EFFICACY OF SINGLE DOSE PRE-OPERATIVE ANTIBIOTIC IN SURGICAL SITE INFECTION AFTER LICHTENSTIEN REPAIR

Dissertation submitted in partial fulfillment of the regulation for the award of M.S. Degree in General Surgery

(Branch I)

THE TAMILNADU

Dr. M. G. R. MEDICAL UNIVERSITY

CHENNAI – 600 032.

MARCH 2010

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COIMBATORE – 641 014.

CERTIFICATE

Certified that this is the bonafide dissertation done by **Dr. RAJA.S.VIGNESH** and submitted in partial fulfillment of the requirements for the Degree of M.S., General Surgery, Branch I of The TamilNadu Dr. M.G.R. Medical University, Chennai.

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ETHICS COMMITTEE

CERTIFICATE

Name of the Candidate : Dr. Raja . S. Vignesh

Course : M.S. General Surgery

Period of Study : 2007 - 2010

College : Coimbatore Medical College

Dissertation Topic : Efficacy of single dose pre-operative antibiotic in surgical site infection after lichenstien repair.

The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation is accepted / ~~Not accepted~~ and you are permitted / ~~Not Permitted~~ to proceed with the above Study.

Coimbatore - 14.

Date : 13.02.08

Secretary
Ethics Committee

DECLARATION

I solemnly declare that the dissertation titled "**EFFICACY OF SINGLE DOSE PRE-OPERATIVE ANTIBIOTIC IN SURGICAL SITE INFECTION AFTER LICHTENSTIEN REPAIR**" was done by me from 2007 onwards under the guidance and supervision of **Prof. Dr.P.M.Nanjundappan, M.S**.

This dissertation is submitted to the TamilNadu Dr. MGR Medical University towards the partial fulfillment of the requirement for the award of M.S Degree in General Surgery (Branch I).

Place : **Dr.RAJA.S.VIGNESH**

Date :

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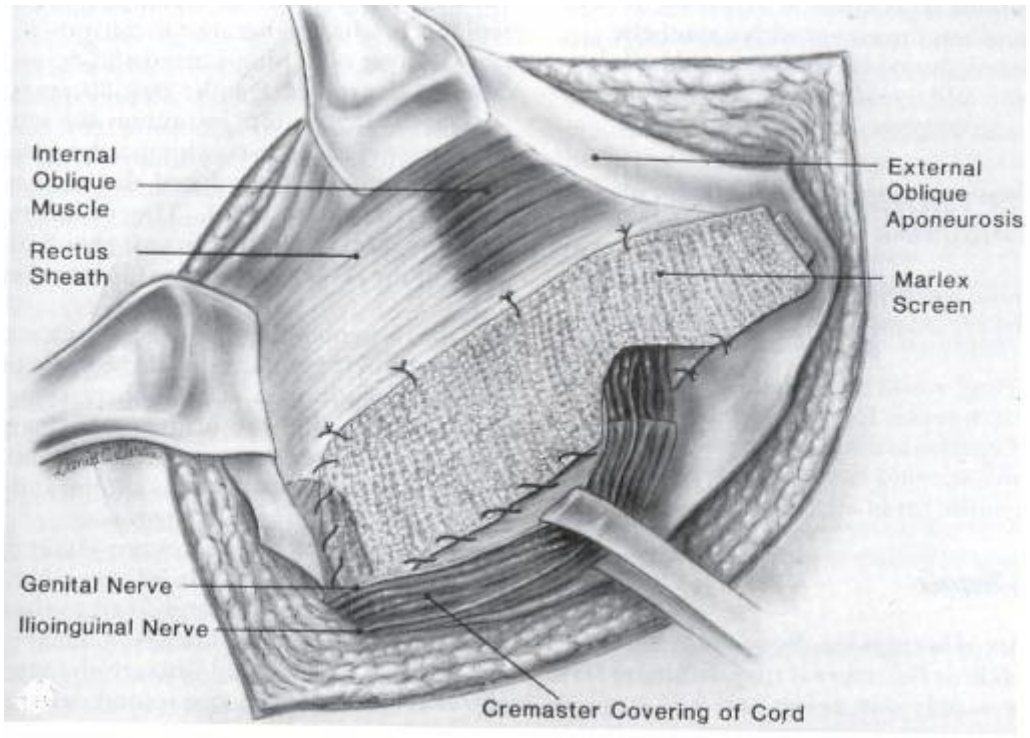
And last but not the least; I thank all the Patients for their kind co-operation extended to me throughout the study.

EFFICACY OF SINGLE DOSE PRE- OPERATIVE ANTIBIOTIC IN SURGICAL SITE INFECTION AFTER LICHTENSTIEN REPAIR



CONTENTS

INTRODUCTION

Surgical site infection (SSI) is the most frequent complication in inguinal hernioplasty.

Some studies have identified risk factors for SSI such as sex (greater in women), age (older than 70 years), co morbidity, operative time, and routine use of drainage and prostheses.SSI is related with an increase in length of stay and costs and a decrease in quality of life. In the 1970s, it was demonstrated that antibiotic prophylaxis for clean-contaminated surgery was the most cost-effective intervention to prevent SSI. But some authors have recommended its use in clean procedures as inguinal herniorrhaphy.

However, the recognition of the free tension herniorrhaphy concept and the current introduction of mesh hernioplasty made the use of antibiotic prophylaxis more critical because of the infection risk when prosthetic materials are used. Antibiotic prophylaxis use in patients submitted to mesh inguinal hernioplasty decreased the rate of surgical site infection by almost 50%.

To prove the effectiveness of antibiotic prophylaxis in these procedures, it is necessary to conduct randomized clinical trials (RCTs) with large numbers of patients, which are difficult and sometimes unfeasible.

Available evidence related to the effectiveness of

antibiotic prophylaxis for mesh inguinal hernia repair is found in a meta-analysis, including few RCTs. SSI rate was 1.2% and 3.3%, in the prophylaxis and placebo group, respectively (odds ratio = 0.28; 95% confidence interval [CI], 0.02–3.

These results concluded there were no statistical differences between groups, so antibiotic prophylaxis was not recommended. However, new RCTs including patients with mesh hernioplasty have been published in the last years, increasing the number of patients evaluated.

Antibiotic prophylaxis in inguinal hernia surgery is controversial, especially after the increasing use of mesh. For some authors, hernia and breast surgery are clear examples of the benefits of antibiotic prophylaxis in clean surgery. Others consider that low frequency of SSI in hernia surgery does not justify prophylaxis.

A previous meta-analysis by Sanchez-Manuel and Seco-Gil for the Cochrane Collaboration, including 8-high quality RCTs, reported no statistical difference in SSI rates between antibiotic and no antibiotic groups. However, a subgroup analysis suggested that, in mesh hernia repair, a protective effect could exist, undetectable because of the small sample size.

The use of prosthetic material for inguinal hernia repair has increased dramatically ever since described by Giraud and colleagues using Nylon mesh in 1951. Various meshes have since been developed consisting mainly of non absorbable materials such as polypropylene, polyester and polytetraflouroethylene.

The presence of plastic biomaterial increases the incidence of complications relating to the mesh itself, in addition to other recognized complications of the hernia repair. The most serious complication is the development of mesh infection leading to groin sepsis sometimes necessitating the removal of mesh implant

To prevent mesh infection, antibiotic prophylaxis is often indicated and recommended. Most surgeons have used prophylactic antibiotics for Lichtenstein hernia repair. The true incidence of mesh infection is not exactly known because in some series infection rates of 1.9% to 7.5% has been reported.

Use of antibiotics in Lichtenstein's hernia repair is still debatable in government set up. Some surgeons use a single dose of pre-operative antibiotic, while the majority use multiple doses of post operative antibiotics claiming that the latter is superior to the former in reduction of surgical site infection in Lichtenstein s repair

Another subject in government setup that must be addressed in antibiotic prophylaxis is cost-effectiveness. In these cases, the costs of antibiotic administration must be carefully evaluated against the potentials benefits. Only studies particularly designed to answer this question could solve it. This study is intended for the above reasons

AIM

To assess the efficacy of single dose pre-operative antibiotic compared to multiple doses of post-operative antibiotic administration in reducing surgical site infection after Lichtenstien repair.

OBJECTIVES

- To compare the incidence of surgical site infection in patients receiving single dose of pre operative antibiotics with those receiving multiple dose of post operative antibiotics in Lichtenstein's hernioplasty.

- To determine if single dose of pre operative antibiotic is therapeutically and cost effectively more beneficial than multiple doses of post operative antibiotics in reducing surgical site infection after Lichtenstein's hernioplasty.

REVIEW OF LITERATURE

Until the middle of the 19th century, when Ignaz Semmelweis and Joseph Lister became the pioneers of infection control by introducing antiseptic surgery, most wounds became infected. In cases of deep or extensive infection this resulted in a mortality rate of 70-80%. Since then a number of significant developments, particularly in the field of microbiology, have made surgery safer. However, the overall incidence of healthcare associated infections (HAIs) remains high and represents a substantial burden of disease.

In 1992, the US Centres for Disease Control (CDC) revised its definition of 'wound infection', creating the definition 'surgical site infection' (SSI) to prevent confusion between the infection of a surgical incision and the infection of a traumatic wound. Most SSIs are superficial, but even so they contribute greatly to the morbidity and mortality associated with surgery. Estimating the cost of SSIs has proved to be difficult but many studies agree that additional bed occupancy is the most significant factor. A review of the incidence and economic burden of SSIs in Europe estimated that the mean length of extended stay attributable to SSIs was 9.8 days, at an average cost per day of €325.

