully absorbable from 60-90 days, weight is medium 56g/m2 .they are popularly used meshes in infected fields

DEXON- polyglycolic acid, medium pore size of 0.75mm

SAFIL (B-BAUN)

MULTIFILAMENT OR MONOFILAMENT MESHES

MARLEX (BARD)/ 3D MAX/POLYSOFT / PROLENE ETHICON /surgipro (AUTOSUTURE) /prolite (ATRIUM)/ trelex (meadox) /premilene

They are names of different polypropylene meshes used .pore size is small to medium 0.8mm.heavy weight of average 80-100g/m2

They are traditionally heavy meshes with small pores and little stretch not used in intraperitoneal spaces as they cause dense adhesions they have low infection risk

MULTI(ETHICON)-polyester , with pore size of large 1-2mm. They are non-absorbable medium weight is 40g/m2.they have low infection risk and less inflammatory response than PP long term degradation might be a problem

FOIL(GORTEX) –ePTFE ,has very small pore size that is not absorbable .has heavy weight. They are smooth and strong .they are not true meshes but a multilaminar patch that carry high rate of infection

Knot security is provided by the 'surgeon's knot' or square knot and this should always be used in preference to a 'granny knot'. Monofilament nylon and polypropylene have poor knotting characteristics and at least five 'throws' should be used to prevent knot slipping when these suture materials are used.

CAUSES FOR SURGICAL SITE INFECTIONS

No single factor is responsible for surgical site infection. Several factors are involved and the relative contribution of these factors varies greatly in different types of surgery. The vast majority of wound infections are endogenous. They are self-infections resulting from contamination of wound by bacteria carried by the host either on the body surface or more commonly within hollow viscera. A smaller proportion

of wound infections are exogenous. They are cross infections by bacteria derived from another source and they may occur in the operating room or in the hospital ward.

Wound infection may be primary or secondary. Primary wound infection is the result of bacterial contamination of the wound occurring during surgery. Secondary wound infection occurs within the postoperative environment when bacteria gain access to the wound either through the wound suture line or through another portal such as a drainage tube or drainage track. The majority of wound infections are primary of type.

RISK FACTORS FOR SURGICAL SITE INFECTIONS

GENERAL AND LOCAL RISK FACTORS

Antimicrobial perioperative prophylaxis should be applied in patients with increased risk for infection due to general or local risk factors which are listed in Table factors associated with an increased risk of surgical site infection

Systemic factors	Local factors
Diabetes	Foreign body
Corticosteroid use	Electrocautery
Obesity	Injection with epinephrine
Extremes of age	Hair removal with razor
Malnutrition	Previous irradiation of surgical site
Recent surgery	
Massive transfusion	

SYSTEMIC FACTORS

Systemic factors which may affect wound healing are

1. Age

2. Malnutrition

3. Vitamin deficiency

4. Zinc deficiency

5. Trauma, hypovolemia and hypoxia

6. Anemia

7.Uremia

8 Malignant disease

9. Jaundice

10. Corticosteroid drugs

11.Cytotoxic and antimetabolite drugs

Age

It is a common finding in studies of wound healing that complications are more prevalent in elderly patient: abdominal wound dehiscence is more common and has been shown that such patients also have a significantly higher incidence of dehiscence of colonic or

colorectal anastomoses. The fact is, however, that surgical patients also have a higher incidence of malnutrition, major operations, vitamin deficiencies and various other systemic abnormalities and it is difficult to conclude that age alone is a factor affecting wound healing.

Malnutrition

Many surgeons believe that malnutrition is the most important systemic factor affecting wound healing. Malnutrition has selective effects on certain tissues and wounds in different tissues may have a greater or lesser susceptibility to the effects of malnutrition. Malnutrition in surgical patients involves the deprivation of both protein and calories. Existing tissue collagen cannot be utilized in the local repair of wounds but it can be broken down and there is evidence that the amino acids of tissue collagen are reutilized in wound healing.

The amino acid methionine may have a key role in wound repair and that the adverse effects of malnutrition on wound healing may be reversed by the administration of methionine alone. Methionine is involved in the synthesis of the sulphatemucopolysaccharides of wound tissue and methionine and cystine are essential nutrients for the survival of fibroblasts in tissue culture. A deficiency of methionine would

therefore provide a neat explanation for the failure of synthesis of collagen and mucopolsaccharides in malnourished subjects.

Vitamin Deficiency

Ascorbic acid deficiency is a significant factor in the healing of wound in surgical patients. Surgical trauma causes a fall in leucocyte ascorbic acid tevels but these changes are unrelated to the severity of surgical trauma, blood loss, or blood transfusion and they may simply be obligatory features of the metabolic response to trauma; some of the ascorbic acid lost from leucocytes may be utilized in the surgical wound. The lowest levels of leucocyte ascorbic acid are found in the elderly and there may be a case for the use of ascorbic acid supplements in elderly patients.

Deficiencies of other vitamins probably have little relevance to wound healing in surgical patients. Vitamin A has a stabilizing effect on lysosomal membranes and it is alleged that it may reverse in inhibitory effects of Corticosteroids on wound tissue. Vitamin E has an inhibitory effect on wound repair in experimental animals but there is no evidence that either vitamin affects wound healing in man.

Vitamin D is an essential in calcium metabolism and in the formation of new bone. In rickets, severe deficiency of the vitamin interferes with bone growth and a soft collagenous matrix of osteoid tissue is laid down instead of calcified bone. However, deficiencies of vitamin D are rarely encountered in civilized communities and there is no evidence that vitamin D deficiency affects the healing on bone in surgical patients.

Zinc Deficiency

It has been suggested that a deficiency of zinc has adverse effects on the healing of wounds in man. Zinc is required for several enzymatic reactions in the human body and it stabilizes lysosomal and cell membranes probably by inhibition of lipid peroxidases; the enzymes DNA polymearse, reverse transcriptase and lysyl oxidase and zinc dependent. A deficiency of zinc has adverse effects on cell multiplication, fibroplasias, collagen synthesis and the epithelial covering of wounds but significant levels of zinc deficiency affecting wound healing in man are probably found only in severe burns, and in the management of intestinal fistulas. Patients required prolonged parenteral nutrition therapy in the absence of a normal diet should be given zinc supplements but the

recommended dosage of zinc should not be exceeded since high serum levels of zinc are associated with toxic effects.

Trauma hypovolemia and hypoxia

Numerous studies have suggested that trauma, hypovolemia and hypoxia have important systemic effects on wound healing. Chassin and his colleagues measured the breaking strength of abdominal wound in rats, and they found that the additional trauma of an extensive skin incision resulted in impaired healing of the abdominal wound. Zederfeldt suggested that the effects of remote trauma and hypovolemia on the breaking strength of abdominal wounds in rabbits and he reported that both factors had adverse effects on wound healing. Zederfeldt suggested that the effects of trauma and hypovolemia on wound healing had a common basis and that tissue hypoxia was the final common factor affecting wound repair. Oxygen is an essential factor in the hydroxylation of the amino acid proline and lysine during the synthesis of collagen and further experimental studies have confirmed that a low tissue PO2 has adverse effects on wound healing. Further possible effect of remote trauma and wound healing is the adverse effect it may on the immunological defenses.

It has been shown that remote trauma and hypovolemia increased the susceptibility of experimental animals to staphylococcal and pseudomonas infections. However, according to Conolly and his colleagues, tissue hypoxia may be the most likely explanation for the susceptibility of traumatized or shocked animals to wound infection. Finally it has been suggested that post-operative changes in ascorbic acid availability may be a significant factor in the pathogenesis of wound failure in traumatized subjects but this seems unlikely since there is no significant correlation between the severity of trauma and postoperative changes in leucocyte ascorbic acid.

Several clinical studies have supported the thesis that major trauma and hypovolaemia affect wound healing. It has been shown that the incidence of Wound complications increases in relation to the severity of abdominal trauma and there is a correlation between the volume of blood transfused or blood loss during surgical operations and the incidence of abdominal wound dehiscence and dehiscence of colonic anastomosis. All the same, these observations do not prove the tissue hypoxia is the final factor causing these complications of wound healing and there may be other factors involved. Indeed, in experimental studies of the effects of trauma on the healing of colonic anastomoses, it was found that the

postoperative intraperitoncal infection was the factor responsible for an increased incidence of anastomotie dehiscence in traumatized animals.

It has been suggested that the normal process of wound repair is inhibited by low wound oxygen tensions and that wound healing may be improved by increasing the oxygen supply to the wound. In tissue cultures, the optimal growth of fibroblasts is achieved at a SpO2 of 60 mm of Hg, but Silver has reported that the proliferation of fibroblasts occurs in vivo at a tissue oxygen tension of 15 mm of Hg. In studies of the tissue fluid accumulating in wound chambers and sponges implanted in the subcutaneous tissue of experimental animals, Hunt and his colleagues found tissue SpO2 levels which were significantly lower than 15 mm Hg and they suggested that hypoxia may be a rate limiting factor in the synthesis of collagen during the normal process of wound repair. Indeed it was shown that synthesis of collagen during the normal process of wound repair. Indeed it was shown that increased inspired oxygen tensions were associated with increased collagen synthesis in the simulated wounds in these experiments and it has also been reported that oxygen therapy in experimental animals results in an increase in the breaking strength of sutured skin incisions. Thus we now have the concept of ‘super-normal’ wound healing, but it should be noted that this

is based to a large extent on biochemical observations of stimulated wounds, where implanted tissue chambers and the tissue capillary oxygen gradients or conditions of oxygenation in these wounds may be quite different from those in sutured surgical incisions.

Anemia

Studies of surgical patients have suggested that anaemia may be involved in the pathogenesis of wound complications; an increased incidence of dehiscence of abdominal wounds and colonic anastomoses has been reported in anaemic patients. However, it is possible that other factor such as malnutrition or the type of surgery performed in anaemic patients were actually responsible for the failure of wound healing.

Malignant Disease

The significance of malignant disease as a systemic factor affecting wound healing is uncertain. Wolf suggested that it has no effect on healing and the results of clinical studies of abdominal wound healing by White and his colleagues Ellis and Heddle appear to support his contention. However, Reitamo and Moeller reported that there was a two-fold increase in the incidence of wound dehiscence in surgical patients suffering from malignant disease and Irvin and Goligher found that the

dehiscence of colonic and colorectal anastomoses occurred frequently in patients with incurable malignancy. Again, it has been shown that jaundice resulting from malignant obstruction of the bile duct is associated with a high incidence of abdominal wound dehiscence, irrespective of the degree of biochemical disturbance associated with the jaundice.

Jaundice

In retrospective clinical studies of abdominal wound healing, Reitamo and Moller and Keill and other found no convincing evidence that jaundice was involved in the pathogenesis of abdominal wound dehiscence. However, these studies included very small numbers of jaundiced patients and in a careful prospective study of abdominal wound healing. Ellis and Heddle found that jaundiced patients had a significantly higher incidence of wound dehiscence and incisional hernia compared with anicteric patients undergoing laparotomy

Bayer and Ellis investigated the effects of jaundice on wound healing in the rat following ligation of the common bile duct and they reported that obstructive jaundice was associated with delay in the appearance of wound fibroblasts and new blood vessels and that there

was a significant reduction in the breaking strength of abdominal wounds. Than et al., reported that there was evidence of reduced collagen synthesis in the tissues of jaundiced patients; measurements of the enzyme prolyl hydroxylase in skin biopsies of jaundiced patients reveal that the accumulation of collagen in abdominal wounds was delayed in jaundice patients but this biochemical abnormality was not accompanied by changes in mechanical strength or rupture stress of abdominal wounds. The effects of jaundice on wound healing in humans have been reexamined recently in a retrospective clinical study of 48 jaundiced patients Undergoing abdominal surgery; abdominal wound healing in these patients was Compared with the findings in 281 anicteric patients undergoing elective surgery for gallstones. Forty six of the 48 jaundiced patients had extra-hepatic biliary obstruction and it was found that they had a significantly higher incidence of abdominal failure compared with anicteric patients; wound dehiscence or incisional hernia occurred in 27.1% of jaundice patients and in 4.3% of anicteric patients. However, there was no correlation between wound dehiscence or incisional hemia and the depth of jaundice or plasma bilirubin, preoperative liver enzymes or plasma albumin levels and the factor which did seem to determine the outcome of abdominal wound healing was the presence or absence of malignant disease. Wound dehiscence or incision hernia occurred in 12 of

22 patients with malignant disease (59.1%) but these complications did not occur in 26 patients with jaundice resulting from benign pathology.

The findings of experimental studies indicate that jaundice has adverse effects on wound repair but the clinical significance of these findings is uncertain and it appears that other factors may account for the failure of wound healing in surgical patients; jaundiced patients with malignant disease are particularly at risk of complications of wound healing. The type of surgery involved in the management of patients with malignant disease may be a factor in the pathogenesis of wound complications.

Corticosteroids

According to Ehrilch and Hunt, the effects of steroids on wound repair may be related to the stabilizing effect of cortisone on lysosomal membranes. Experimental studies have shown that the effects of steroids on wound tissue are reversed by the administration of vitamin A which stabilizes lysosomal membranes. Laboratory studies of Sandberge have suggested that steroid therapy affects wound healing only when it is used before surgery or in the early postoperative period; steroid therapy

commcnccd several days after surgery has little or no effect on the healing of wound healing in experimental animals.

Clinical studies of wound healing in surgical patients have shown that wound dehiscence and sepsis are more frequent complications in patients receiving steroids at the time of operation. However, it is by no means certain that steroids are responsible for these complications for the patients receiving steroid therapy are frequency those who have serious disease, malnutrition and other factors which may affect wound healing.

Cytotoxic and Anti Metabolite Drugs

There is increasing use of cytotoxic and anti - metabolic durg in medicine, transplantations surgery and in the management of malignant disease. It seems probable by the nature of their action that the therapeutic use of these agents would interfere with wound repair and experimental studies in laboratory animals have produced some evidence to support this connection.

'Cut well, sew well, heal well' is an axiom favored by surgeons but it appears that there is rather more involved in the healing of surgical wounds. Surgical technique and other local factors are undoubtedly of much greater importance than the influence of systemic factors in the

success or failure of Wound repair, but we can nevertheless identify groups of patients who are at risk of wound complications by virtue of the presence of various systemic abnormalities. Unfortunately, with the probable exceptions malnutrition and uraemia. we remain in the unhappy position of being unable to define the precise significance of the systemic abnormalities or to offer specific therapy which may remove the threat of wound complications. Further progress may depend on the development of improved techniques of local wound care.

The effect of bacterial infection on wound healing

The biochemistry of wound infection is complex. Delayed epithelial growth and migration, cellular necrosis and microvascular thrombosis are histological features of infected wounds and they result from the combined effect of bacterial toxins and the hostile chemical environment of the infected wound. The principle of biochemical abnormality in infected wound seems to be a disturbance of collagen metabolism, there is a constant process of synthesis and lysis of collagen in all wounds and to a lesser extent in unwounded tissue and this process may be affected in several ways by the presence of bacterial infection. Firstly, there is exaggerated lysis of wound collagen by collagenolytic enzymes, some of these are lysosomal enzymes present in

polymorphonuclear lymphocytes in the infected wounds, others are enzymes which are normally present in tissues.