Wound infections have been subdivided according to the following clinically related subgroups

Aetiology: in a *primary infection*, the wound is the primary site of infection, whereas a *secondary infection* arises following a complication that is not directly related to the wound;

Time: an *early infection* presents within 30 days of a surgical procedure, whereas an infection is described as *intermediate* if it occurs between one and three months afterwards and *late* if it presents more than three months after surgery;

Severity: a wound infection is described as *minor* if there is discharge without cellulitis or deep tissue destruction, and *major* if the discharge of pus is associated with tissue breakdown, partial or total dehiscence of the deep fascial layers of the wound, or if systemic illness is present.

HEALING BY PRIMARY INTENTION

Surgical wounds may heal by primary intention, delayed primary intention or by secondary intention. Most heal by primary intention, where the wound edges are brought together (apposed) and then held in place by mechanical means (adhesive strips, staples or sutures), allowing the wound time to heal and develop enough strength to withstand stress without support. The goal of surgery is to achieve healing by such means with minimal oedema, no serous discharge or infection, without separation of the wound edges and with minimal scar formation. On occasion, surgical incisions are allowed to heal by delayed primary intention where non-viable tissue is removed and the wound is initially left open. Wound edges are brought together at about 4-6 days, before granulation tissue is visible . This method is often used after traumatic injury.

HEALING BY SECONDARY INTENTION

Healing by secondary intention happens when the wound is left open, because of the presence of infection, excessive trauma or skin loss, and the wound edges come together naturally by means of granulation and contraction . Experimentally as well as clinically it has been shown that a delay in wound closure of four to five days increases the tensile strength of the wound as well as resistance to infection. The overall rate of SSIs in traumatic war wounds using

delayed principles was 3-4%, compared with more than 20% after primary closure . In civilian practice, delayed healing has been used successfully in cases of severe incisional abscesses, mainly after laparotomy. Another benefit of delayed closure is the cosmetic result after healing. The appearance of a wound after a delay of four to five days is comparable to that of primary closure. A wider scar follows late closure (after 10-14 days), although this is cosmetically much better than the result obtained after the healing of an open granulating wound.

Many factors influence surgical wound healing and determine the potential for, and the incidence of, infection . The level of bacterial burden is the most significant risk factor, but modern surgical techniques and the use of prophylactic antibiotics have reduced this risk.

A system of classification for operative wounds that is based on the degree of microbial contamination was developed by the US National Research Council group in 1964 . Four wound classes with an increasing risk of SSIs were described: clean, clean-contaminated, contaminated and dirty.

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.

[Adapted from Berard F, Gandon J, *Ann Surg* 1964]

DEFINITIONS OF PERIOPERATIVE AND PERIPROCEDURAL SURGICAL PROPHYLAXIS

Perioperative prophylaxis implies the use of 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).

Level of recommendation

Level	Recommendation
A	Requires at least one randomized controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation. (Evidence levels Ia, Ib)
B	Requires the availability of well conducted clinical studies but no randomised clinical trials on the topic of recommendation. (Evidence levels IIa, IIb, III)
C	Requires evidence obtained from expert committee reports or opinions And/or clinical experiences of respected authorities. Indicates an absence of directly applicable clinical studies of good quality. (Evidence level IV)

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	
Multiple (3 or more) preoperative co morbid medical diagnoses	
ASA class 3, 4 or 5	

RISK ASSOCIATED WITH ASA CLASS

According to the preoperative risk score devised by the American Society of Anaesthesiologists (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 a mild systemic disease,

3 – Patient with a 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.

Risk associated with the type of surgical procedure

- An increased risk for the development of surgical site infection is described in the chapter Classification of surgical procedures.

Risk associated with the insertion of prosthetic implants

- Insertion of any type of prosthetic implants increases the risk for infection.

Risk associated with the duration of surgery

- The risk for surgical site infection is directly proportional to the duration of surgical procedure.

COMMON SURGICAL SITE INFECTION PATHOGENS

The majority of surgical site infections are caused by bacteria the 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

- *Staphylococcus aureus*
- Coagulase-negative staphylococci (CONS)
- *Enterococcus* spp.
- *Escherichia coli*
- *Pseudomonas aeruginosa*
- *Enterobacter* spp.
- *Proteus mirabilis*
- *Klebsiella pneumoniae*
- Streptococci
- *Candida albicans*

.

CLASIFICATION OF SURGICAL SITE INFECTIONS

Superficial incisional SSI - occur within 30 days after the operation; involve Skin and subcutaneous tissue of the incision and at least *one* of the following signs :

1. Purulent drainage,
2. Organism isolated from an aseptically obtained culture,
3. At least one of the following symptoms:

   Pain,

   Swelling,

   Redness,

   Heat.

Deep incisional SSI – occur within 30 days after the operation (within 1 year if implant is in place), involve deep soft tissue of the incision, and at least *one* of the following signs:

1. Purulent drainage from the deep incision (but not from the organ/space component of the surgical site)

2. Spontaneous dehiscence or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms:

   Fever, localized pain, redness, heat.

3. An abscess

The diagnosis of superficial infection is made by surgeon of supervising physician.

Organ/space SSI - occur within 30 days after the operation (within 1 year if implant is in place), involve organs or spaces exposed to operation with at least *one* of the following:

1. Purulent discharge from a drain that is placed into the organ/space
2. Organism isolated from an aseptically obtained culture of tissue or fluid in the organ/space
3. An abscess found on direct examination, during reoperation or according to radiologic or Histopathological finding .

If an infection involves tissues below deep fascia , it should be treated as deep incisional infection. If an organ space infection is drained through incision it should be treated as organ space infection.

ANTIBIOTICS IN SURGICAL PROPHYLAXIS

The antibiotic chosen for prophylaxis should cover the most common SSI pathogens, however not necessarily all possible pathogens.

The choice of antibiotic primarily depends on anatomic location of the surgical procedure. Also, the antibiotic used in prophylaxis should differ from other drugs used in the therapy for the same anatomic area in order to prevent the development of resistance and preserve those medications efficient for the treatment of infections in a particular anatomic area

If a contamination with anaerobic pathogens is possible, e.g. during colorectal, gynaecological and head and neck procedures, the use of antibiotic with anaerobic activity is recommended.

If a patient is already receiving an antibiotic that covers targeted organisms for that particular surgical procedure, prophylaxis is not needed.

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 anaesthesia 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 ½ 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 ($T_{1/2}$)

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.

RISKS OF ANTIBIOTIC PROPJYLAXIS

- Even proper use of antibiotics in perioperative prophylaxis increases the incidence of *Clostridium difficile* colitis.

- Antimicrobial prophylaxis in surgery can influence the resistance of bacteria to antibiotics.

- There is always a risk of drug allergy

PREVENTIVE TECHNIQUES

The surgical technique used can affect the infection rate in various ways, for example in relation to skin preparation, shaving and wound closure.

Skin preparation: The skin is colonised by various types of bacteria, but up to 50% of these are *Staphylococcus aureus*[14]. In analyses of contamination rates after cholecystectomy, the main source of wound contamination was found to be the skin of the patient [15]. For this reason, preoperative preparation should be performed. Evidence has shown that the use of a preoperative wash containing chlorhexidine decreases the bacterial count on skin by 80-90%, resulting in a decrease in preoperative wound contamination [16]. The effect on SSI incidence has, however, been more difficult to demonstrate and it is possible that prolonged washing releases organisms from deeper layers of the skin.

Shaving: It is now recognised that shaving damages the skin and that the risk of infection increases with the length of time between shaving and surgery [10]. In one study, if the patient had been shaved more than two hours before surgery the clean wound infection rate was found to be 2.3% [11]. However, if patients had not been shaved but their body hair had been clipped the rate was 1.7%, and if they had not been shaved or clipped the rate dropped to 0.9%[11]. If shaving is essential, it should be performed as close to the time of surgery as possible.

MATERIALS AND METHODS

DESIGN

A prospective Randomised control study

COLLECTION OF DATA AND SOURCES

- The study was conducted in Coimbatore Medical College Hospital from 2007 to 2010.
- The population for the study were from surgical units in CMCH.
- The results were tabulated and appropriate tests of significance were worked up.

INCLUSION CRITERIA

- Patients with primary inguinal hernia in age group 30 to 65 yrs
- Patients with primary inguinal hernia in age group 20 to 30 yrs with weak abdominal musculature who were ineligible for herniorrhaphy.

EXCLUSION CRITERIA

Patients with

- Recurrent hernias,
- Immunosuppressive diseases,
- Allergies for the given antibiotic,
- Prior infection,
- Patients who had received antibiotics within past 48 hours,
- Pregnant and lactating women,
- Patients with cardiac valvular disease, prosthetic valves,
- Patients with uncontrolled DM and HT.

GROUP SELECTION

Patients under the inclusion criteria were arranged randomly into two groups A and B.

- Group A received 1 gram of Cefotaxime just before skin incision.

- Group B received 1 gram Cefotaxime twice daily post operatively for 5 days.

PRE-OPERATIVE PREPARATION

- Standard aseptic precautions as for any other surgery.

- All diabetic patients had strict glycemic control and

- Normal FBS and urine acetone negative before surgery.

OPERATIVE PROCEDURE

- All the patients were operated in same theatre.

- Pre-operative preparation of the surgical site done according to standard principles.
- Lichtenstein's repair was done in all patients.

- Dressing done after surgery.

- Surgical site inspected after 48 hours.

Follow up

The surgical site was inspected daily from second post operative day onwards based on the following criteria for SSI.