The second factor, which may affect collagen metabolism, is disturbance of collagen synthesis in infected wound. Fibroblasts engaged in synthesis of wounds collagen must complete with other cells for available nutrients within the wound and in the presence of infection the metabolism of bacteria and inflammatory cells may utilize oxygen and other wound nutrients to the extent that the metabolism of fibroblasts is impaired. The net result of the changes in collagen metabolism is that the collagen content of the wound is reduced, the process is not confined to the wound alone, it extends through the wound edges into unwounded tissues, the wound edges becomes soft and mechanically weak, and wound sutures will cut out the softened tissue resulting in the disruption of wounds closed by primary suture. Etiology of Surgical Site Infection

Infection

Bacterial infection is the most common complication of wound healing and it encountered in every surgical specialty. Multiple factors are involved in the pathogenesis of wound infection and the effects of infection are divers. Classical wound infection occurring in wounds

closed by primary suture may simply be a source of significant morbidity but infection in vascular operations, plastic surgery and orthopaedic surgery may have disastrous consequences.

COMMON SURGICAL SITE INFECTION PATHOGENS

The majority of surgical site infections are caused by bacteria tha patient is colonized with and are part of the normal human flora. Exceptionally, in patients with prolonged hospital stay, multiple resistant hospital pathogens can be expected

The most common bacterial pathogens causing surgical site infections

- Staphylococccus auereus
- Coagulase – negative staphylococci(CONS)
- Enterococcus spp.
- Pseudomonas aeruginosa
- Enterobactor spp.
- Proteus mirabilis
- Klebsiella pneuminae
- Streptococci
- Candida albicans

PROPERTIES OF GENTAMYCIN

Gentamycin is a broad spectrum antibiotic that is of aminoglycoside family produced by the fermentation of micromonospora purpurae or micromonospora echinospora.it is an antibiotic consisting of four major and several minor components. It is an amino acid with a sugar linked glycoside bond to central aminoyclitol ring.it then causes concentration dependent killing of bacteria that does not dependent on inoculums size .It then diffuses passively across the diffusion pores, outer membrane and then by transversing the membrane by an energy dependent system. In cytoplasm gentamycinbinds the BOS ribosomal submit which leads to faulty translation of mRNA codon through which wrong aminoacidis incorporated compromising the strength of bacterial protein. It is followed by bacteriostatic effect.

Other mechanism causes electrostatic interaction, have been postulated explain the rapid action. Along with gram negative bacteria, gentamycin has killing actively against gram positive staph aurens and staph epidermidis. It also shows synergy when used in combination with other beta lactams.

Gentamycin is poorly excreted in milk newborn infants apparently absorb small amounts of gentamycin ,but serum levels with typical three times/day dosages are far below those attained when treating newborn infections and systemic effects of gentamycin are unlikely older infants are expected to absorb less levels of gentamycin because there is a less variability in milk gentamycin levels during multiple daily dose regimens, timing breastfeeding's with accordance to the dose is of little or no benefit in reducing infant exposure.

SPECTRUM OF COVERAGE

It is indicated in serious infections caused by susceptible strains of organisms like pseudomonas aueroginosa, proteus species, Escherichia coli, klebsiella enterobacter and serratia species, citrobacter, staphylococcus sp.

It is effectively used in combination with carbeniciilin for the treatment of life threatening infection caused by pseudomonas aueroginosa.it is also found to be effective when used in conjunction with penicillin type drug for the treatment of endocarditis caused by group D streptococci

It has also been to show effective in treatment of serious staphylococcal infections. While it is not the first choice, gentamycin may be considered when penicillin or other less potentially toxic drugs are highly contraindicated

In the neonate, with bacterial sepsis or staphylococcal pneumonia,a penicillin type drug is also usually indicated as concomitant therapy with gentamycin

Gentamycin is used for the treatment of bacterial endocarditis and for the prevention of bacterial endocarditis

Gentamycin is used in conjunction with other appropriate anti infectives for treatment of endocarditis caused by viridians streptococci or s.bovis

Gentamycin has been used in the treatment of bartonella infection, including infections caused by B.hensele, B.quintana or bacilliformis

Gentamycin is used for empric anti-infective therapy of presumed bacterial infection is febrile neutropenic patients. Gentamycin is used in conjunction with an appropriate antipsuedomonal cephalosporin, extended spectrum penicillin or carbapenam. Gentamicin should not be used alone for empiric therapy in febrile neutropenic patients.

It is used in the treatment of tularemia caused by Francisella tularensis. Although streptomycin generally is considered the drug of choice for this infection,

PHARMACODYNAMICS:

They are handled by a simple way. It is excreted unmodified by kidney and it follows first order kinetics that means that the concentration of drug excreted from the system is proportional to its blood levels.

This means that after the initial administration of drug, it is excreted exponentially which means that the drug excreted will be

considerably low at later hours, as the concentration of drug remains in plasma is less.

In patient with normal renal function, T1/2 is 2 hours. In poorly functioning kidneys, T ½ is greater, if no kidney function is there, levels are infinite then.

Gentamycin is given thrice a day, with dose ranging from2.5mg/kg -7.5mg/kg. The levels in the blood can be predicted closely if kidney function and volume of distribution are known. A peak level is attained usually in 30 mins, followed by a through level just before the next dose. When many people assume that the toxic symptoms following gentamycin is caused by an overdose, the one is safe if the peak troughs remains in the limits noted above. Exceptional cases have been reported where toxicity occurs even after a single dose. The possibility of bilateral vestibular toxicity develops even when recommended doses are given for extended periods of time.

Extended interval dosing

Nowadays after knowing that high peak dose are not required necessarily harmful, a large bolus is given in once a day or along schedule for every 24hrs dosing, peak levels are found to be much higher

than levels that are expected from three times dosing on an attempt to monitor this extended interval dosing, are not a good measure of kidney function, as mostly they reflect the volume of distribution.

Use of gentamycin impregnated meshes

Use of topical gentamycin allows the concentration (peak and trough) levels attained in blood to be very minimal much lesser than the systemically administered dose. The concentration of the local drug is to keep atleast for 48hrs, before they go into systemic circulation avoiding resistance to antibiotics. Gentamycin also improves collagen type 1:3 ratio, scar quality and integration of the mesh .later they showed dose dependent effect in expression of matrix metalloproteinase 2 and tissue integration. The serum concentration of antibiotics display a peak value of one hour post operatively and decline within the very next day.

METHODOLOGY

- The primary aim of this study is to preferentially select a group of individuals (without chronic kidney disease).and classify them randomly into two groups .one group undergoes surgery for inguinal hernia with mesh hernioplasty and is given injection gentamycin 160 mg IV as single dose for three days . the study group undergoes hernia surgery with mesh hernioplasty in which mesh is impregnated preoperatively with 160mg of gentamycin and soaked for a period of 15 mins and it is implanted over the defect. Rest of the surgical procedures are just carried out and post operatively they are not subjected to any antibiotic (including oral, intravenous and topical route) throughout their duration of stay in hospital. Both the groups are followed at around the time of suture removal , 30 days from surgery and 6 months follow up after surgery and their results are tabulated

- The result of superficial infection are taken from the fact that the infection that presents around the time of suture removal or within 30days of surgery are grouped under superficial infections.

- Deep infections are generally give the name when the wound doesn’t heal over a long period of time despite multiple interventions and since the implant present inside the space clearly defines the wound infection that was present for a significant amount of time(less than year)

- Wound infection are confirmed only when the following criteria is fulfilled

- 1.signs and symptoms of inflammation like redness, rise in temperature, pain and tenderness and oedema are seen over the wound covering an area of approximately 2 cms in diameter

- 2.purulent discharge that is seen coming from the wound site from 1st post-operative day to 30 days for superficial infection and in my study they are conveniently followed for longer periods of time to upto 1 year

- 3.fever >38.5 degree on two unrelated occasions with a gap less than 24hrs significantly between them. Other causes for fever should be ruled out before concluding this

- Though stitch abscess and seroma are taken into consideration in my study the are not classified under wound infections as they don’t fill in the criteria of SSI

- Wounds with purulent discharge are opened and swabs are collected under sterile aseptic precautions. These swabs are then sent for microbiological examination where they are processed aerobically and anaerobically by standard methods over blood agar and plain agar for a period of three days. Antibiotic sensitivity of the cultured organisms was sufficiently tested and reported following which they are started on them for proper wound management

MATERIALS AND METHODS

- **STUDY PLACE**: Coimbatore medical college and hospital

  Coimbatore

- **TYPE OF STUDY:** prospective cohort study

- **STUDY PERIOD:** January 2018-january 2019

- **SAMPLE SIZE :** 100

INCLUSION CRITERIA

- All the patients undergoing hernia surgeries preferably inguinal hernia surgery without sex disparity are taken into consideration from age groups between 20-90yrs

EXCLUSION CRITERIA

- Patients undergoing surgeries for emergency conditions that are associated with hernia like obstruction, strangulation and incarcerations

- Patients who have very poor glycemic control/uncontrolled diabetes mellitus

- Patients suffering from any form of kidney disease or vulnerable to get one likely

- Patients who are allergic to aminoglycoside antibiotics(even those who develop minor skin reactions following the administration of the test dose are excluded)

- Patient whose follow up is supposedly very unlikely owing to their distance or personal reasons

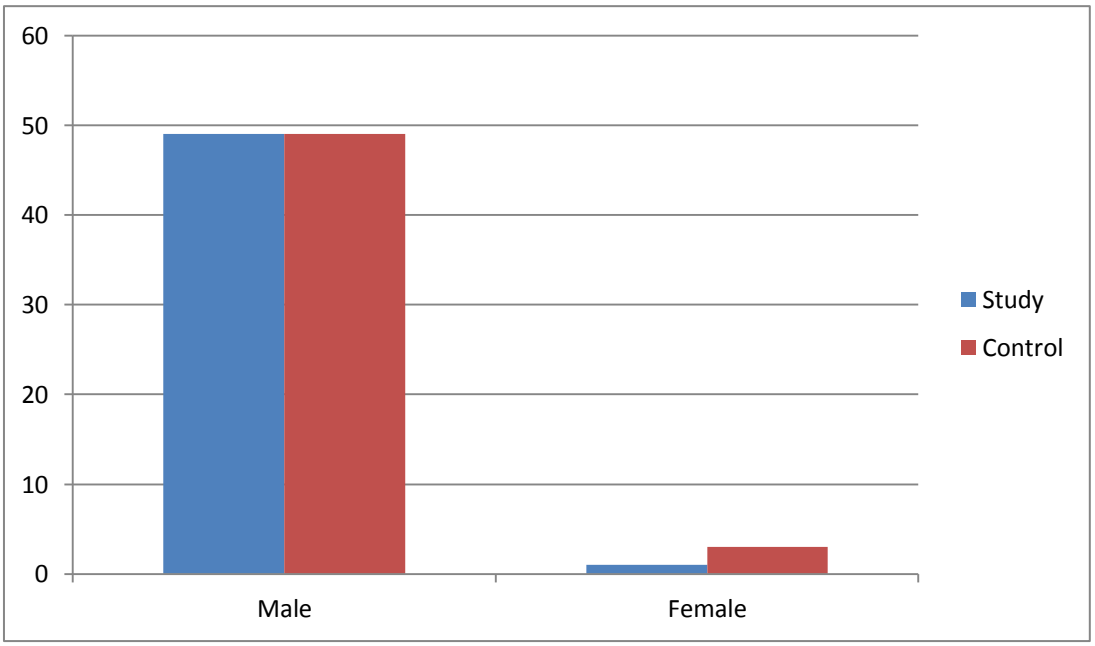
RESULTS AND OBSERVATION

All patients were categorized into surgical groups (as stated in methods) and occurrence of SSI was assessed in relationship to the following parameters (to determine clinical significance)

TABLE1

SEX DISTRIBUTION

Sex	Study	Control	Frequency	Percentage
Male	49	49	96	96
Female	1	3	4	4
Total	50	50	100	100

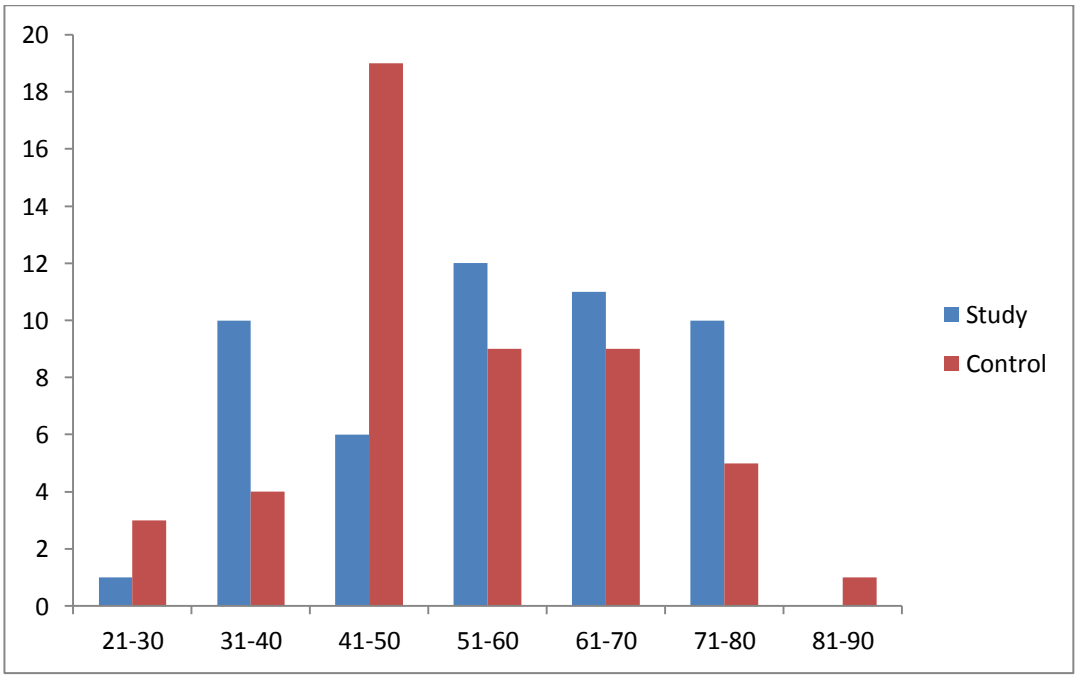


In my current study, the percentage of men in the study is 96% and that of female is 4%, the incidence of hernia is more in male patients compared to female sides.