Surgical site infection surveillance criteria

- Presence of purulent drainage
- Presence of erythema and drainage
- Erythema extending at least 2 cm beyond the wound edges
- A wound that was opened and left to heal by secondary intention.
- Wound dehiscence.

When there was no SSI sutures were removed on the 7th post operative day and the patient was discharged. In patients who had SSI, culture and sensitivity tests were done and appropriate antibiotics were given. A patient with wound gaping had thorough wound debridement and secondary suturing was done.

DATA COLLECTION AND ANALYSIS

The following data were collected and analysed.

1. Patients demographic profile

2. Clinical type of hernia (direct / indirect)

3. Biochemical parameters

4. Anaesthesia variables such as

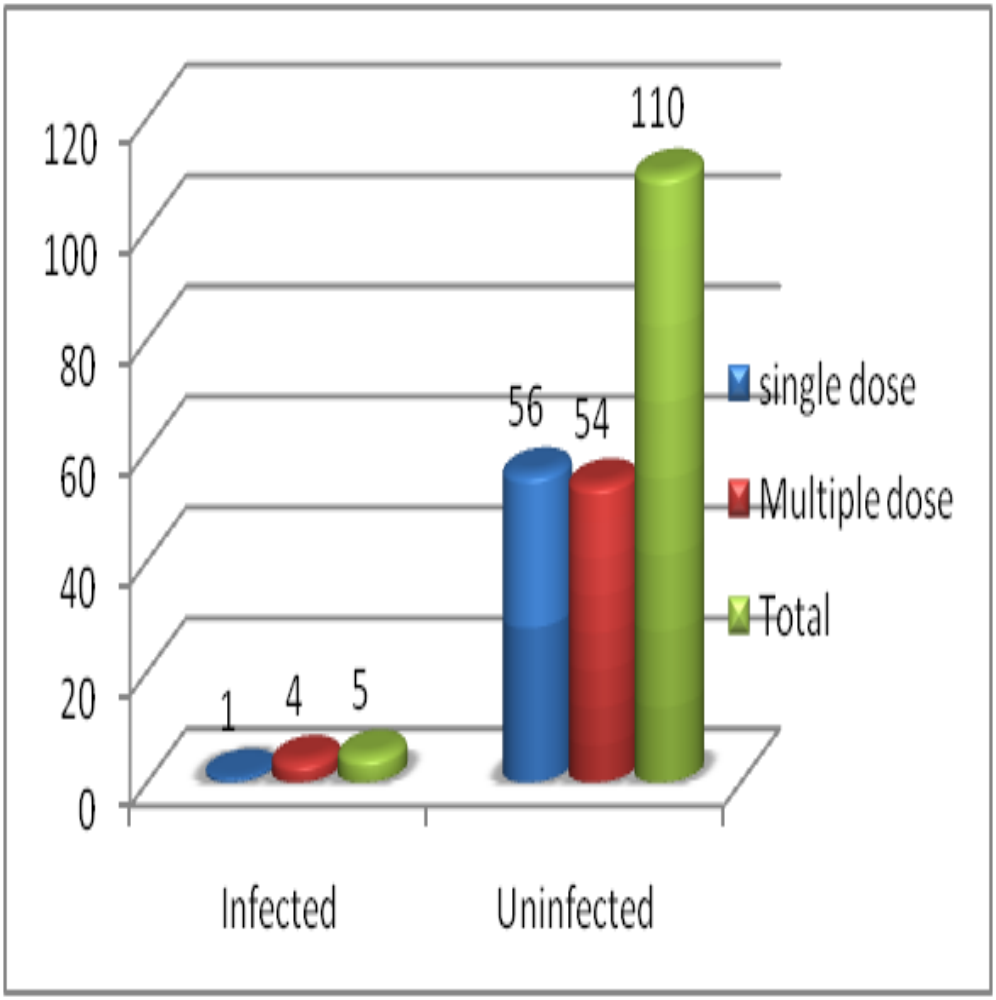
- ASA grade
- Type of anaesthesia
- Duration of anaesthesia

STATISTICAL ANALYSIS

- Analysis of the data was done with primary objective to determine if single dose of pre operative antibiotic is therapeutically and cost effectively more beneficial than those receiving multiple dose of post operative antibiotics in reducing surgical site infection after Lichtenstein's repair.

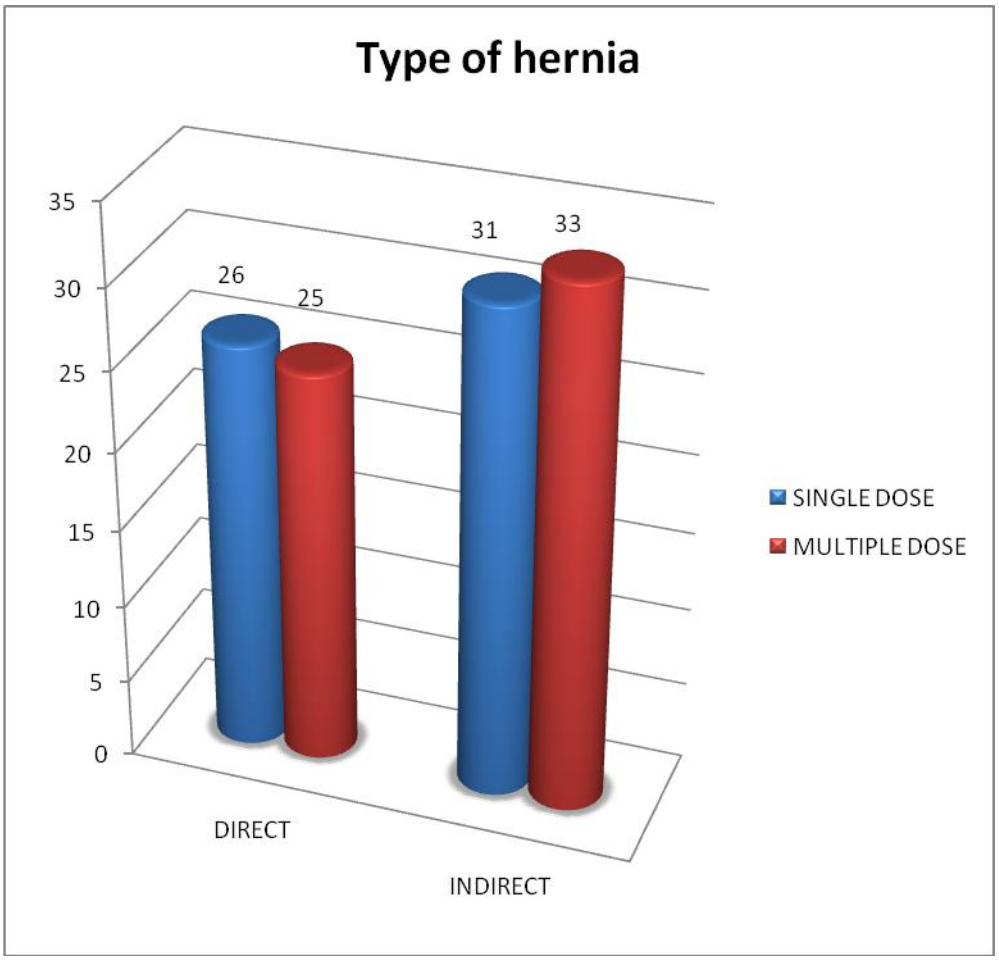
- Differences between groups in the distribution of parameters were tested using chi -square test and $p<0.05$ was considered statistically significant.

SURGICAL SITE	SINGLE DOSE	MULTIPLE DOSE	Total
Infected	**1**	**4**	**5**
Not infected	**56**	**54**	**110**
Total	**57**	**58**	**115**