Table 2

Age distribution

Age	Study	Control	Frequency	Percentage
21-30	1	3	4	4.0
31-40	10	4	14	14.0
41-50	6	19	25	25.0
51-60	12	9	21	21.0
61-70	11	9	20	20.0
71-80	10	5	15	15.0
81-90	0	1	1	1.0
Total	50	50	100	100.0

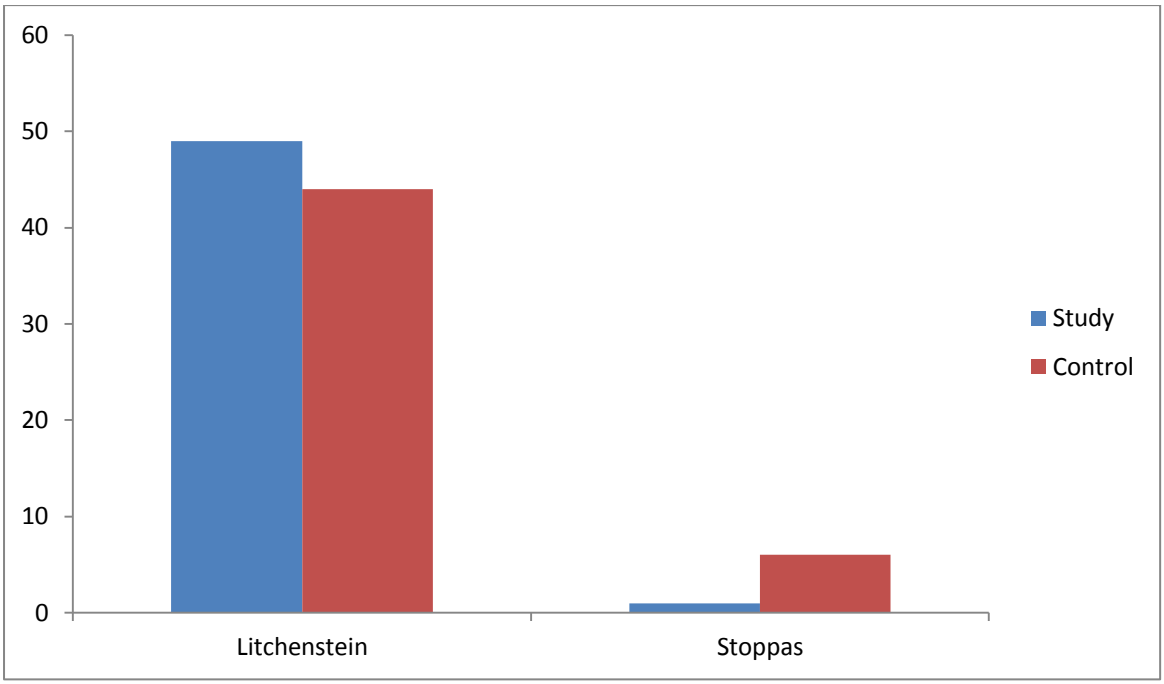


In the above study the age distribution of the patients varied from 21-90 years. The most common age group is 51-60yrs . The frequency of age group is evenly distributed between the study and control group.

Table 3

Types of surgery

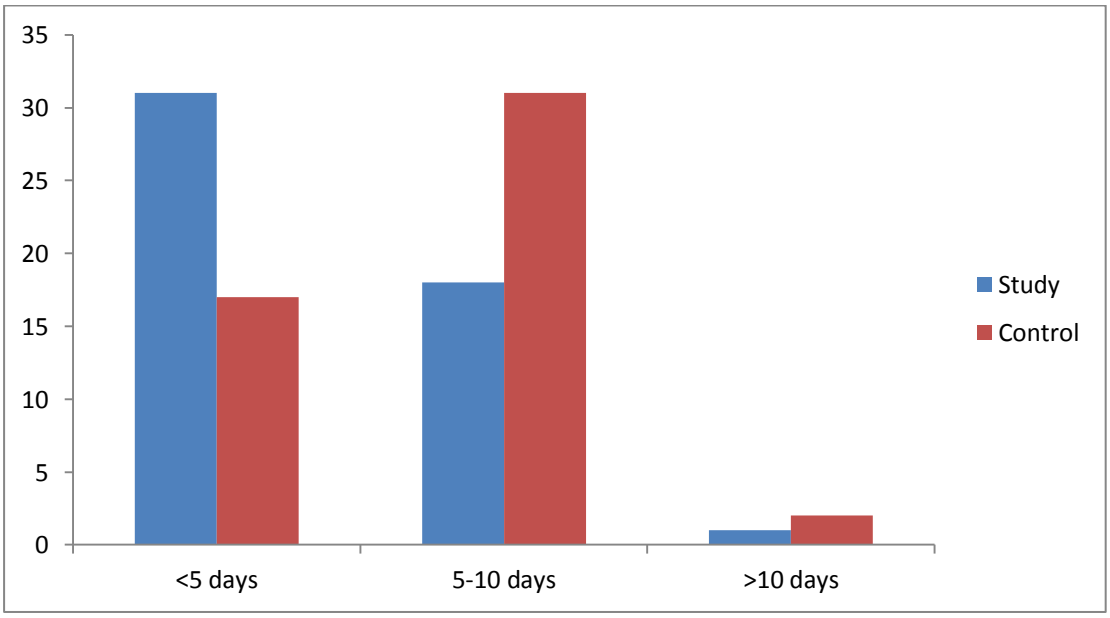
Procedure	Study	Control	Frequency	Percentage	Chi-square	p value
Litchenstein	49	44	93	93.0	3.840	0.050
Stoppas	1	6	7	7.0		
Total	50	50	100	100.0		



The majority of the patients undergoing this study underwent lichenstein's hernioplasty compared to stoppas repair. Around 93% of the people in the study underwent lichenstein's hernioplasty and 7% underwent stoppas repair. But the p value is 0.05 which is insignificant, there is no significant discrepancy between the distribution of cases on both sides.

Table 4
Duration of stay in hospital

Hospital stay	Study	Control	Frequency	Percentage	Chi-square	p value
<5 days	31	17	48	48	7.866	0.020
5-10 days	18	31	49	49		
>10 days	1	2	3	3		
Total	50	50	100	100		

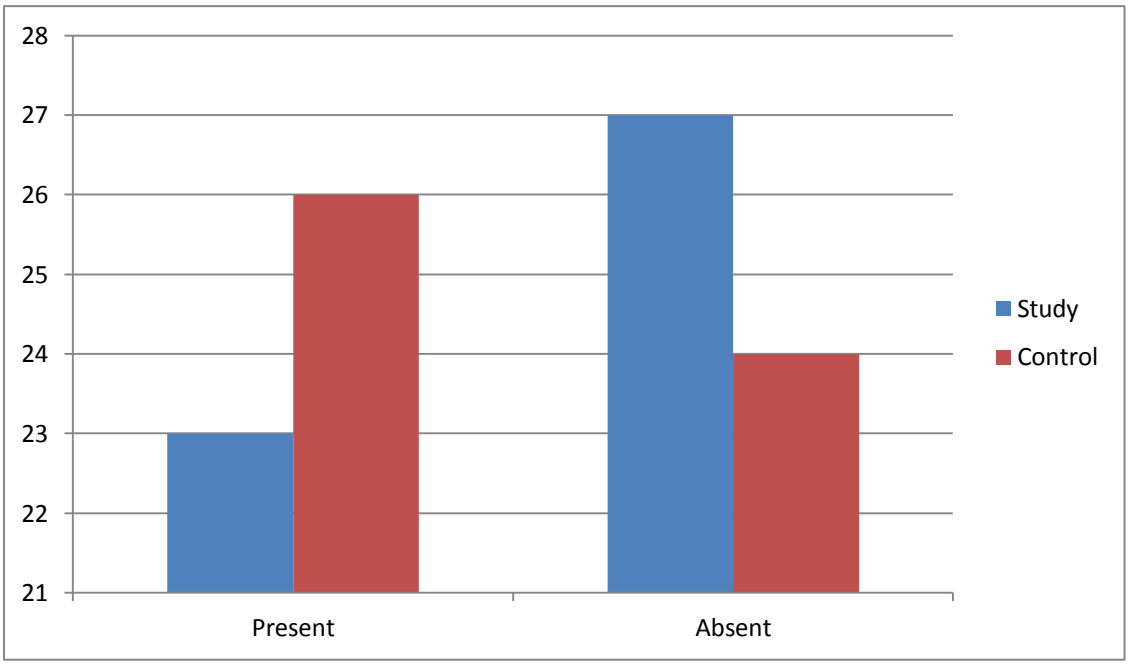


Around 48% of the patients stayed less than 5 days in hospital preoperatively of which 31% are in the study group and 17% are in the control group. Around 49% of the patients stayed for 5_10 days in the hospital preoperatively of which 18% are in the study group and 31% are in the control group. Around 3% of the patients stayed for more than 10 days in the hospital preoperatively of which 1% is in the study group and 2% are in the control group.

Table 5

Patients with hypertension

Hypertension	Study	Control	Frequency	Percentage	Chi-square	p value
Present	23	26	49	49	0.360	0.548
Absent	27	24	51	51		
Total	50	50	100	100		

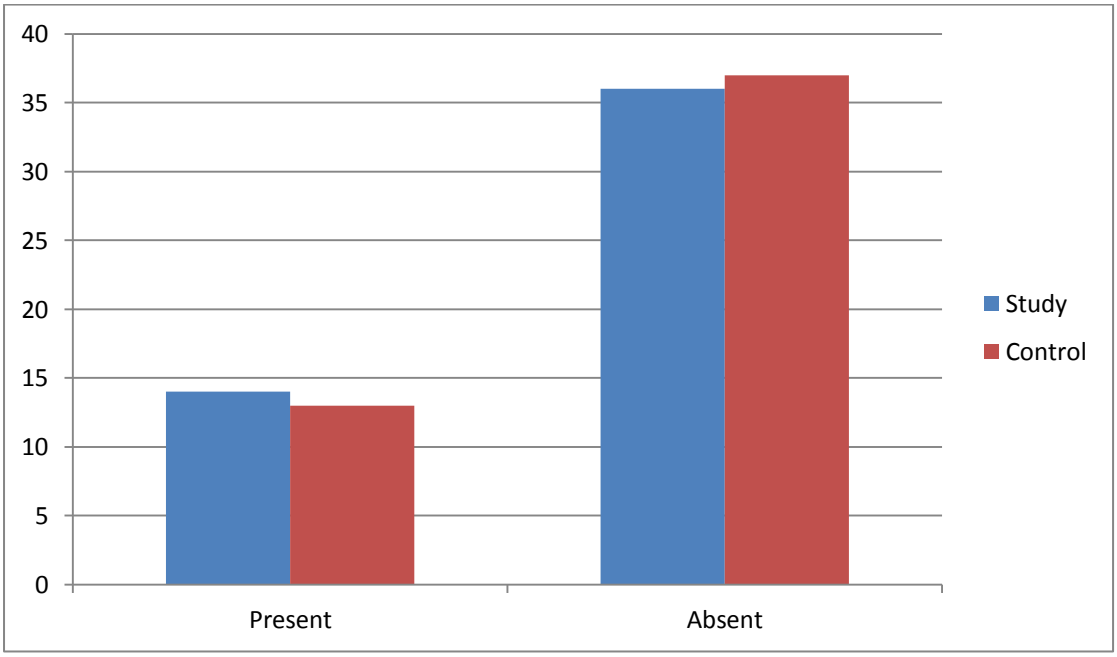


Around 49% of the patients involved in this study are hypertensive and 51% of the patients in this study are not hypertensive, but again as borne out by the p value which is 0.5 there is no significant discrepancy in distribution of cases based on hypertension between the groups .

Table 6

Patients with dyslipidemia

Dyslipidemia	Study	Control	Frequency	Percentage	Chi-square	p value
Present	14	13	27	27	0.051	0.822
Absent	36	37	73	73		
Total	50	50	100	100		

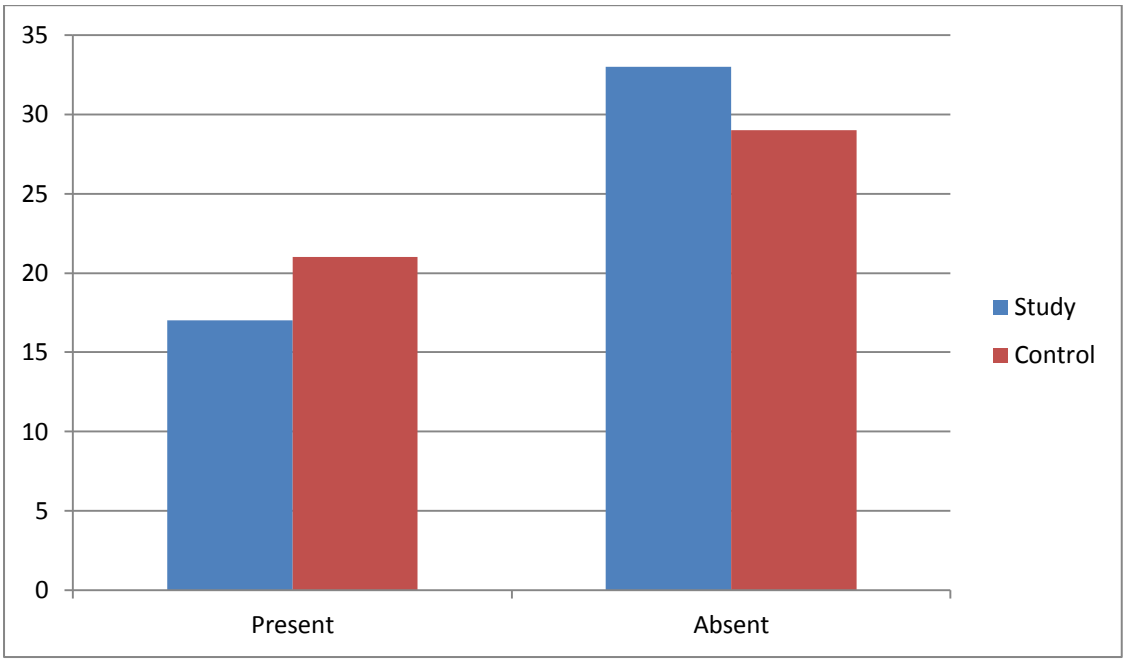


Around 27% of the people involved in this study showed altered lipid ranges and 73% of the people had levels within normal limits, since the p value is 0.8 there is no significant discrepancy between distributions of cases based on lipid values.

Table 7

Patients with CAD

CAD	Study	Control	Frequency	Percentage	Chi-square	p value
Present	17	21	38	38	0.679	0.410
Absent	33	29	62	62		
Total	50	50	100	50		

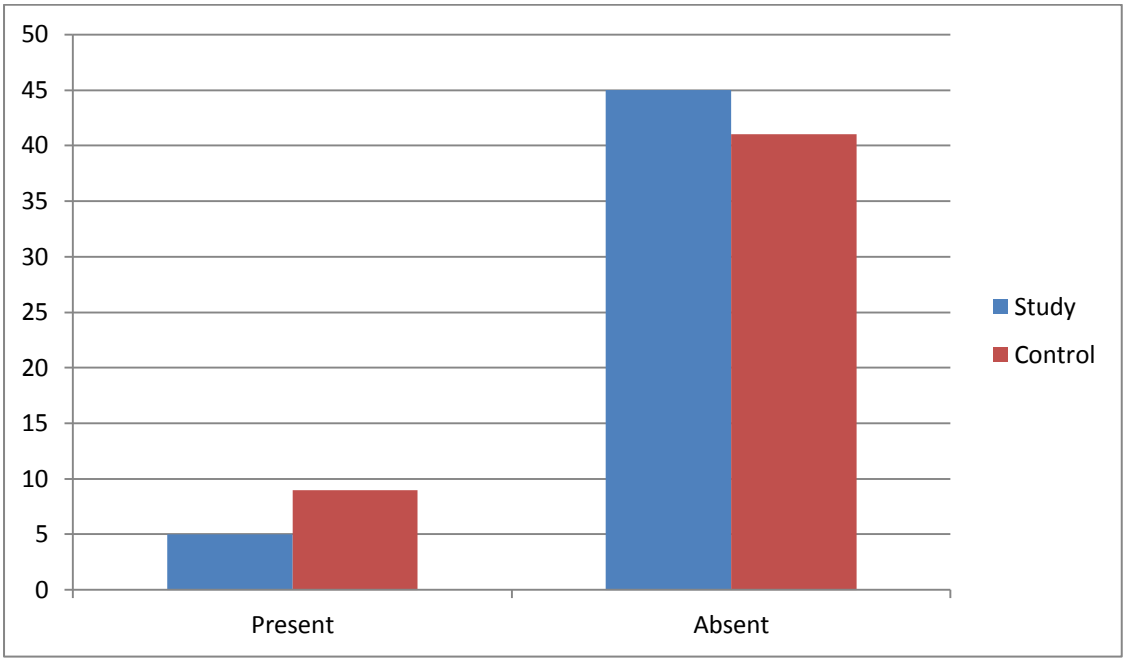


Around 38% of the patients who underwent this study had coronary artery disease and 62% of the people had stable heart conditions, the p value is 0.4 which again proved to be insignificant.

Table 8

Patients with pain

Pain	Study	Control	Frequency	Percentage	Chi-square	p value
Present	5	9	14	14	1.329	0.249
Absent	45	41	86	86		
Total	50	50	100	100		

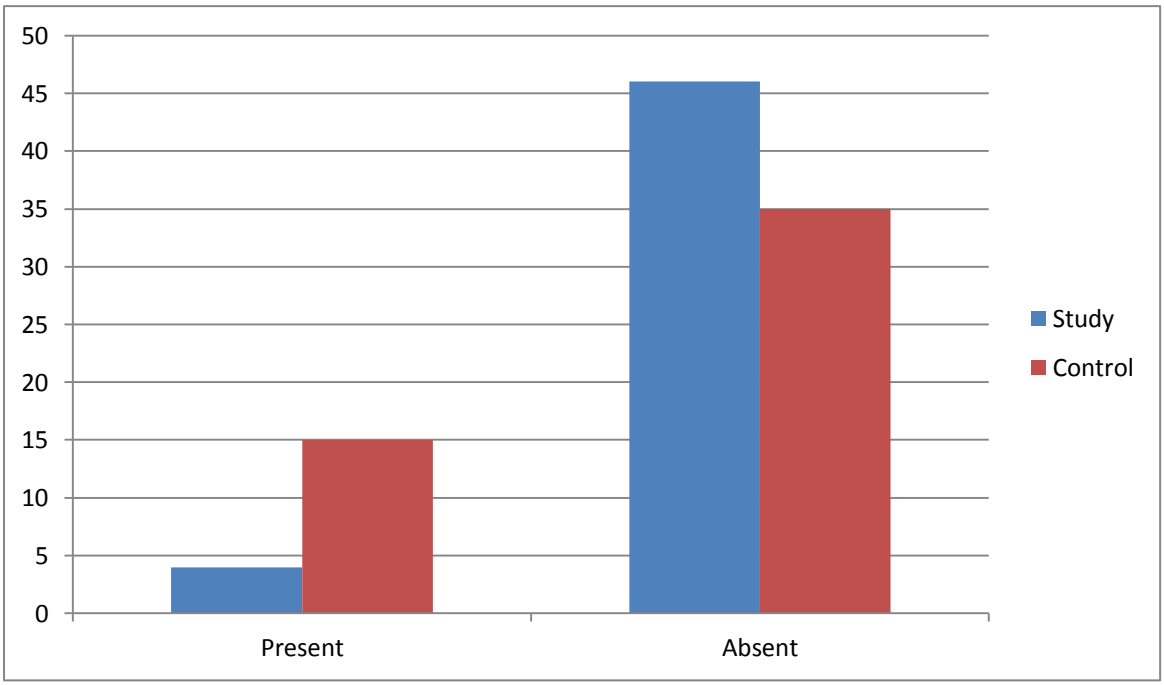


Around 5 people in the study group and 9 people from the control group complained of pain the study, this shows that around 18% of the people in the control group exhibited pain compared to 10 % of the study group, the p value is insignificant.

Table 9

Patients with Superficial infection

Superficial infections	Study	Control	Frequency	Percentage	Chi-square	p value
Present	4	11	15	15	3.843	0.050
Absent	46	39	85	855		
Total	50	50	100	100		

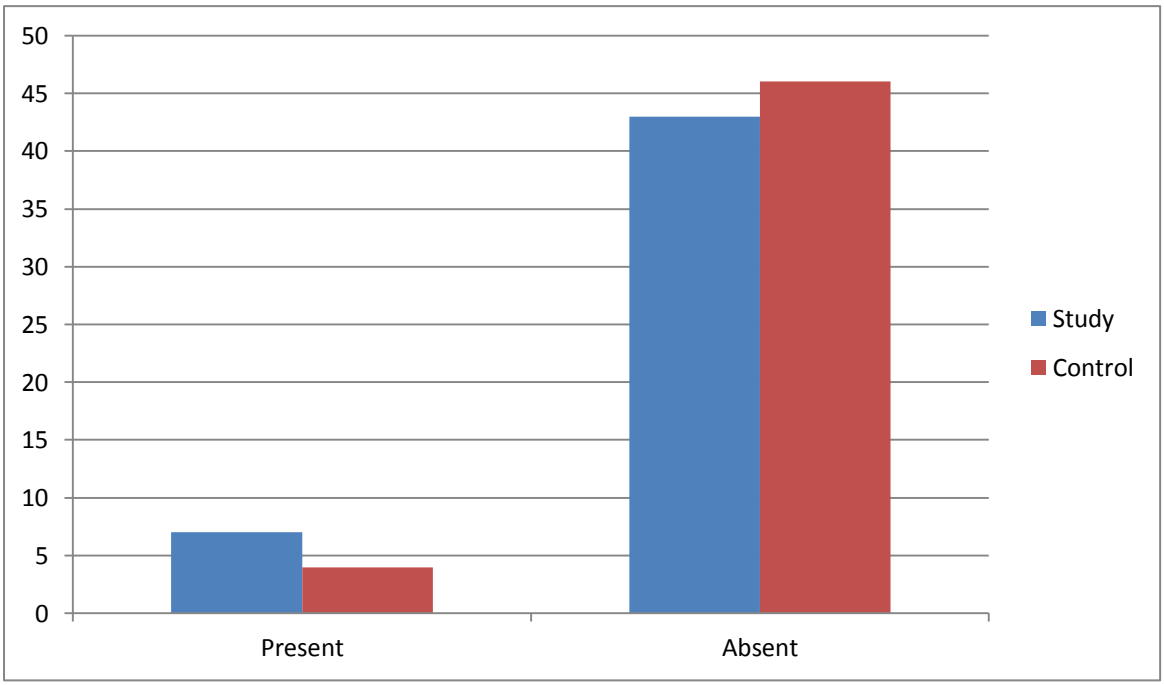


In the study group 4 people (8%) and in the control group 11 people (22%) exhibited signs of infection, p value is 0.05 though it is not significant between the study and the control group, around 22% of people in the control group are treated for infection compared to only 8% in the study group.

Table 10

Seroma

Seroma	Study	Control	Frequency	Percentage	Chi-square	p value
Present	7	4	11	11	0.919	0.338
Absent	43	46	89	89		
Total	50	50	100	100		

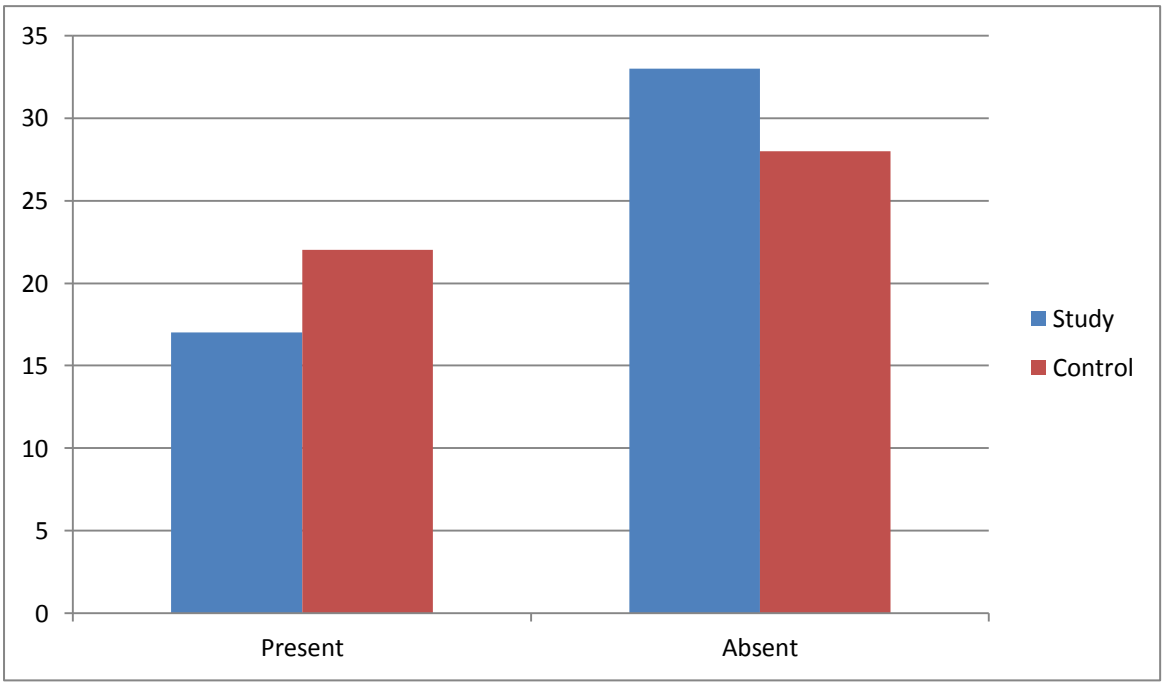


Around 7 patients in the study group and 4 patients in the control group presented with seroma postoperatively, around 14 % of the patients in the study group showed seroma, the p value is 0.3 , there is no significant difference between the 2 groups.

Table 11

DIABETES MELLITUS

Diabetes mellitus	Study	Control	Frequency	Percentage	Chi-square	p value
Present	11	22	33	33	5.473	0.019
Absent	39	28	67	67		
Total	50	50	100	100		

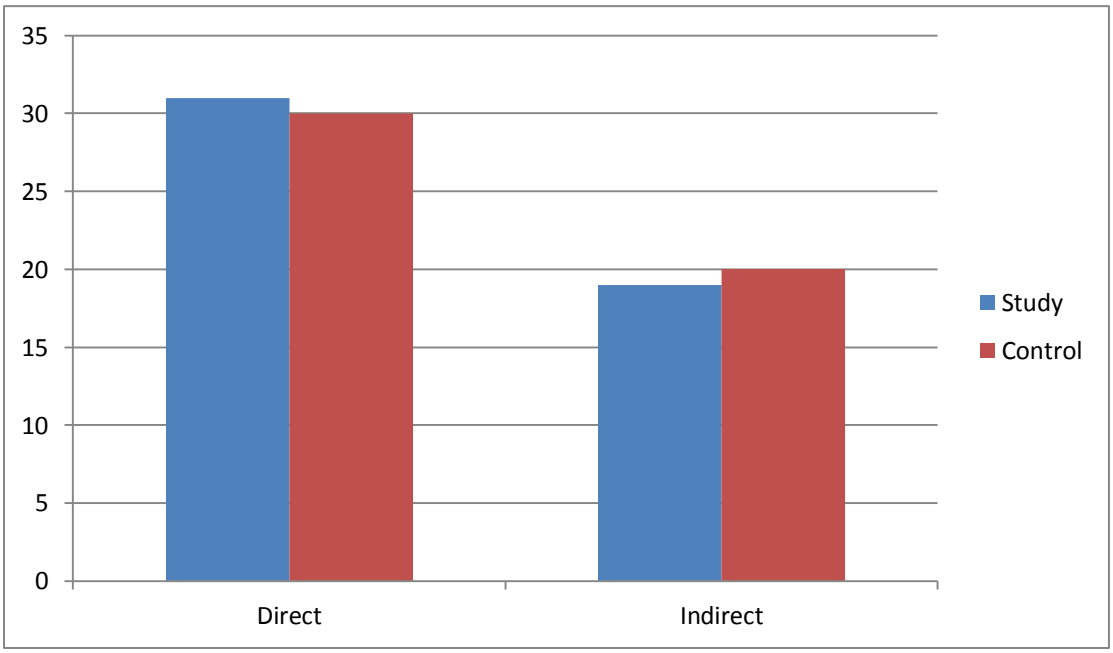


Around 11 patients in the study and 22 patients in the control group are diabetic that makes a total of 33% of people. The remaining 67% of the population that underwent the study are non-diabetic .the p value is 0.019 is significant in distribution of cases between study and control group

Table 12

TYPE OF HERNIA

Type of hernia	Study	Control	Frequency	Percentage	Chi-square	p value
Direct	31	30	61	61.0	0.042	0.838
Indirect	19	20	39	39.0		
Total	50	50	100	100.0		

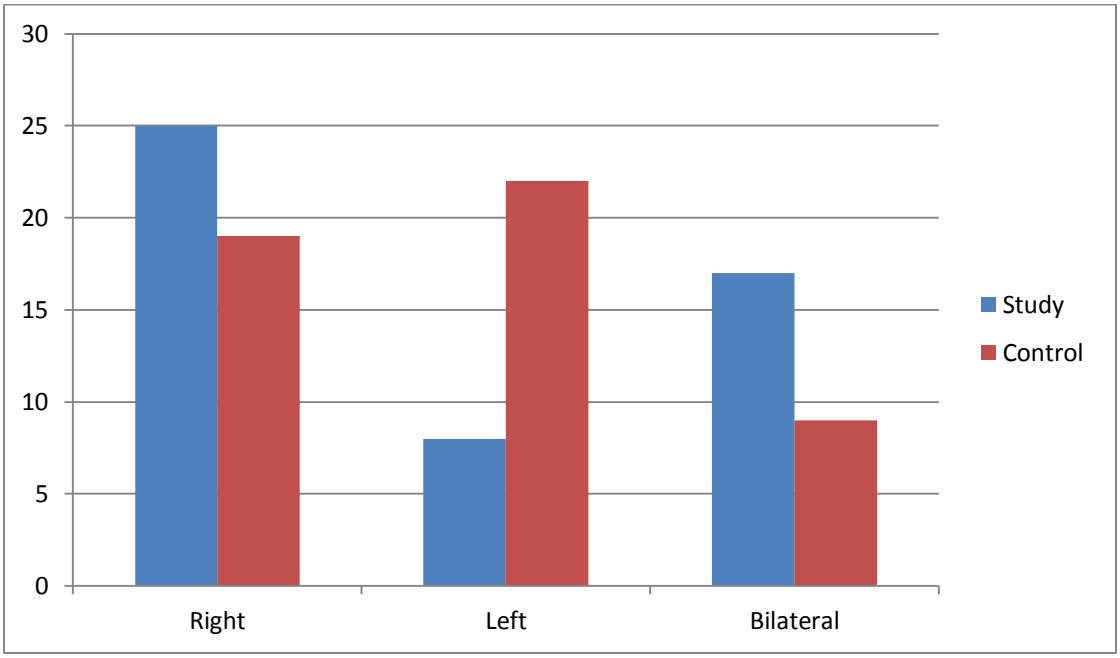


Around 61% of the people who underwent this study presented wit direct hernia in which 31% of the people are in study and 30% were in the control group and around 39% of the people who underwent this study presented with indirect hernia of which 19 % of the people are in the study group and 29% in the control group, the p value is 0.8 which is insignificant between the groups.