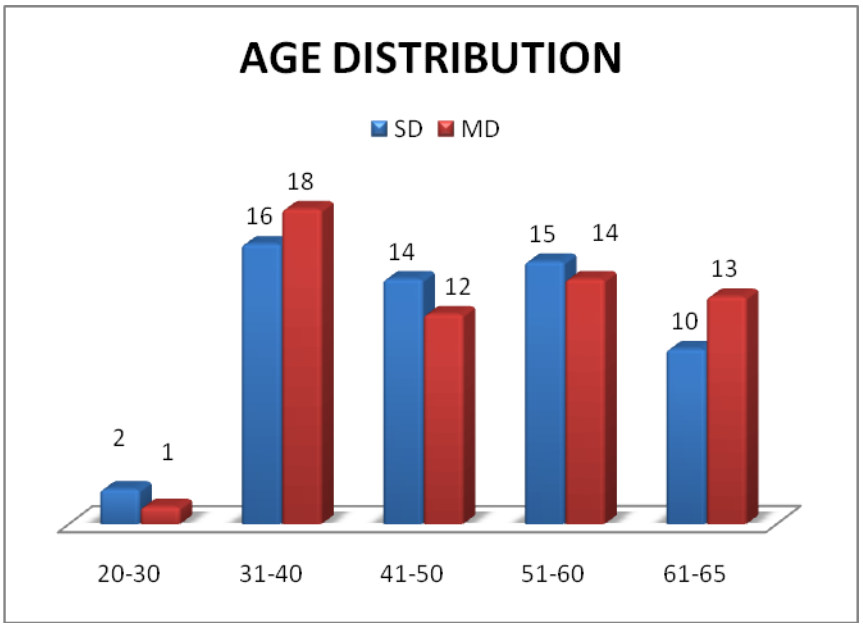
TYPE OF HERNIA

Type of hernia	Group A	Group B
Direct	26	25
Indirect	31	33



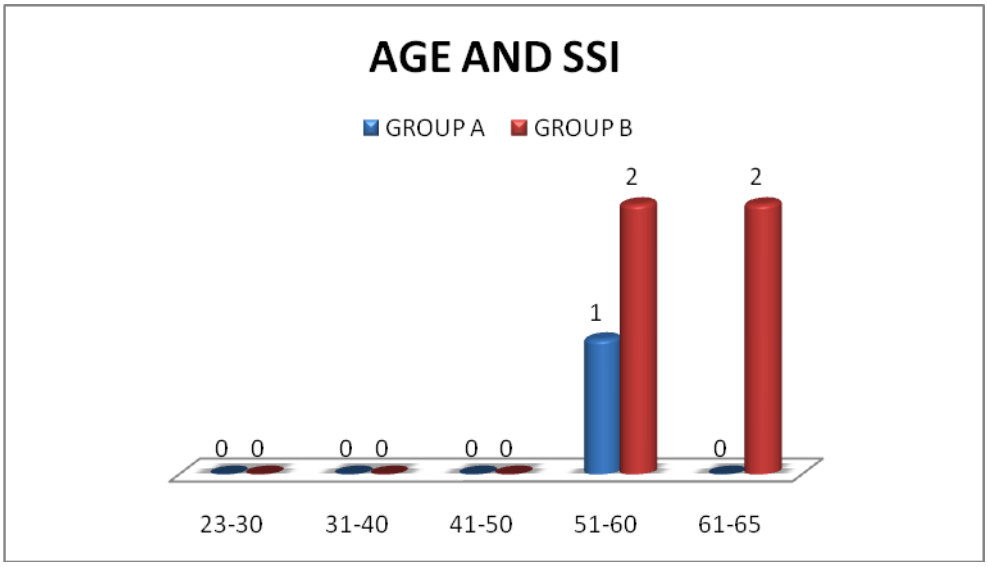
AGE WISE DISTRIBUTION OF PATIENTS

Age of the patient in years	Group A	Group B
20-30	2	1
31-40	16	18
41-50	14	12
51-60	15	14
61-65	10	13



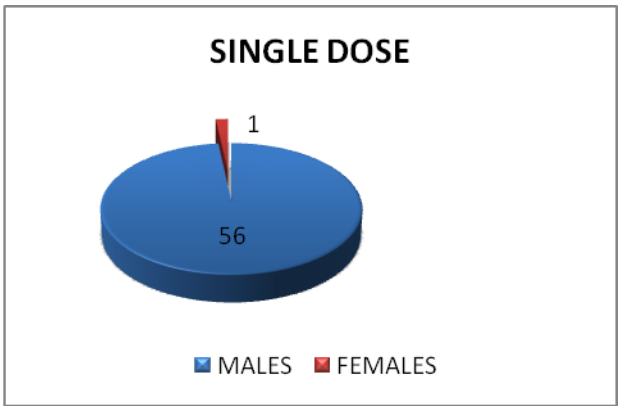
AGE WISE DISTRIBUTION OF SSI

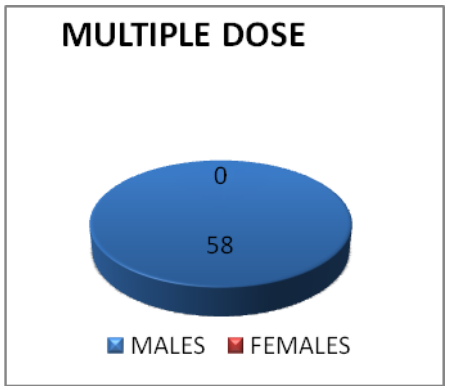
Age of the patient in years	Group A	Group B
20-30	Nil	Nil
31-40	Nil	Nil
41-50	Nil	Nil
51-60	one	Two
61-65	Nil	Two



SEX WISE DISTRIBUTION OF PATIENTS

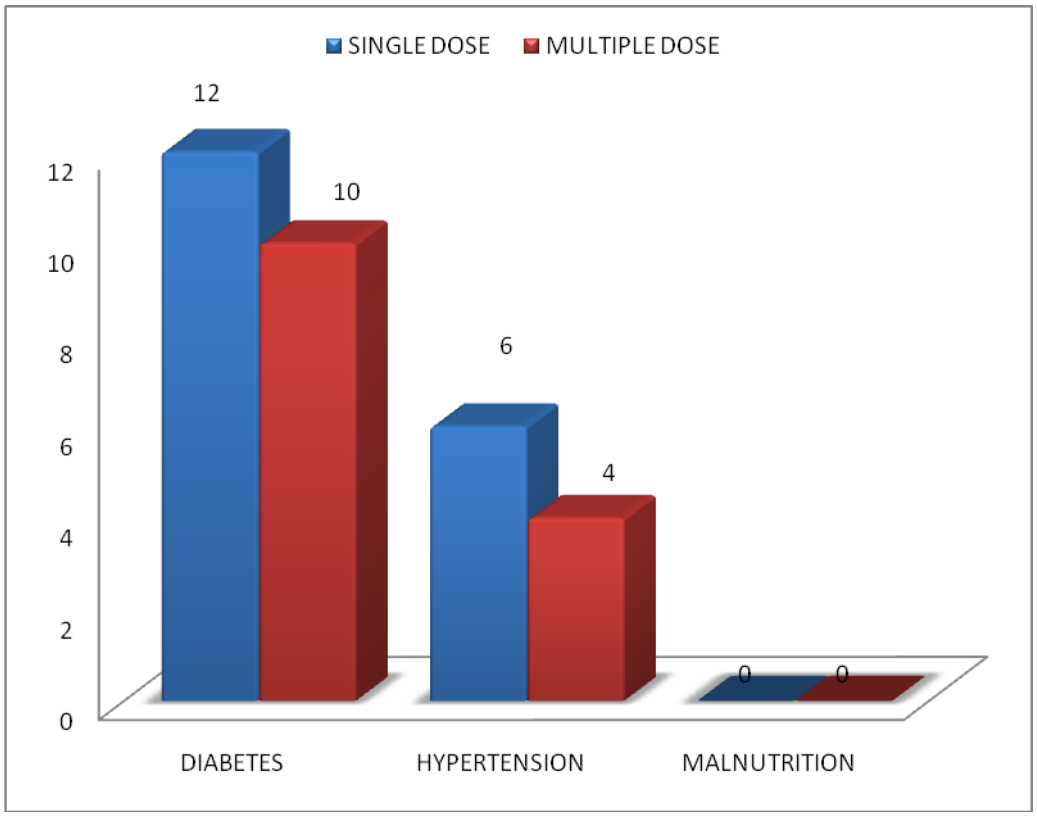
Sex	Group A	Group B
Males	56	58
Females	1	NIL



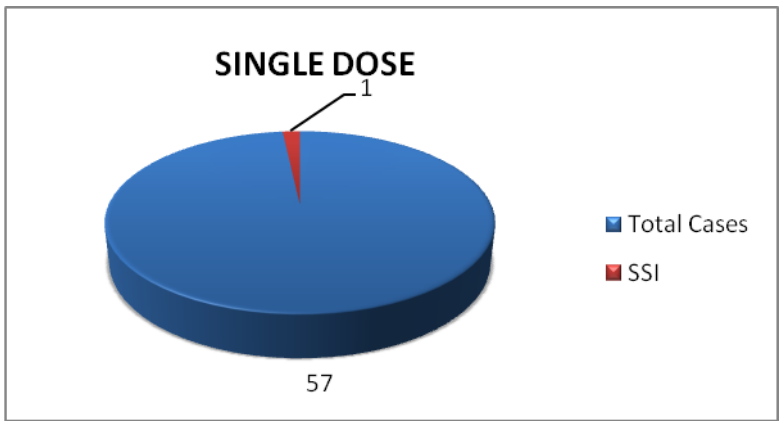


CO-MORBID CONDITIONS

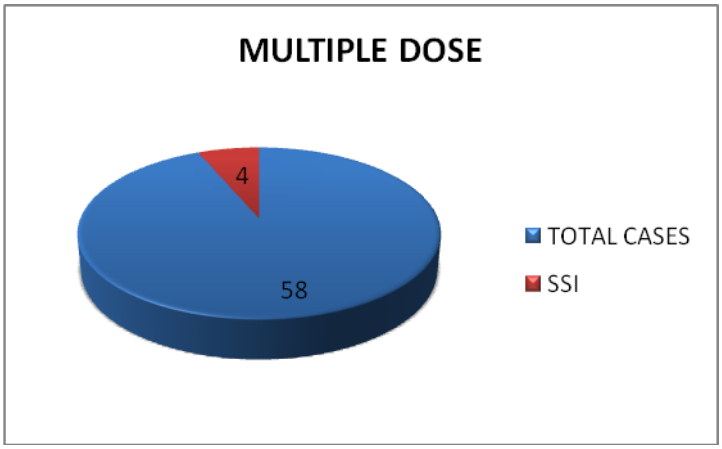
Co-morbid conditions	Group A	Group B
Diabetes mellitus	12	10
Hypertension	6	4
Malnutrition	Nil	Nil