Table 13

SIDE OF HERNIA

Side of hernia	Study	Control	Frequency	Percentage
Right	25	19	44	44.0
Left	8	22	30	30.0
Bilateral	17	9	26	26.0
Total	50	50	100	100.0

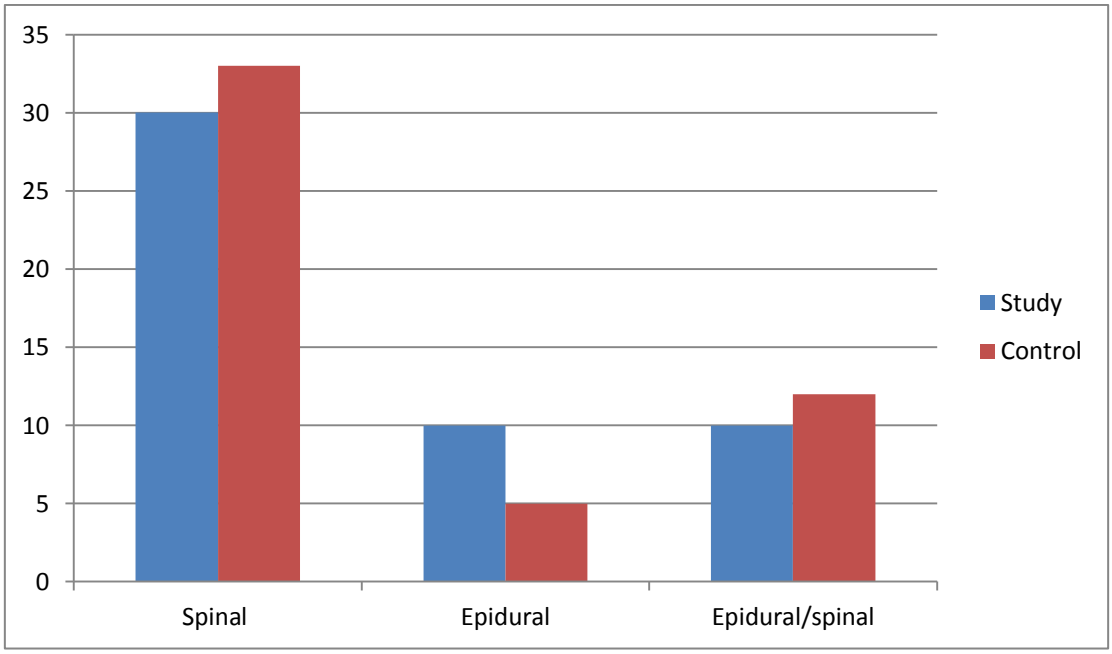


In this study there was an even distribution of cases based on the side of hernia. but the predominance of right sided hernia is over all, around 44% of the people presented with right side hernia, 30% with left side hernia and 26% presented with bilateral hernia.

Table 14

ANESTHESIA

Type of anaesthesia	Study	Control	Frequency	Percentage	Chi-square	p value
Spinal	30	33	63	63	1.991	0.369
Epidural	10	5	15	15		
Epidural/spinal	10	12	22	22		
Total	50	50	100	100		

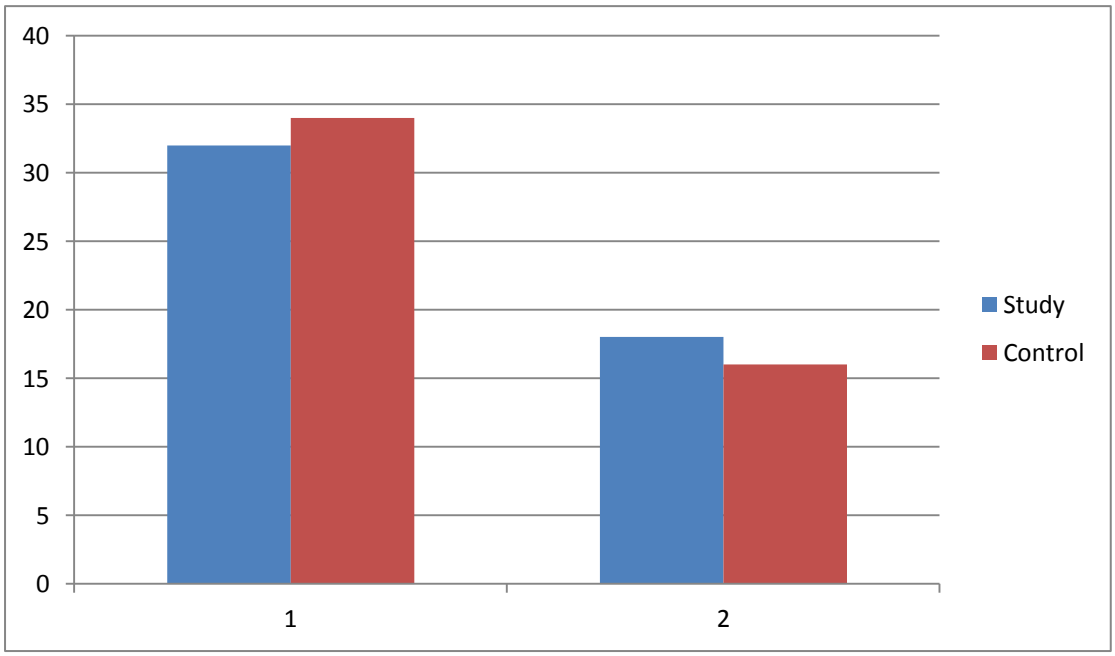


Around 63% of the people were given spinal anesthesia of which 33% were in the study group and 30% were in the control group, around 15 % of the people underwent epidural anesthesia of which 10% are in the study and 5% are in the control group, around 22% of the people underwent epidural anesthesia followed by spinal anesthesia of which 10% are in the study and 12% are in the control group and there is no significance between the distribution of cases.

Table 15

ASA GRADING

ASA Grading	Study	Control	Frequency	Percentage	Chi-square	p value
1	32	34	66	66	0.178	0.673
2	18	16	34	34		
Total	50	50	100	100		

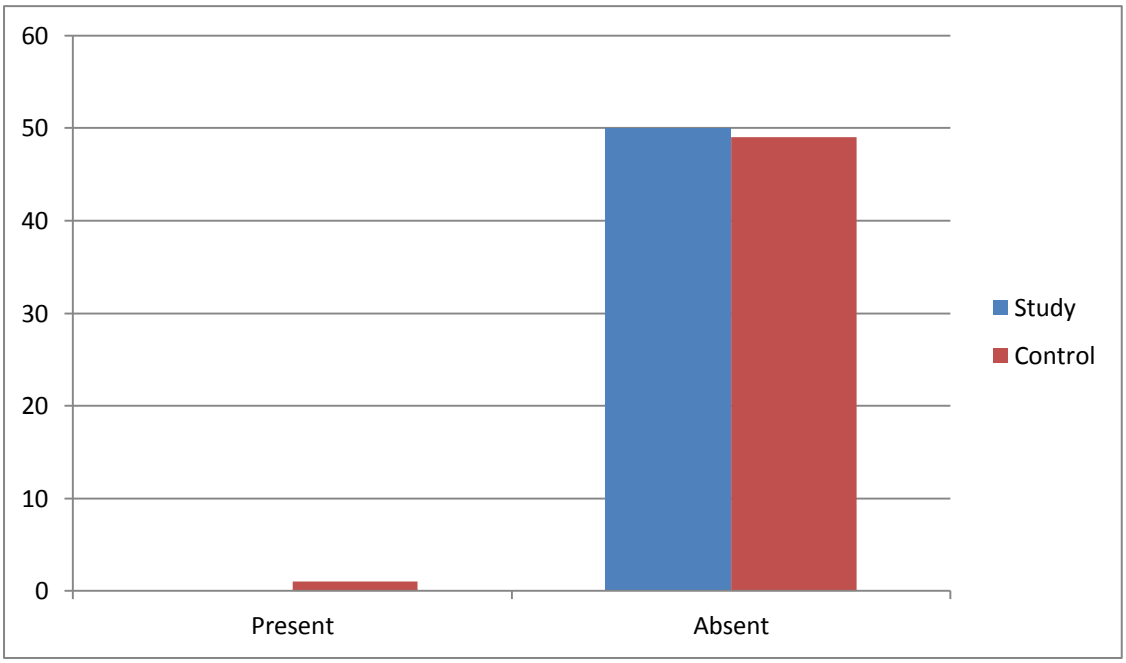


Around 66% of the people were grade ASA 1 of which 32% are in the study group and 34% in the control group. Around 34% of the people were graded as ASA 2 of which 18% are in the study group and 16% are in the control group. Again by the p value there is no significance between the distribution of cases.

Table 16

DEEP INFECTIONS

Deep infections	Study	Control	Frequency	Percentage	Chi-square	p value
Present	0	1	1	1	1.010	0.315
Absent	50	49	99	99		
Total	50	50	100	100		



Only 1% of the total population i.e only one patient who underwent this study presented with deep infection , the rest of the 99% did not show significant wound changes during their 6 month follow up

Table 17

CULTURE ORGANISMS

ORGANISM	STUDY	CONTROL	TOTAL
NO GROWTH	1	5	6
E.COLI	2	4	6
KLEBSIELLA	0	1	1
PROTEUS	0	2	2
PSUEDOMONAS	1	0	1
TOTAL	4	12	16

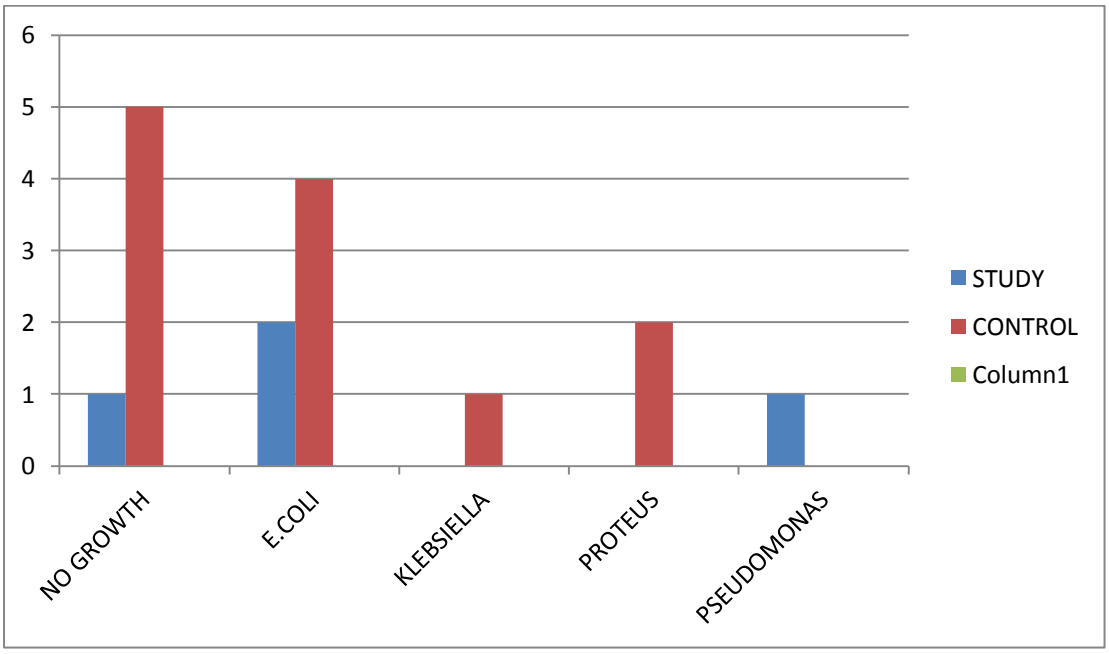
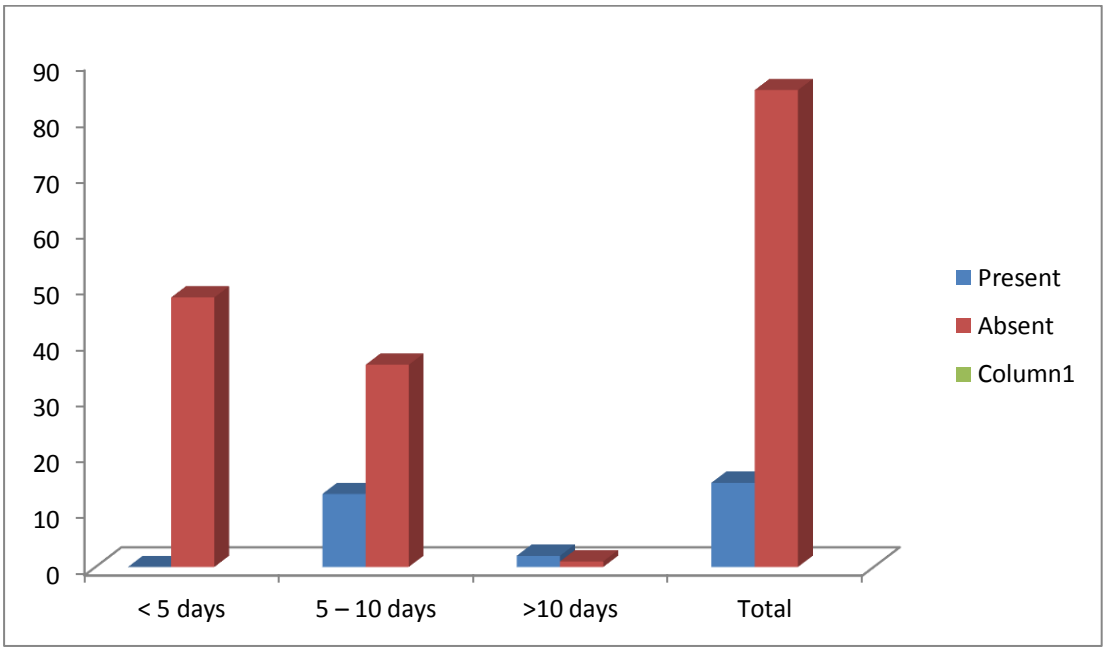


TABLE 18

SSI AND HOSPITAL STAY

Hospital stay	Superficial infections		Frequency	Chi-Square	P value
	Present	Absent			
< 5 days	0	48	48	19.861	<0.001
5 – 10 days	13	36	49		
>10 days	2	1	3		
Total	15	85	100		

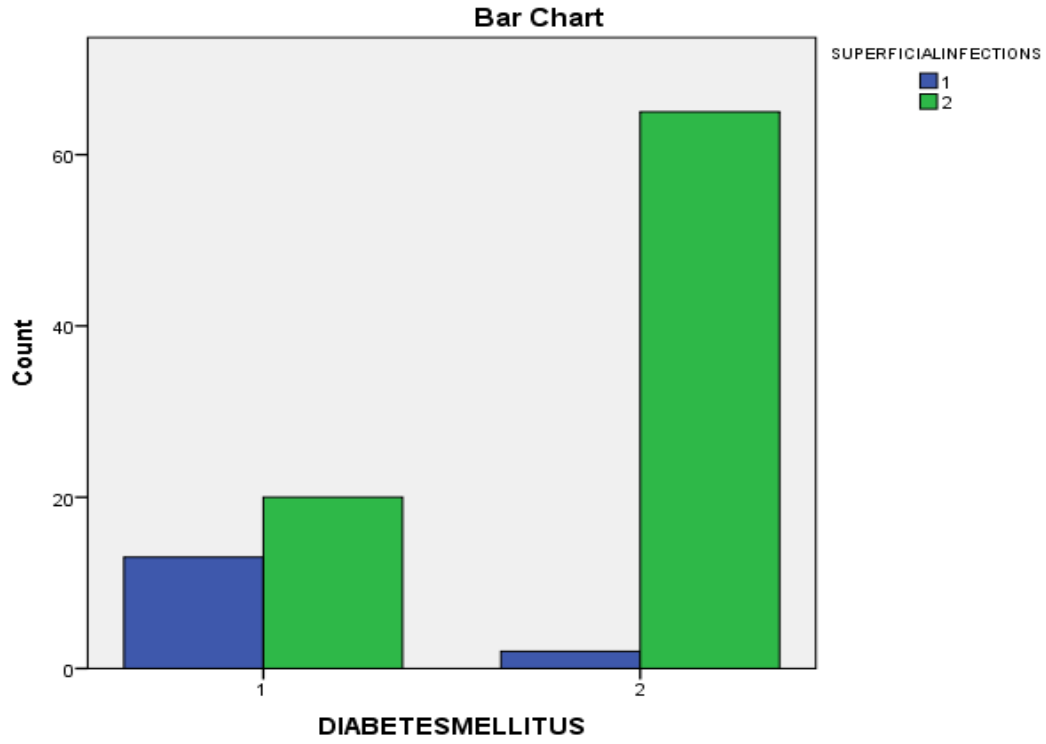


In this tabulation surgical site infections are compared with duration of hospital stay, with the p value of less than 0.001 they are significant that means that the incidence of surgical site infections increases with increased duration of hospital stay.so eventually increased preoperative stay corresponds to increased rates of infections.

TABLE 19

SSI AND DIABETES MELLITUS

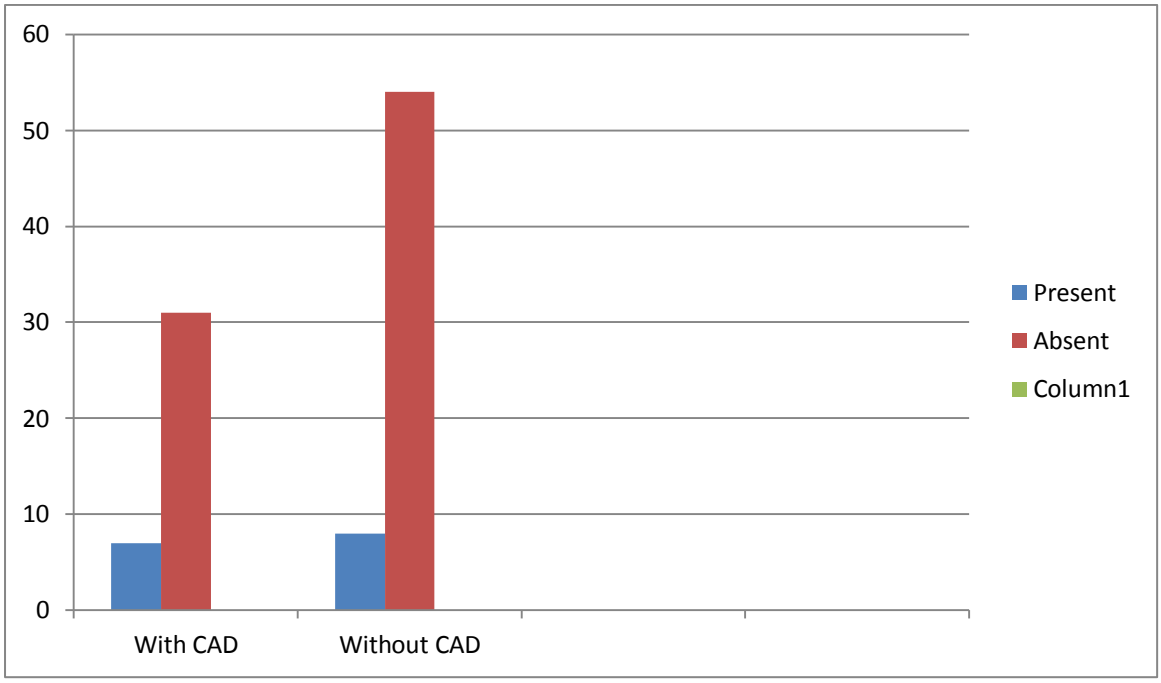
Diabetes Mellitus	Superficial infections		Total	Percentage	Chi-square	p value
	Present	Absent				
Present	13	20	33	33	22.998	<0.01
Absent	2	65	67	67		
Total	15	85	100	100		



Here we have compared the association between the incidence of diabetes mellitus and surgical site infections, that clearly states that with the p value less than 0.01 it is very much significant.so the association between that of SSI and diabetes mellitus can be established

TABLE 20

SSI AND CORONARY ARTERY DISEASE



CAD	Superficial infections		Total	Percentage	Chi-square	p value
	Present	Absent				
Present	7	31	38	38	0.563	0.453
Absent	8	54	62	62		
Total	15	85	100	100		

Here the relationship between coronary artery disease to that of surgical site infections are studied. The value is 0.4 which clearly states that there is no significant relationship between the presence of coronary artery disease to that of incidence of surgical site infections as mentioned

TABLE 21

PRESENTATION OF SYMPTOMS

Presentation of complaints	Study	Control	Frequency	Percentage	Chi - Square	P value
Bulge	27	22	49	49	1.193	0.755
Discomfort and restriction	7	7	14	14		
Irreducibility	4	5	9	9		
Pain	12	16	28	28		
Total	50	50	100	100		

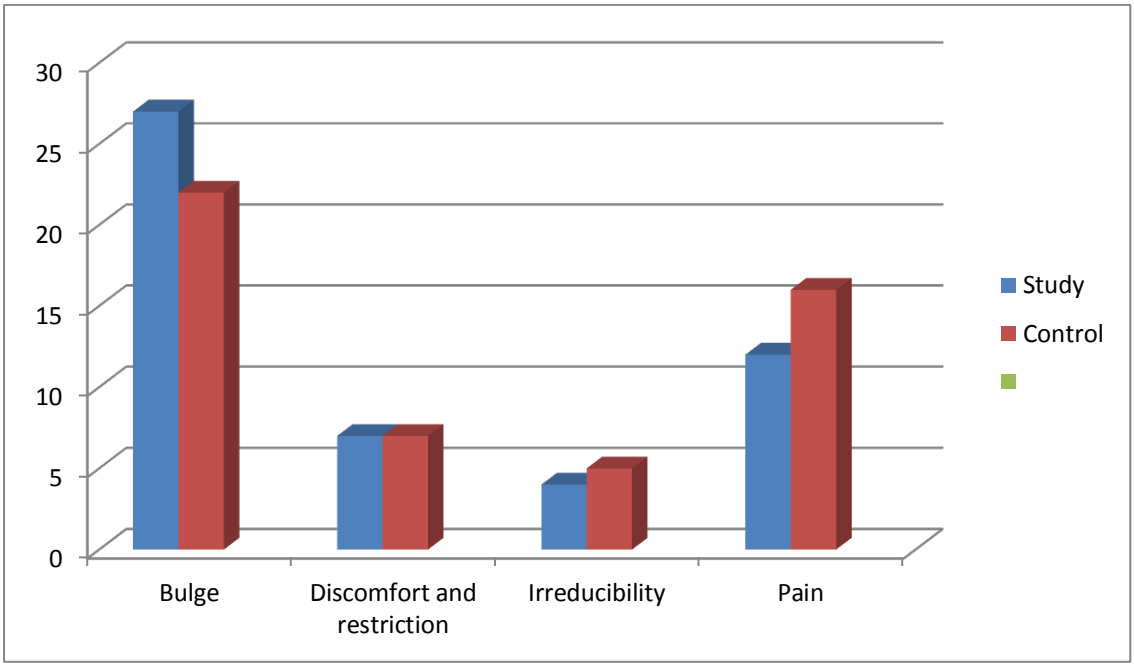
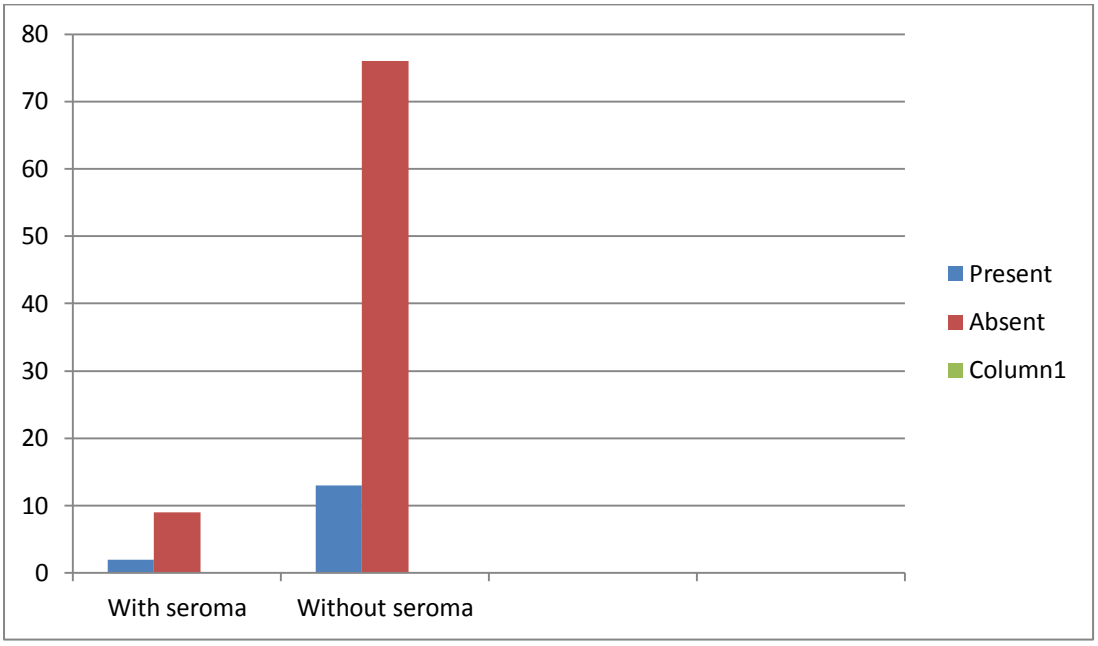


TABLE 22

SSI AND SEROMA

Seroma	Superficial infections		Total	Percentage	Chi-square	p value
	Present	Absent				
Present	2	9	11	11	0.098	0.754
Absent	13	76	89	89		
Total	15	85	100	100		



The incidence of surgical site infections are now compared to that of seroma, since the p value is 0.7 no relationship can be considerably established between that of superficial infections and that of seroma.

LIMITATIONS OF THE STUDY

The study population is comparatively less doubting its efficiency in large group of applications. The co morbid group are not taken into consideration that makes it implausible in significant elderly group that brings its own age related illness over the period of time .ventral hernias (umbilical and incisional) are not included in this study who also require mesh and succumb to infection. The usage of drain in these procedures make this application of mesh a challenging one as the soaked seroma that forms after implantation is let out. The blood levels of antibiotic are not analysed in this study due to non-availability of elaborate investigations.

Furthermore studies should be undertaken to completely appreciate the authenticity of this technique. patients with co morbid conditions like liver failure and complications that arise from presenting in emergency conditions like renal failure following dehydration are excluded as mesh is not preferred generally in those cases and the efficiency of use of impregnated meshes in emergency conditions are still to be explored.

DISCUSSION

The duration of the surgery is another important factor that signifies the outcome of infection in surgical patients. But since unilateral hernia surgeries are usually completed within a period of one hour or less, this factor is not taken much into attribution of account none of the surgeries including stoppas procedure did not take much time to complete. They were done in stipulated period of time therefore it is potentially difficult to compute the infection rates based on the duration of surgical time at our hospital

In my study though I couldn't provide a significant value between the incidence of superficial surgical site infection between my study and control population the percentage of infection rates are comparatively much higher in control group who received post-operative intravenous gentamycin. The study population exhibited significantly less rates of infection . even deep infection that presented in the later stages are also reported only in the patients of the control group .

A lot of studies have significantly reported that staphylococcus aureus is the most commonly isolated organism from the post-operative wound site. In my study along with e.coli, rates of klebseilla,

pseudomonas and proteus species have also been reported. the studies undertaken by lilani et al showed the predominance of pseudomonas from the wound isolates of post-operative patients who are succumbed to hospital bed .this is also reported mostly from clean and contaminated cases like cholecystectomy and bowel surgeries. This also shine a light at the fact that not only polymicrobial organism endogenous to get flore are usually involved. The spectrum may vary widely.

The superficial infections that were reported in cases controls of my study, also revealed organisms and their susceptile sensitivity in culture. They were managed with appropriate antibiotics according to their report of sensitivity. They are given for significant number of days till the wound infection is controlled. The patients improved a lot better clinically following antibiotics. They were followed for a significant time till the next cultures go negative and wound infection is controlled.

The deep infections that were reported after 30 days in one patient of control group developed a significant gaping in wound (Inguinal region) of 1cm. They are managed with sending the discharge for culture and sensitivity followed by repeated wound dressing, once sensitivity report regarding growth is obtained, they are started on it and response tracked for a while

The patient was assessed for surgery following 2 months of followup in which none of the measures helped. The including antibiotic therapy, wound debridement, secondary suturing following which none responded and it is found to be exposing the mesh in the infected side, so following elective surgery in septic OT, the wound is explored thorough wash is given, exposed mesh is cut and rest of the incorporated mesh is found to be healthy, so they are let alone in their place. The wound is cleaned properly and suturing done

The patient was followed for the next 2 months in which slowly the infection subsided and wound improved a lot better. At the end of the 4 months , the inguinal scar healed well and good outcome is noted .

The cultures of seroma are negative. They usually presented during the time of suture removal, in which they are aspirated using a sterile needle. 2 of the cases required repeated aspirations in subsequent follow up but nearly all the swabs taken from such case even more than once, revealed no growth in culture and sensitivity and responded nearly very well after aspiration and light dressing.