SSI



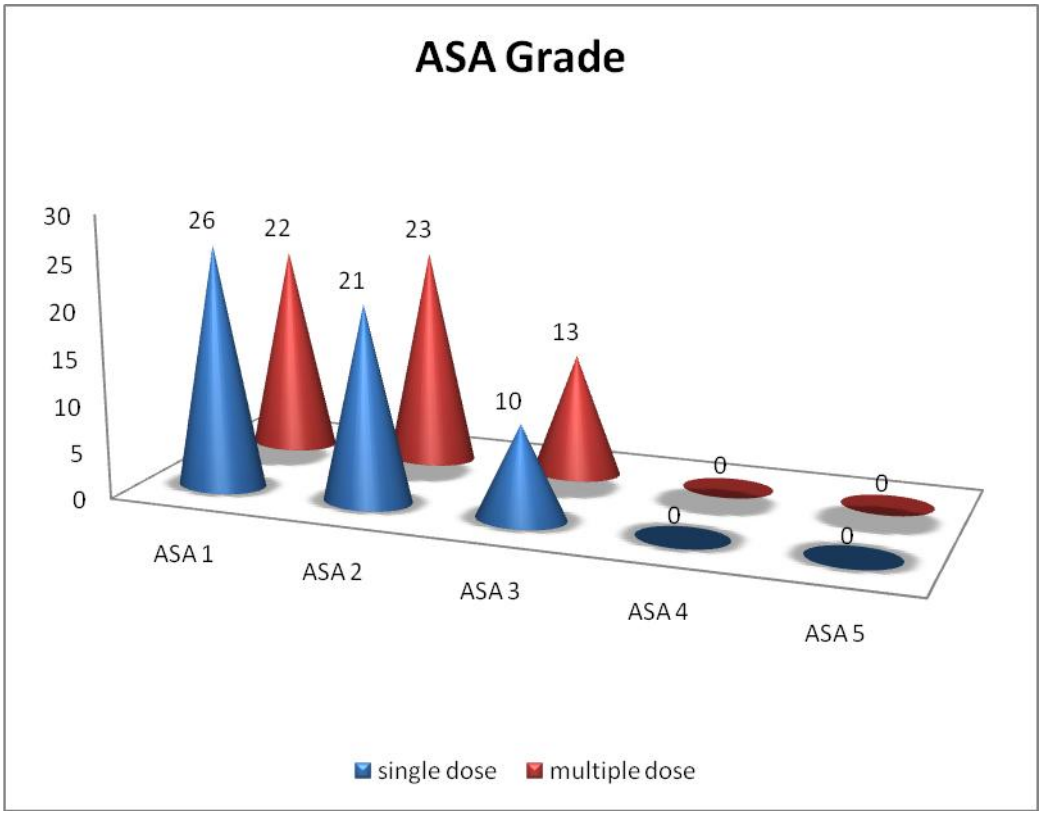
Total cases	SSI present
57	1



Total cases	SSI present
58	4

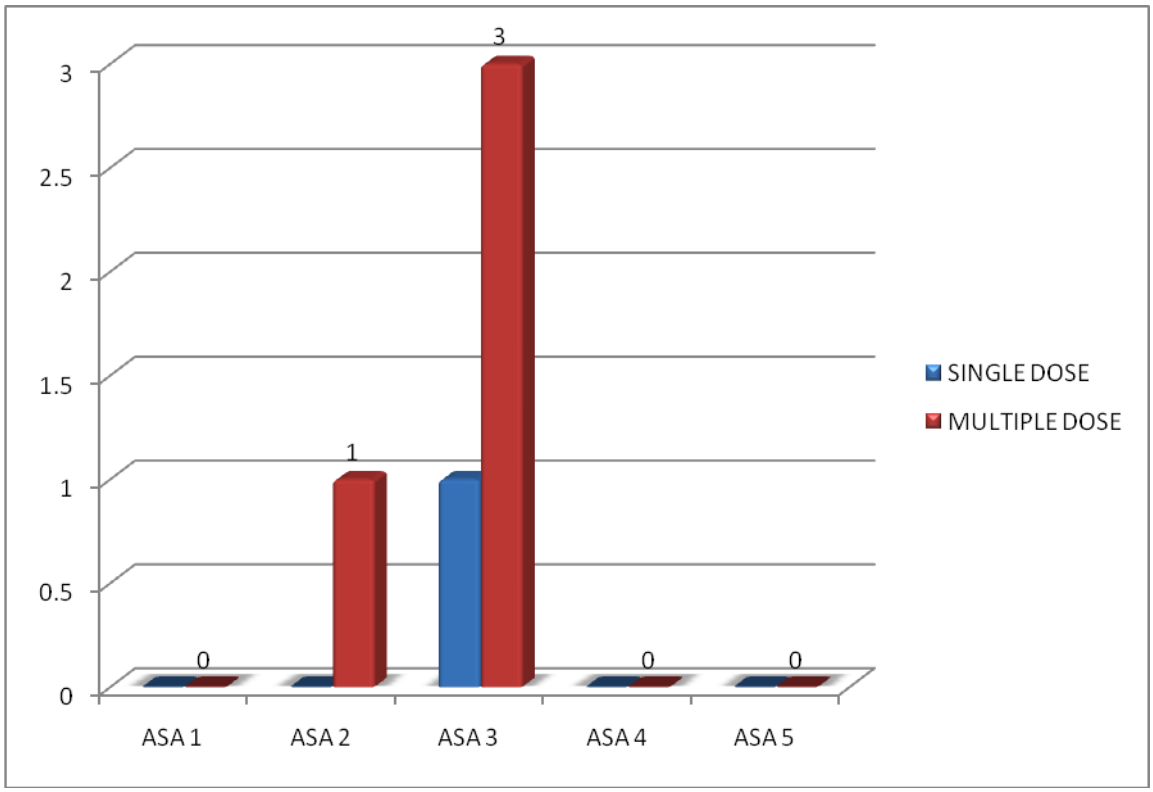
ASA GRADE DISTRIBUTION

ASA grade	Group A	Group B
1	26	22
2	21	23
3	10	13
4	Nil	Nil
5	Nil	Nil



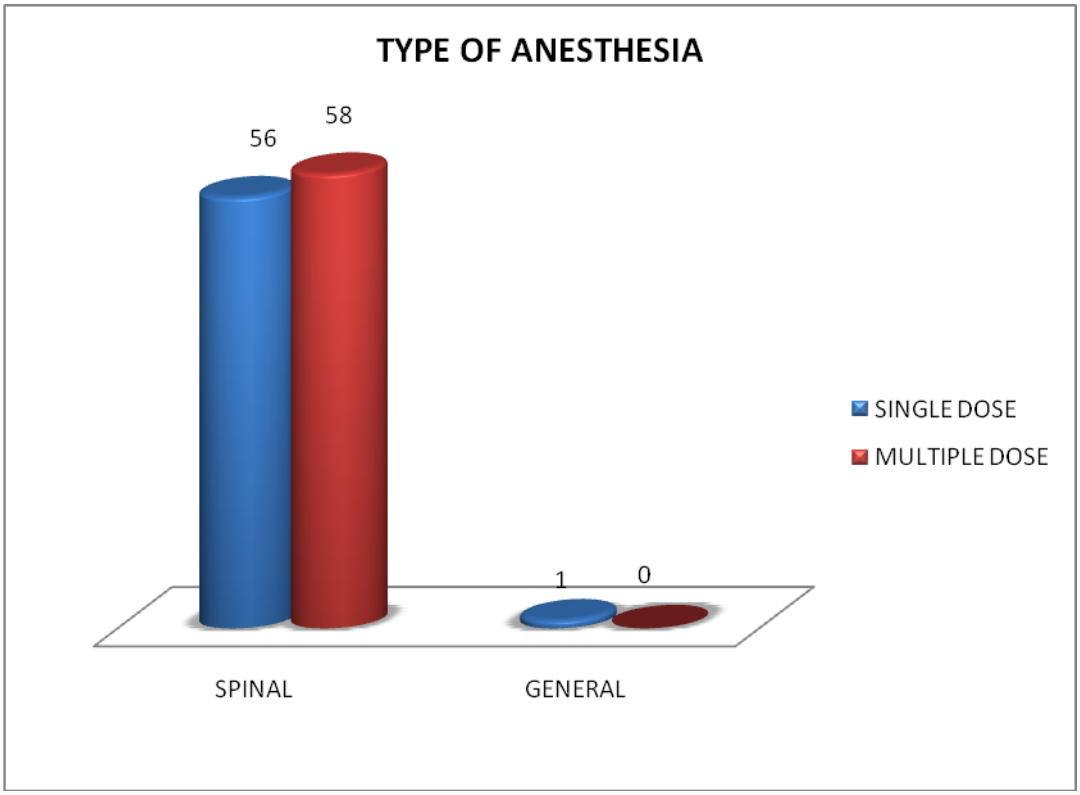
ASA GRADE AND SSI

ASA grade	Group A	Group B
1	Nil	Nil
2	Nil	1
3	1	3
4	Nil	Nil
5	Nil	Nil



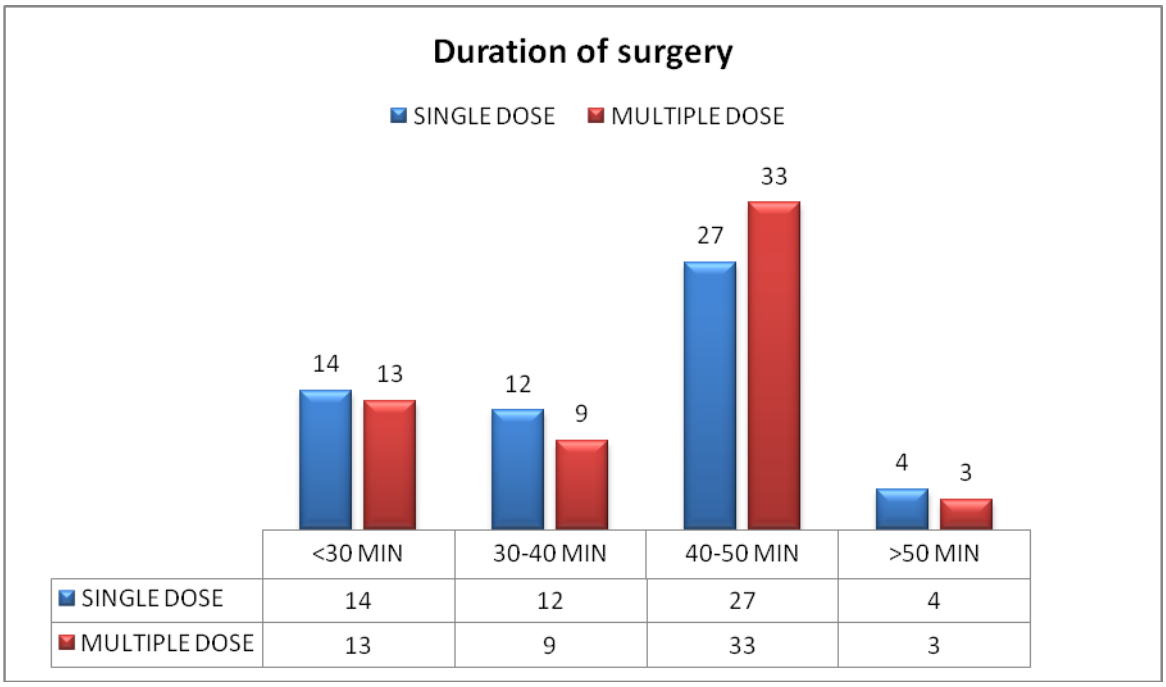
TYPE OF ANAESTHESIA

Type of anaesthesia	Group A	Group B
Spinal	56	58
Epidural	Nil	Nil
General	1	Nil



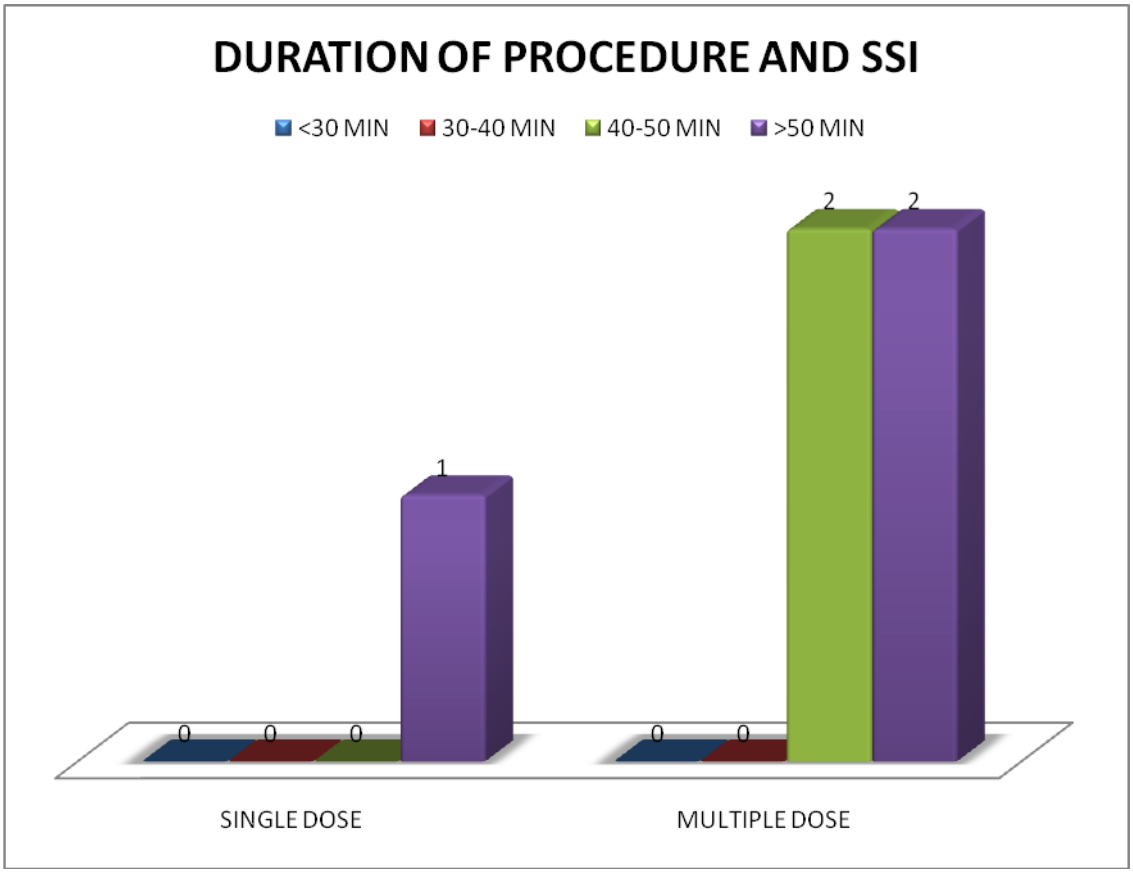
DURATION OF SURGERY

Duration of surgery	Group A	Group B
<30 min	14	13
30-40 min	12	9
40-50 min	27	33
> 50 min	4	3



DURATION OF SURGERY AND SSI

Group	<30 min	30-40 min	40-50 min	> 50 min
A	Nil	Nil	Nil	One
B	Nil	Nil	Two	Two



CHARACTERISTICS OF SSI PATIENTS

S NO	GROUP	AGE	SSI DETECTED ON POD	TYPE OF SSI	ORGANISM
1	A	52	4	Purulent	KLEBSIELLA
2	B	55	3	Purulent	E. COLI
3	B	57	4	Fever /serous	NIL
4	B	60	4	Fever/erythema	NIL
5	B	63	5	Wound gaping	STAPHYLOCOCCUS

CALCULATION

- Null hypothesis: There is no significant difference in infection rates between pre-operative and post-operative administration of antibiotics.

- Alternate hypothesis: Pre-operative antibiotic administration results in significantly lower infection rates.

- **X2 = € ((O-E) 2/E)**
- Expected value E= (row total x column total)/overall total
- E1= (57 x 5)/115 = 2.48
- E2= (58 x 5)/115 = 2.52
- E3= (57 x 110)/115 = 54.52
- E1= (58 x 110)/115 = 55.47
- X2 = (1.48^2)/2.48 + (1.48^2)/2.52 + (1.48^2)/54.52 + (1.48^2)/55.47
- X2 = 0.88+0.04+0.87+0.04
- **X2 = 1.83**
- Value of X2 is less than value of X2 at degree of freedom 1 at 0.05 level(3.84)
- Thus, null hypothesis is true.

OBSERVATIONS AND RESULTS

115 patients were recruited to the study from AUGUST 2007 to OCTOBER 2009.

Patients were assigned randomly into two groups A(n=57) and B(n=58),to receive single dose or multiple dose antibiotics respectively.

The baseline characteristics were similar in both groups.

There was no statistically significant age specific infection risk.

Type of anaesthesia, and ASA grade were similar in both groups.

Duration of procedure was almost 50 minutes to 1 hour in all the patients.

SSI was identified on the 3rd to 5th post operative day in both groups.

Bacteria isolated were Klebsiella, staphylococcus and E.coli

Incidence of SSI in group A was 2 %(1 among 57patients)

Incidence of SSI in group B was 6 %(4 among 58 patients)