A prolonged pre-operative stay is attributed to cause infection in significant number of cases that resulted in infections. The ubiquitous

diagnostic procedures, therapies and microflora, have significantly increased the rates of infection in lot of cases. The preoperative stay of more than 7 days are found to be cause of infection rate in some of the cases.

The contribution of other co-morbid conditions like hypertension, dyslipedemia and coronary artery disease are not found to be in association with the post-operative wound infection rate. The exclusion of uncontrolled diabetes that contraindicated in old aged patients receiving Gentamycin is a major limiting factor in this study. This is highly because the majority of infections are highly associated with acquired immunocompromised states like diabetes rather than others.

Even controlled status of diabetic individual (<150mg/dl) who were taken under the study exhibited wound infection postoperatively since all the patients with established superficial and deep infection are diabetic. Despite proper glycemic control in these patients per preoperatively and immediate postoperative period they are still become susceptible to infections

CONCLUSION

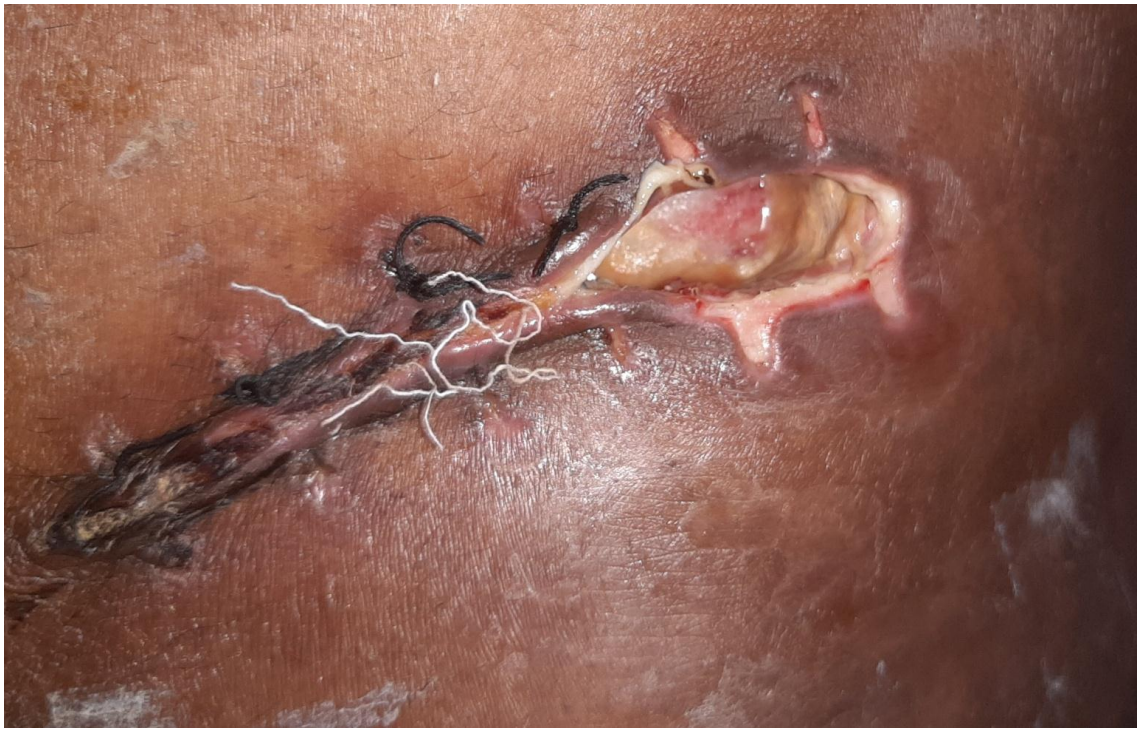
Though there were not multiple studies that were undertaken to contribute to my study, this is a small initiative that was undertaken to implement this new idea of use of impregnated meshes for hernia surgeries.so once done in the operating room itself patient doesn't require a continuous monitoring of look of the wound till the first look. Post operatively pain killers, analgesics and vitamin supplements are sufficient enough to give it to the patients.

Surgical site infection that presents in higher age groups, also have many co morbid factors along with them. But since hernia is reported at higher incidence in age groups more than 30 one can attribute the cause of infection to wide range of factors extending from common nutritional causes extending to rare genetic causes. The use of gentamycin was not just a random choice for impregnation as its efficacy was tested in some condition. Further more challenging uses of the use of impregnated meshes are yet to be tested in forthcoming years.

The repeated follow up of patients who were followed for a significant time span also proved their efficacy in long time. The analysis of pain and seroma associated with superficial infection also proved to be

insignificant in the study adding that infection is not the only cause for the development of pain and seroma. The regression of surgical site infection in the future years atleast in elective procedures should be taken into matters of discussion seriously and we as surgeons should work toward it in achieving this goal.

SUPERFICIAL INFECTION



BIBILIOGRAPHY

1. Badiou W, Lavigne JP, Bousquet PJ, O'Callaghan D, Marès P, de Tayrac R (1995) Aminoglycosides. Med Clin North Am 79(4):761–787

2. Cobb WS, Carbonell AM, Kalbaugh CL, Jones Y, Lokey JS (2009) Infection risk of open placement of intraperitoneal composite mesh. Am Surg 75(9):762–767

3. Collage RD, Rosengart MR (2010) Abdominal wall infections with in situ mesh. Surg Infect (Larchmt) 11(3):311–318

4. Dietz UA, Spor L, Germer CT (2011) Management of mesh related infections. Chirurg 82:208–217

5. Dietz UA, Winkler MS, Härtel RW, Fleischhacker A, Wiegering A, Isbert C, Jurowich C, Heuschmann P, Germer CT (2012) Importance of recurrence rating, morphology, hernial gap size, and risk factors in ventral and incisional hernia classification. Hernia. doi:

6. Choi JJ, Palaniappa NC, Dallas KB, Rudich TB, Colon MJ, Divino CM (2012) Use of mesh during ventral hernia repair in clean-contaminated and contaminated cases: outcomes of 33,832 cases. Ann Surg 255(1):176–180

7. Hawn MT, Gray SH, Snyder CW, Graham LA, Finan KR, Vick CC (2011) Predictors of mesh explantation after incisional hernia repair. Am J Surg 202(1):28–33

8. Engelsman AF, van der Mei HC, Busscher HJ, Ploeg RJ (2008) Morphological aspects of surgical meshes as a risk factor for bacterial colonization. Br J Surg 95(8):1051–1059

9. Robinson TN, Clarke JH, Schoen J, Walsh MD (2005) Major mesh-related complications following hernia repair: events reported to the Food and Drug Administration. Surg Endosc 19(12):1556–1560

10. Greenberg JJ (2010) Can infected composite mesh be salvaged? Hernia 14(6):589–592

11. Aufenacker TJ, Koelemay MJ, Gouma DJ, Simons MP (2006) Systematic review and meta-analysis of the effectiveness of antibiotic prophylaxis in prevention of wound infection after mesh repair of abdominal wall hernia. Br J Surg 93(1):5–10

12. Sanchez-Manuel FJ, Lozano-García J, Seco-Gil JL (2012) Antibiotic prophylaxis for hernia repair. Cochrane Database Syst Rev 2:CD003769

13. Wiegering A, Schlegel N, Isbert C, Jurowich C, Doht S, Germer CT, Dietz UA (2013) Lessons and challenges during a 5-year follow-up of 21 Composix Kugel implantations. Hernia 17(4):435–443

14. Brandt CJ, Kammer D, Fiebeler A, Klinge U (2011) Benefitial effects of hydrocortisone or spironolactone coating on foreign body response to mesh biomaterial in a mouse model. J Biomed Mater Res 99A(3):335–343

15. Dietz UA, Hamelmann W, Winkler MS, Debus ES, Malafaia O, Czeczko NG, Thiede A, Kuhfuß I (2007) An alternative classification of incisional hernias enlisting morphology, body type and risk factors in the assessment of prognosis and tailoring of surgical technique. J Plast Reconstr Aesthet Surg 60(4):383–388

16. Bittner et al (2013) Guidelines for laparoscopic treatment of ventral and incisional abdominal wall hernias. Part I. Surg Endosc (accepted)

17. Klinge U, Klosterhalfen B (2012) Modified classification of surgical meshes for hernia repair based on the analyses of 1,000 explanted meshes. Hernia 16(3):251–258

18. DeBord JR, Bauer JJ, Grischkan DM, LeBlanc KA, Smoot RT Jr, Voeller GR, Weiland LH (1999) Short-term study on the safety of antimicrobial-agent-impregnated ePTFE patches for hernia repair. Hernia 3:189–193

19. Regis D, Sandri A, Samaila E, Benini A, Bondi M, Magnan B (2013) Release of gentamicin and vancomycin from preformed spacers in infected total hip arthroplasties: measurement of concentrations and inhibitory activity in patients' drainage fluids and serum. Sci World J 22:e75218

20. Wang J, Zhu C, Cheng T, Peng X, Zhang W, Qin H, Zhang X (2013) A systematic review and meta-analysis of antibiotic-impregnated bone cement use in primary total hip or knee arthroplasty. PLoS One 8:e82745

21. Engelsman AF, van der Mei HC, Ploeg RJ, Busscher HJ (2007) The phenomenon of infection with abdominal wall reconstruction. Biomaterials 28(14):2314–2327

22. Klosterhalfen B, Hermanns B, Rosch R, Junge K (2003) Biological response to mesh. Eur Surg 35:16–20

23. Musella M, Guido A, Musella S (2001) Collagen tampons as aminoglycoside carriers to reduce postoperative infection rate in prosthetic repair of groin hernias. Eur J Surg 167(2):130–132

24. Letouzey V, Lavigne JP, Garric X, Coudane J, de Callaghan Tayrac DO (2011) Is degradable antibiotic coating for synthetic meshes provide protection against experimental animal infection after fascia repair? J Biomed Mater Res 100B(2):471–479

25. Lortholary O, Tod M, Cohen Y, Petitjean O (1997) Antibiotic prophylaxis and open groin hernia repair. World J Surg 21(8):811–814

26. Klinge U (2008) Mesh for hernia repair. Br J Surg 95:539–540

27. Binnebösel M, von Trotha KT, Ricken C, Klink CD, Junge K, Conze J, Jansen M, Neumann UP, Lynen Jansen P (2012) Gentamicin supplemented polyvinylidenfluoride mesh materials enhance tissue integration due to a transcriptionally reduced MMP-2 protein expression. BMC Surg 12:1. doi:

28. Klink CD, Binnebösel M, Lambertz A, Alizai HP, Roeth A, Otto J, Klinge U, Neumann UP, Junge K (2012) In vitro and in vivo characteristics of gentamicin-supplemented polyvinylidenfluoride mesh materials. J Biomed Mater Res 100A(5):1195–1202

29. Varghese JM, Roberts JA, Wallis SC, Boots RJ, Healy H, Fassett RG, Lipman J, Ranganathan D (2012) Pharmacokinetics of intraperitoneal gentamicin in peritoneal dialysis patients with peritonitis (GIPD study). Clin J Am Soc Nephrol 7(8):1249–1256

30. Blatnik JA, Krpata DM, Jacobs MR, Gao Y, Novitsky YW, Rosen MJ (2012) In vivo analysis of the morphologic characteristics of synthetic mesh to resist MRSA adherence. J Gastrointest Surg 16(11):2139–2144

31. Engelsman AF, van Dam GM, van der Mei HC, Busscher HJ, Ploeg RJ (2010) In vivo evaluation of bacterial infection involving morphologically different surgical meshes. Ann Surg 251(1):133–137

32. Geiger D, Debus ES, Ziegler UE, Larena-Avellaneda A, Frosch M, Thiede A, Dietz UA (2005) Capillary activity of surgical sutures and suture-dependent bacterial transport: a qualitative study. Surg Infect (Larchmt) 6(4):377–383

33. Sadava EE, Krpata DM, Gao Y, Novitsky YW, Rosen MJ (2013) Does presoaking synthetic mesh in antibiotic solution reduce mesh infections? An experimental study. J Gastrointest Surg 17:562–628

34. Muysoms F, Campanelli G, Champault GG, DeBeaux AC, Dietz UA, Jeekel J, Klinge U, Köckerling F, Mandala V, Montgomery A, Morales Conde S, Puppe F, Simmermacher RK, Śmietański M, Miserez M (2012) EuraHS: the development of an international online platform for registration and outcome measurement of ventral abdominal wall hernia repair. Hernia 16(3):239–250

35. Muysoms FE, Deerenberg EB, Peeters E, Agresta F, Berrevoet F, Campanelli G, Ceelen W, Champault GG, Corcione F, Cuccurullo D, Debeaux AC, Dietz UA, Fitzgibbons RJ Jr, Gillion JF, Hilgers RD, Jeekel J, Kyle-Leinhase I, Köckerling F, Mandala V, Montgomery A, Morales-Conde S, Simmermacher RK, Schumpelick V, Smietański M, Walgenbach M, Miserez M (2013) Recommendations for reporting outcome results in abdominal wall repair: results of a Consensus meeting in Palermo, Italy, 28-30 June 2012. Hernia 17(4):423–433

PROFORMA

A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI.

Name of the patient :

Age: Sex:

Occupation:

Address: Date of Discharge:

Date of admission:

Chief complaints:

1.BULGE

2.PAIN

3.DISCOMFORT

4.LIMITATION OF ACTIVITIES

5.IRREDUCIBILITY

Duration of stay in Hospital :

Co –morbid conditions associated:

1.Hypertension

2.Dyslipidemia

3.CAD

4.diabetes mellitus

5.chronic kidney disease

6.bronchial asthma

7.epilepsy

GENERAL EXAMINATION:

Pallor

Icterus

Cyanosis

Clubbing

Pedal edema

Generalised lymphadenopathy

Obese /non obese

BMI: kg/m2

VITALS

BLOOD PRESSURE

PULSE RATE

RESPIRATORY RATE

SATURATION

LOCAL EXAMINATION :

INSPECTION:

SIZE :

SITE:

SURFACE /EXTENT:

SHAPE OF THE SWELLING:

SKIN OVER THE SWELLING:

COUGH IMPULSE:

DILATED VEINS/SCARS/SINUSES:

PALPATION:

WARMTH :

TENDERNESS:

THREE FINGER TEST:

FINGER INVAGINATION TEST:

DEEP RING OCCLUSION TEST:

P/R:

DIAGNOSIS:

PROCEDURE PLANNED

ANESTHESIA SCORE

ANESTHESIA

DATE OF SURGERY

INVESTIGATIONS:

TEMPERATURE :

Hb :

TC :

DC :

blood urea ;

Creatinine :

FBS :

PPBS :

HbA1C :

Urine Microscopy :

Xray of part involved :

ECG ;

Culture and sensitivity :

Wound management :

Type of dressing :

Advise on discharge

Follow up

CONSENT FORM

I Mr/Mrs_____hereby volunteer to participate in the study **"A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI"**. I was explained about the nature of the study by the doctor, knowing which I fully give my consent to participate in this study. I also give consent to take clinical photographs for the purpose of the study.

Date :

Place :

Signature of the Patient

ஒப்புதல் படிவம்

பெயர் :

வயது / பாலினம் :

முகவரி :

அரசு கோவை மருத்துவக் கல்லூரி மருத்துவமனையில் பொது அறுவை சிகிச்சை பிரிவில் பட்ட மேற்படிப்பு பயிலும் மாணவன் **மரு. ஜா.லே. வைரவன்** அவர்கள் மேற்கொள்ளும் **"A COMPARATIVE STUDY OF USE OF GENTAMYCIN IMPREGNATED MESH OVER CONVENTIONAL IV GENTAMYCIN IN HERNIAL SURGERY FOR THE PREVENTION OF SSI"** குறித்த ஆய்வில் செய்முறை மற்றும் அனைத்து விபரங்களையும் கேட்டுக் கொண்டு எனது சந்தேகங்களை தெளிவுப்படுத்திக் கொண்டேன் என்பதை தெரிவித்துக் கொள்கிறேன்.

எனது இந்த ஆய்வில் கலந்து கொள்ள முழு சம்மமத்துடனும், சுய சிந்தனையுடனும் சம்மதிக்கிறேன்.

இந்த ஆய்வில் என்னுடைய விபரங்கள் பாதுகாக்கப்படுவதுடன் இதன் முடிவுகள் ஆய்விதழில் வெளியிடப்படுவதில் ஆட்சேபனை இல்லை என்பதை தெரிவித்துக் கொள்கிறேன். எந்த நேரத்திலும் இந்த ஆய்விலிருந்து நான் விலிகிக் கொள்ள எனக்கு உரிமை உண்டு என்பதையும் அறிவேன்.

இடம் : கையொப்பம்

நாள் :

MASTER CHART

Group	NAME	AGE	SEX	IP NO	SIDE OF HERNIA	TYPE OF HERNIA	PROCEDURE	TYPE OF ANESTHESIA	ASA GRADING	PRESENTATION OF COMPLAINTS	HOSPITAL STAY	DIABETES MELLITUS	HYPERTENSIVE PATIENTS	DYSLIPIDEMIA	CAD	SUPERFICIAL INFECTIONS	DEEP INFECTIONS	PAIN	SEROMA	CULTURE GROWTH	SENSITVITY
1	JANARTHANAN	5	1	192540	1	1	1	1	1	BULGE	1	2	1	1	1	2	2	1	1	2	7
1	GURUVAYA	5	1	198002	3	1	1	3	2	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	MANI	6	1	2038	3	1	1	2	2	PAIN	1	2	1	2	2	2	2	2	2	2	7
1	RAMAIYAH	6	1	207657	1	1	1	2	2	PAIN	2	2	2	2	1	2	2	2	1	2	7
1	NATRAYAN	5	1	209405	2	1	1	3	1	BULGE	1	2	2	1	2	2	2	2	2	2	7
1	SUNDARAM	4	1	20413	1	2	1	1	1	DISCOMFORT AND RESTRICTION	1	2	1	2	2	2	2	2	2	2	7
1	NASSAR	2	1	213066	1	2	1	1	1	BULGE	2	2	2	2	1	2	2	2	2	2	7
1	MURUGESAN	3	1	216505	3	1	1	1	1	PAIN	1	2	2	1	2	2	2	2	2	2	7
1	MAHALINGAM	5	1	216457	1	1	1	2	2	BULGE	1	2	1	2	1	2	2	2	2	2	7
1	MURUGESAN	6	1	218215	3	1	1	2	2	PAIN	3	1	2	2	1	1	2	2	2	1	1
1	ARUSAMY	4	1	222231	1	2	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	NALLUSAMY	4	1	22577	1	2	1	1	1	BULGE	1	2	1	2	2	2	2	1	2	2	7
1	SIVASAMY	6	1	227644	1	1	1	3	1	BULGE	1	2	2	2	1	2	2	2	2	2	7
1	ABDUL SHEKAR	6	1	229437	3	1	1	3	2	BULGE	2	2	1	2	2	2	2	2	2	2	7
1	BALAJI	2	1	229835	3	1	1	1	2	BULGE	1	2	1	2	2	2	2	1	1	2	7
1	PALANISAMY	6	1	238895	1	1	1	2	2	PAIN	1	2	1	2	2	2	2	2	2	2	7
1	RENGASAMY	5	1	241408	1	2	1	1	1	DISCOMFORT AND RESTRICTION	1	2	1	2	1	2	2	2	2	2	7
1	CHINNA PALANI	4	1	295794	3	1	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	NAGALINGAM	6	1	25020	3	1	1	2	2	IRREDUCIBILITY	1	2	1	2	2	2	2	2	2	2	7
1	JEHANGIR	4	1	250304	1	1	1	1	1	BULGE	1	1	2	1	2	2	2	2	2	2	7
1	RAJA	1	1	5565	2	2	1	1	1	DISCOMFORT AND RESTRICTION	1	2	1	2	2	2	2	2	2	2	7
1	ABDUL RAHUMAN	2	1	9206	1	2	1	1	1	BULGE	1	2	1	2	1	2	2	2	2	2	7
1	MURUGESAN	4	1	24380	2	2	1	1	1	BULGE	1	2	1	1	2	2	2	2	2	2	7
1	VIJAYAKUMAR	5	1	30009	3	1	2	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	NATRAJ	3	1	33889	1	1	1	1	1	BULGE	1	2	1	1	1	2	2	2	2	2	7
1	MURUGESAN	3	1	216505	3	1	1	1	1	IRREDUCIBILITY	2	2	1	2	2	2	2	2	2	2	7
1	MOHAMMED	4	1	220328	3	1	1	3	2	BULGE	2	1	1	1	1	2	2	2	2	2	7
1	ARUSAMY	4	1	222231	1	2	1	1	1	IRREDUCIBILITY	2	2	2	2	2	2	2	2	2	2	7
1	SURESH	2	1	235042	1	2	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	RATHINAM	6	1	251917	1	1	1	2	2	PAIN	2	1	1	1	1	1	2	2	1	1	1
1	MARASAMY	4	1	284	3	1	1	1	1	BULGE	1	2	1	2	1	2	2	2	2	1	7

1	KANAGARAJ	2	1	13151	3	1	1	1	1	DISCOMFORT AND RESTRICTION	2	2	2	2	2	1	2	2	2	1	2
1	ELLAYA GUPTA	4	1	16692	2	1	1	3	2	BULGE	1	2	2	1	2	2	2	2	1	2	7
1	GANGATHARAN	4	1	16797	1	1	1	1	1	PAIN	1	1	1	1	2	2	2	2	2	2	7
1	ANBU	2	1	246309	1	2	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	VIJAYATHUM	5	1	30009	2	1	1	1	1	PAIN	2	1	2	2	1	2	2	2	2	2	7
1	MUTHUSELVAN	4	1	37786	2	2	1	3	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	MARRIYAPPAN	5	1	37754	1	2	1	1	2	DISCOMFORT AND RESTRICTION	1	1	1	1	1	2	2	2	2	2	7
1	DHANARAJ	3	1	41686	2	1	1	1	1	BULGE	2	2	2	2	2	2	2	1	2	2	7
1	VIGNESH	2	1	41660	1	2	1	1	1	DISCOMFORT AND RESTRICTION	1	2	2	2	2	2	2	2	2	2	7
1	NADHA KUMAR	2	1	41733	2	2	1	1	1	PAIN	2	2	2	2	2	2	2	2	2	2	7
1	PERIYASAMY	3	1	43662	1	2	1	3	2	BULGE	2	2	1	2	1	2	2	2	2	2	7
1	KANNIYAN	2	1	44227	3	1	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
1	SUBBURAJ	5	1	43637	1	1	1	2	2	DISCOMFORT AND RESTRICTION	2	1	2	1	1	2	2	2	1	2	7
1	RANGANATHAN	5	1	47695	1	2	1	3	2	PAIN	2	1	1	1	1	2	2	2	2	2	7
1	KARTHIKEYAN	2	1	47776	1	2	1	1	1	BULGE	2	2	2	2	2	2	2	2	2	2	7
1	MARAPPAN	6	1	49776	3	1	1	2	2	IRREDUCIBILITY	1	1	2	2	2	2	2	2	1	2	7
1	ARUMUGAM	6	1	49726	1	2	1	2	2	BULGE	2	1	1	1	2	2	2	1	2	2	7
1	PRINCE	5	1	53564	3	1	1	3	1	PAIN	2	2	2	2	2	1	2	2	2	1	3
1	RAHAMATH BANU	3	2	75236	3	1	1	1	1	PAIN	2	2	2	2	2	2	2	2	2	2	7
2	SELVARAJ	3	1	12403	1	2	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
2	MUNNIYAN	4	1	175543	1	2	1	1	1	PAIN	3	1	1	2	1	2	2	2	2	2	7
2	RAMASAMY	7	1	180276	3	1	1	2	2	BULGE	1	2	2	1	1	2	2	2	2	2	7
2	PARAMASIVAM	5	1	182434	2	1	1	3	1	IRREDUCIBILITY	2	1	1	2	2	2	2	2	2	2	7
2	LINGUSAMY	6	1	182280	1	2	1	3	1	BULGE	1	2	2	2	2	2	2	2	1	2	7
2	DEEPAN	1	1	184299	1	2	1	1	1	BULGE	2	1	1	2	1	2	2	2	2	2	7
2	ALAN	4	1	186197	2	1	1	1	1	DISCOMFORT AND RESTRICTION	2	1	1	2	2	1	2	1	2	1	4
2	ASHOK KUMAR	3	1	186213	2	1	1	1	1	BULGE	2	1	2	1	1	2	1	2	2	1	5
2	KRISHNASWAMY	4	1	190005	1	1	1	1	1	PAIN	1	2	1	2	2	2	2	2	2	2	7
2	SOUNDAR RAJ	3	1	190000	2	1	1	1	1	BULGE	1	2	2	2	1	2	2	2	2	2	7
2	NAZEEB	5	1	191818	3	1	2	3	1	DISCOMFORT AND RESTRICTION	2	1	1	2	1	1	2	1	2	1	3
2	THANGARAJ	3	1	196060	2	1	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
2	MURUGAN	4	1	199378	2	2	1	1	1	PAIN	2	1	1	2	1	2	2	2	2	2	7
2	DURAISAMY	3	1	199512	1	1	1	1	1	BULGE	1	2	1	2	2	2	2	2	2	2	7
2	MANI	3	1	201433	3	1	1	1	1	IRREDUCIBILITY	2	1	1	1	1	2	2	2	2	2	7
2	RENGA NATHAN	6	1	214243	1	2	1	3	2	BULGE	2	1	2	2	2	1	2	2	2	1	6
2	RAMAN	3	1	217884	1	1	1	1	1	BULGE	1	2	1	2	1	2	2	2	2	2	7
2	MAHESH KUMAR	3	1	217712	2	1	1	1	1	DISCOMFORT AND RESTRICTION	1	2	2	2	2	2	2	1	2	2	7
2	CHENNIYAPPAN	4	1	219761	1	2	1	1	1	BULGE	2	1	1	2	1	2	2	2	2	2	7
2	THASIM	3	1	221990	2	2	1	1	1	PAIN	1	2	2	2	2	2	2	2	2	2	7
2	ARUMUGAM	6	1	230498	2	1	1	2	2	BULGE	2	2	1	1	1	2	2	2	2	2	7

2	PALANISAMY	5	1	230688	1	2	1	1	1	PAIN	2	1	2	2	2	1	2	1	2	1	1
2	CHINNASAMY	5	1	236251	2	1	1	3	2	BULGE	1	2	2	2	2	2	2	2	2	2	7
2	SUBBAIYAH	5	1	236208	3	1	2	3	2	BULGE	1	2	2	2	1	2	2	2	2	2	7
2	AIYYASAMY	5	1	249325	1	1	1	1	1	PAIN	2	1	2	2	2	2	2	2	2	2	7
2	SHANMUGAM	2	1	116658	2	1	1	1	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
2	RENGAIYAH	6	1	119099	3	1	2	3	2	PAIN	2	1	1	1	1	1	2	2	2	2	7
2	KUPPUSAMY	4	1	129532	1	2	1	1	1	IRREDUCIBILITY	2	1	2	1	2	1	2	1	2	1	1
2	BASKAR	2	1	129536	1	1	1	1	1	BULGE	2	2	1	2	1	2	2	2	2	2	7
2	DASS	3	1	129555	1	2	1	1	2	PAIN	2	2	1	2	1	2	2	1	2	2	7
2	ORDHU JAYARAJ	3	1	15011	2	1	1	3	1	BULGE	1	2	2	2	2	2	2	2	2	2	7
2	SUBRAMANI	4	1	7536	3	1	1	3	2	DISCOMFORT AND RESTRICTION	2	2	1	2	1	2	2	2	2	2	7
2	PONNUSAMY	5	1	9551	2	2	1	2	2	BULGE	2	1	1	1	1	1	2	2	1	1	2
2	HARIRAMANI	1	1	13335	2	2	1	1	1	PAIN	1	2	2	2	2	2	2	2	2	2	7
2	SELVARAJ	3	1	15378	1	1	1	1	1	PAIN	2	2	1	1	2	2	2	2	2	2	7
2	SHAKTHIVEL	3	1	15438	2	2	1	2	2	BULGE	2	1	2	1	2	1	2	2	2	1	1
2	PALANI	5	1	171386	2	1	1	3	2	IRREDUCIBILITY	2	1	1	2	2	1	2	2	2	1	1
2	SATHEESH	2	1	183308	2	2	1	1	1	DISCOMFORT AND RESTRICTION	2	2	2	2	2	2	2	2	2	2	7
2	GANESAN	3	1	183286	2	1	1	1	1	BULGE	2	2	1	1	2	2	2	2	2	2	7
2	MURUGESAN	3	1	185344	2	2	1	3	2	PAIN	2	2	2	2	2	2	2	2	2	2	7
2	RAMASAMY	3	1	185293	3	1	2	1	1	PAIN	1	2	2	2	2	2	2	2	2	2	7
2	GOPAL	4	1	189037	2	2	1	1	2	BULGE	2	1	2	2	1	1	2	2	2	1	2
2	ARUL KUTTY	4	1	189011	3	1	2	2	2	DISCOMFORT AND RESTRICTION	2	1	1	2	1	2	2	2	1	2	7
2	KITTAN	3	1	193206	1	2	1	1	1	PAIN	2	2	1	1	2	2	2	2	2	2	7
2	MANI	6	1	192942	1	1	1	1	2	BULGE	2	1	1	1	1	2	2	2	2	2	7
2	VADIVEL	3	1	196372	3	1	2	1	1	IRREDUCIBILITY	1	2	1	2	2	2	2	2	2	2	7
2	PONNUMANI	3	2	458	2	1	1	1	1	PAIN	2	1	1	2	2	2	2	1	2	2	7
2	AANI PUNITHA	1	2	2322	1	2	1	1	1	PAIN	2	2	2	2	2	2	2	2	2	2	7
2	KAVITHA	2	2	177775	1	2	1	1	1	DISCOMFORT AND RESTRICTION	2	2	2	2	2	2	2	1	1	2	7
2	RAHUMAN	5	1	41378	2	1	1	3	2	PAIN	3	1	1	1	1	1	2	1	2	1	3