Incidence of SSI though higher in group B than group A was not statistically significant when chi square test was applied.

Incidence of SSI was higher in both the groups with high ASA Grades and prolonged duration of surgery.

The cost of antibiotic per patient in group A was Rs.14 while that in group B was between a minimum of Rs.140 in patients without SSI to a maximum of Rs.650 with SSI.

The difference in cost of antibiotic in both groups was statistically significant.

DISCUSSION

Inguinal hernia is the commonest problem amongst all external hernias and inguinal hernia repair is most frequent procedure in general surgery accounting for 10–15% of all operations. The age incidence is distributed in all decades of life. Incidence of inguinal hernia is race related. It is at least three times more common in black Africans than in the white population.

About 80–90% of repairs are done in males. The most frequent type is right sided indirect inguinal hernia. Direct inguinal hernias are rare in females.

Due to its common nature and increased incidence of recurrence and wound infection, a wide variety of surgical procedures and different materials were being used from time to time for hernia repair.

All these procedures and materials have equivocal results and are beyond the level of satisfaction for different surgeons. All these modifications and surgical techniques have showed a common disadvantage i.e. suture line tension, which leads to increased incidence of recurrence and other complications.

Post operative wound infection remains a common complication after hernia repair.

With the use of modern mesh prosthesis, it is now possible to repair all hernias without distortion of the normal anatomy and with no suture line tension.

Modern mesh is strong monofilament, inert, and readily available. It is unable to harbour infection, is very thin and porous. Its interstices become completely infiltrated with fibroblasts and remain strong permanently .It is not subjected to deterioration or rejection or it cannot be felt by patients or surgeons postoperatively.

Many factors including antimicrobial prophylaxis affect surgical site infection. For eg., beginning antibiotic prophylaxis during the immediate preoperative period reduces the risk of wound infection fourfold. Maintaining therapeutic antibiotic levels in the serum and tissues throughout the operation until, at most, a few hours after incision closure reduces this risk.

In this study, patients in Group A received a single dose of Inj. Cefotaxime 1 g at induction time and patients in Group B received multi dose of Inj. Cefotaxime 1 g, twice daily for 5 days

Indiscriminate use of antibiotics leads to proliferation of resistant organisms and was probably responsible for high rate of surgical site infection of 6% in Group B when compared with group A 2%. Pathogens encountered in these patients were E.coli/Staph/ Klebsiella

CONCLUSION

Single dose antibiotic prophylaxis was therapeutically efficient as well as cost effective in comparison with multiple doses of postoperative antibiotics usage for the prevention of surgical site infection in uncomplicated elective cases of Lichtenstein's hernioplasty. The infection rate is less when compared to studies wherein no antibiotics were used. The study shows that the cost of management of hernia patients with respect to use of antibiotics can be reduced in Govenment set up by use of single dose antibiotic, thereby reducing financial burden to the Government.

BIBILIOGRAPHY

Delgado-Rodriguez M, Sillero-Arenas M, Medina-Cuadros M, Martinez-Gallego G. Nosocomial Infections in Surgical Patients: Comparison of Two Measures of Intrinsic Patient Risk. Infect Control Hosp Epidemiol 1997;18:19-23.

Horan TC, Culver DH, Gaynes RP, Jarvis WR, Edwards JR, Reid CR. Nosocomial Infections in Surgical Patients in the United States, January 1986-June 1992. National Nosocomial Infections Surveillance (NNIS) System. Infect Control Hosp Epilemiol 1993;14:73-80.

Wallace WC, Cinat M, Gornick WB, Lekawa ME, Wilson SE. Nosocomial Infections in the Surgical Intensive Care Unit: A Difference Between Trauma and Surgical Patients. Am Surg 1999;65:987-990.

Gorecki P, Schein M, Rucinski JC, Wise L. Antibiotic Administration in Patients Undergoing Common Surgical Procedures in a Community Teaching Hospital: the Chaos Continues. World J Surg 1999;23:429-33.

Silver A, Eichorn A, Kral J, Pickett G, Barie P, Pryor V, Dearie MB, and Members of the Antibiotic Prophylaxis Study Group. Timeliness and Use of Antibiotic Prophylaxis in Selected Inpatient Surgical Procedures. Am J Surg

Bez autora. Antimicrobial prophylaxis in surgery. Med Lett Drugs Ther 1999;41:75-80.

Gilbert DN, Moellering RC, Sande MA. The Sanford Guide to Antimicrobial Therapy 2006. Vermont: Antimicrobial Therapy Inc., 2006.

Page CP, Bohnen JM, Fletcher JR, McManus AT, Solomkin JS, Wittman DH. Antimicrobial prophylaxis for surgical wounds. Arch Surg 1993;128:79-88.

SIGN Antibiotic Prophylaxis in Surgery. A National Guideline, 2000. Available at www.sign.ac.uk.

Bratzler DW, Houck PM for the Surgical Infection Prevention Guidelines Writers Workgroup. Antimicrobial Prophylaxis for Surgery: An Advisory Statement from the National Surgical Infection Prevention Project. Clin Infect Dis 2004;38:1706-15.

Therapeutic Guidelines: Antibiotic. Version 13. Melbourne: Therapeutic Guidelines Limited; 2006.

US Department of Health and Human Services. Agency for Health Care Policy and Research. Acute Pain Management: operative or medical

procedures and trauma. Rockville (MD): The Agency; 1993. Clinical Practice Guideline No 1. AHCPR Publication No 92-0023, str. 107.

Cruse PJ, Foord R. The epidemiology of wound infection. A 10-year prospective study of 62,939 wounds. Surg Clin North Am 1980;60:27-40.

Woods RK, Dellinger EP. Current Guidelines for Antibiotic Prophylaxis of Surgical Wounds. Am Fam Phys 1998;57:2731-40.

American Society of Anesthesiologists. New classification of physical status. Anesthesiology 1963;24:111.

Trampuz A, Zimmerli W. Antimicrobial Agents in Orthopaedic Surgery: Prophylaxis and Treatment. Therapy In Practice. Drugs 2006; 66:1089-1105.

Horan TC, Gaynes RP, Martone WY, Jarvis WR, Emori TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiol 1992;13:606-8.

Centers for Disease Control and Prevention. National Nosocomial Infections Surveillance (NNIS) report, data summary from October 1986-April 1996,

Privitera G, Scarpellini P, Ortisi G, Nicastro G, Nicolin R, de Lala F. Prospective study of Clostridium difficile intestinal colonization and disease following single dose antibiotic prophylaxis in surgery. Antimicrob Agents Chemother 1991;35:208-10.

Muto CA, Jernigan JA, Ostrowsky BE et al. SHEA guideline for preventing nosocomial transmission of multidrug resistant strains of Staphylococcus aureus and Enterococcus. Infect Control Hosp Epidemiol 2003;24:362-86.

Adkinson NF Jr. Risk factors for drug allergy. J Allergy Clin Immuno 1984;74:567-72

Penicillin allergy in childhood. Lancet 1989;25:420.

Idsoe O, Guthe T, Wilcox RR, Weck AL de. Nature and extent of penicillin side-reactions with particular reference to fatalities form analphylactic shock. Bull World Health Organ 1968;38:159-88.

Martin C. Antimicrobial prophylaxis in surgery: general concepts and clinical guidelines. French Study Group on Antimicrobial Prophylaxis in Surgery, French Society of Anesthesia and Intensive Care. Infect Control Hosp Epidemiol 1994;15:463-71

Proforma **case no:**

Study group: Single dose pre- op (A) / Multiple doses post-op (B)

Name: **age/ sex:**

I.P.No

Diagnosis:

Investigations

Hb%	Glucose	Urea	Creatinine	Others(specify)

Date of admission: **Date of surgery:**
Date of discharge:

Wound infection: Yes / No

If yes, type

Erythema	Serous discharge	Purulent discharge	Wound dehiscence	Mesh exposed	Fever

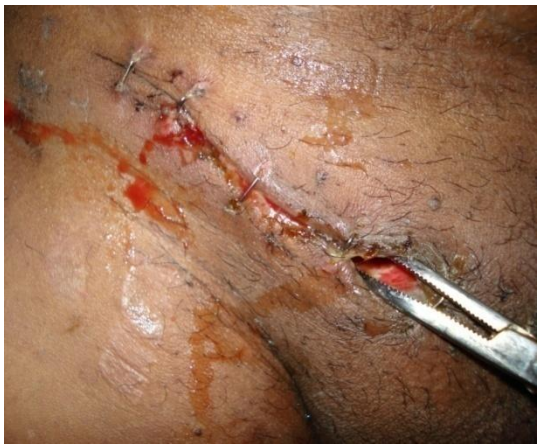
Culture sensitivity

Organism isolated	Antibiotic sensitivity	Antibiotic ,Dose and duration

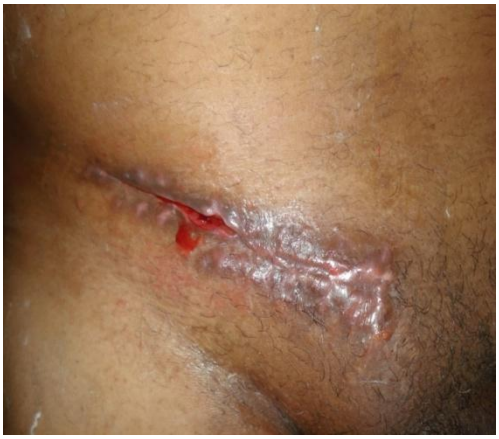
Outcome of the case

Wound uninfected **Wound infected**

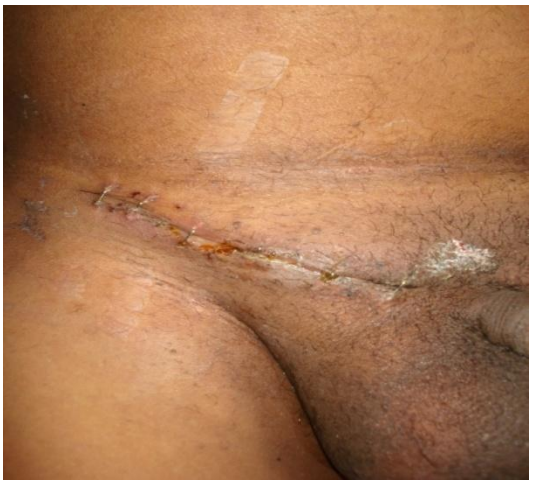
DEEP SURGICAL SITE INFECTION



DEEP SSI- 5TH POD

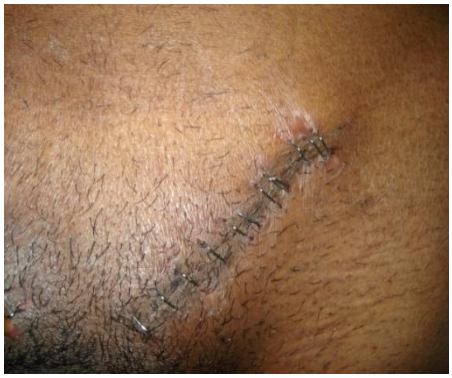


DEEP SSI- 9TH POD

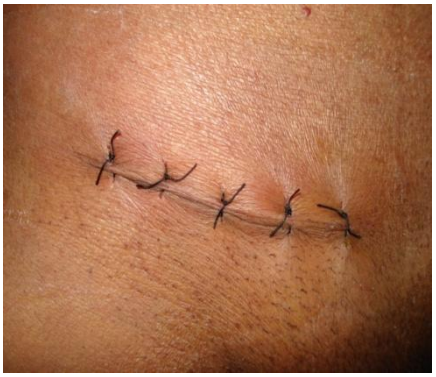


DEEP SSI- 14TH POD

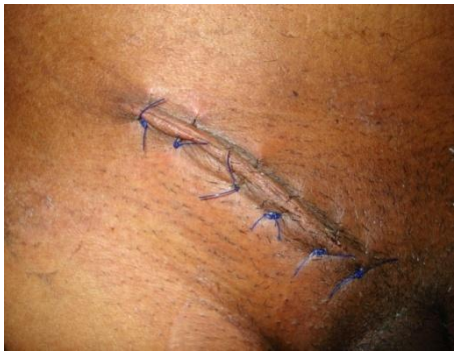
WOUND CLOSURE



STAPLERS

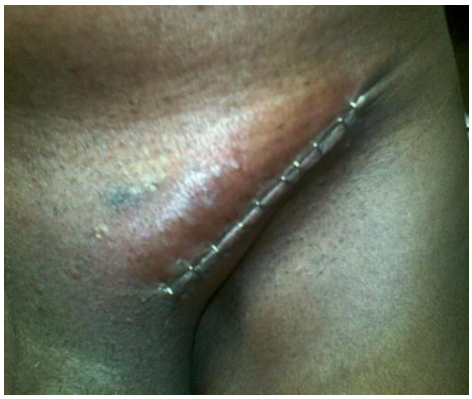


SILK

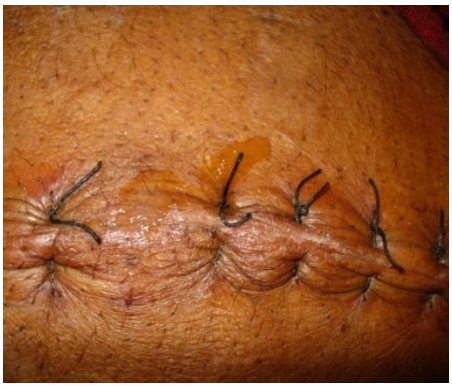


PROLENE

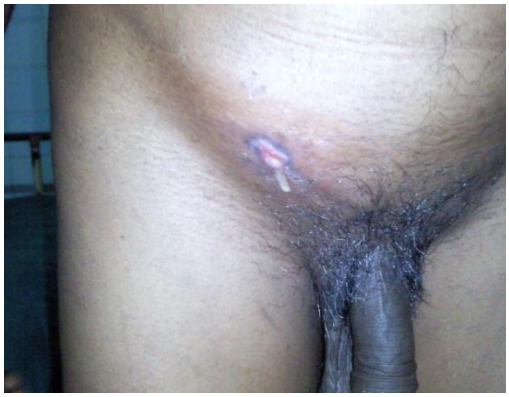
TYPES OF SSI



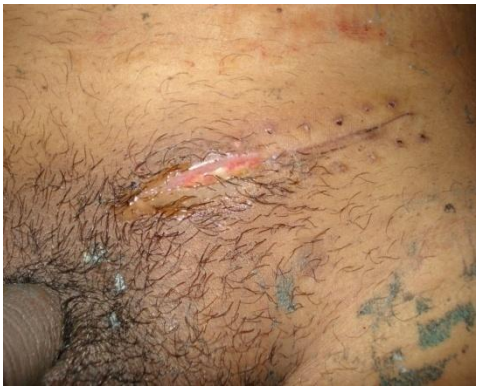
ERYTHEMA



SEROUS DISCHARGE



PURULENT DISCHARGE



WOUND GAPING

GROUP A- SINGLE DOSE						
S.NO	NAME	AGE/SEX	IP NO	TYPE OF INGUINAL HERNIA	SSI	ORGANISM
1	RAMESH	38/M	37623	(R) DIRECT	NIL	
2	VISHWANATHAN	70/M	39041	(R) INDIRECT	NIL	
3	KARUPATHAL	72/F	39180	(L) DIRECT	NIL	
4	SELVARAJ	42/M	39214	(R) INDIRECT	NIL	
5	RADHAKRISHNAN	46/M	41563	(L) INDIRECT	NIL	
6	RAJA	52/M	40424	(R) INDIRECT	NIL	
7	SAGADEVAN	56/M	45972	(L) INDIRECT	NIL	
8	MUTHU	63/M	47524	(R) DIRECT	NIL	
9	CHINNATHURAI	37/M	48624	(L) INDIRECT	NIL	
10	ARUNGAJ	48/M	50052	(R) INDIRECT	NIL	
11	MAKALI	50/M	50060	(R) INDIRECT	NIL	
12	ARUNACHALAM	58/M	51526	(L) DIRECT	NIL	
13	RAMU	40/M	56041	(L) DIRECT	NIL	
14	SUNDARAM	46/M	61200	(L) INDIRECT	NIL	
15	SIVAKUMAR	41/M	61820	(R) INDIRECT	NIL	
16	MANI	67/M	68137	(R) DIRECT	NIL	
17	MADHAVAN	35/M	68202	(L) INDIRECT	NIL	
18	CHINNARAJ	55/M	69511	(L) INDIRECT	NIL	
19	ARIVALAGAN	37/M	60940	(R) INDIRECT	NIL	
20	NATRAJ	52/M	68934	(R) INDIRECT	NIL	
21	RAVIKUMAR	37/M	61121	(R) INDIRECT	NIL	
22	MANO	35/M	60469	(R) INDIRECT	NIL	
23	RAMAN	60/M	42947	(R) DIRECT	PRESENT	KLEBSIELLA
24	ANGAMMAL	49/F	68962	(L) INDIRECT	NIL	
25	NATARAJ	52/M	68934	(R) INDIRECT	NIL	
26	MUNYAMUTHU	60/M	66171	(R) DIRECT	NIL	
27	VELUMURUGAN	69/M	66107	(R) DIRECT	NIL	
28	PALANISAMY	54/M	55503	(R) DIRECT	NIL	
29	SELVARANI	32/F	51791	(L) INDIRECT	NIL	
30	MANICHAM	42/M	41804	(L) INDIRECT	NIL	
31	BALASUBRAMANIAM	35/M	53296	(R) INDIRECT	NIL	
32	KARTHIKEYAN	45/M	65226	(R) INDIRECT	NIL	
33	MANSUR	33/M	25333	(L) INDIRECT	NIL	
34	KALIMUTHU	49/M	27641	(R) INDIRECT	NIL	
35	LAKSHMANAN	43/M	27626	(R) INDIRECT	NIL	
36	PONNUSAMY	65/M	37669	(R) DIRECT	NIL	
37	THANGAMUTHU	44/M	37667	(R) INDIRECT	NIL	
38	PETER	75/M	40339	(R) DIRECT	NIL	
39	MARUTHACHALAM	39/M	45841	(L) INDIRECT	NIL	
40	SATHAPPAN	37/M	53061	(L) INDIRECT	NIL	

41	**DEVARAJ**	**40/M**	**53063**	**(R) INDIRECT**	**NIL**	
42	**UDAYARAJ**	**33/M**	**41052**	**(R) INDIRECT**	**NIL**	
43	**KARTHIKEYAN**	**53/M**	**40072**	**(R) DIRECT**	**NIL**	
44	**MANICHAM**	**37/M**	**41221**	**(R) INDIRECT**	**NIL**	
45	**PALANISAMY**	**48/M**	**41814**	**(L) DIRECT**	**NIL**	
46	**RAJENDRAN**	**34/M**	**43144**	**(L) INDIRECT**	**NIL**	
47	**BADRUDEEN**	**39/M**	**48294**	**(L) INDIRECT**	**NIL**	
48	**PERUMAL**	**39/M**	**48470**	**(L) INDIRECT**	**NIL**	
49	**RAJENDRAN**	**48/M**	**48222**	**(R) DIRECT**	**NIL**	
50	**JOHN**	**59/M**	**52032**	**(R) DIRECT**	**NIL**	
51	**KARUPPASAMY**	**48/M**	**52593**	**(R) DIRECT**	**NIL**	
52	**FASEED**	**65/M**	**55558**	**(L) DIRECT**	**NIL**	
53	**PERUMAL**	**58/M**	**63211**	**(R) INDIRECT**	**NIL**	
54	**RAVI**	**31/M**	**54230**	**(L) INDIRECT**	**NIL**	
55	**SIVAKUMAR**	**66/M**	**60233**	**(L) DIRECT**	**NIL**	
56	**KARUPASSAMY**	**31/M**	**47064**	**(L) INDIRECT**	**NIL**	
57	**VEERAPPAN**	**38/M**	**47016**	**(R) INDIRECT**	**NIL**	

GROUP B MULTIPLE DOSE						
S.NO	**NAME**	**AGE/SEX**	**IP NO**	**TYPE OF INGUINAL HERNIA**	**SSI**	**ORGANISM**
1	**GANESAN**	**63/M**	**45967**	**(R) DIRECT**	**NIL**	
2	**KUPPUSAMY**	**37/M**	**50982**	**(L) INDIRECT**	**NIL**	
3	**CHANDRAN**	**43/M**	**50996**	**(L) INDIRECT**	**NIL**	
4	**BALAKRISHNAN**	**30/M**	**50976**	**(R) INDIRECT**	**NIL**	
5	**NATARAJAN**	**48/M**	**52448**	**(L) INDIRECT**	**NIL**	
6	**VIMAL**	**34/M**	**53847**	**(R) INDIRECT**	**NIL**	
7	**CHINNASAMY**	**68/M**	**56711**	**(L) DIRECT**	**NIL**	
8	**RAJAN**	**48/M**	**66876**	**(R) INDIRECT**	**PRESENT**	**E.COLI**
9	**VENKATACHALAM**	**65/M**	**58417**	**(L) DIRECT**	**NIL**	
10	**KANDASAMY**	**49/M**	**58401**	**(R) INDIRECT**	**NIL**	
11	**CHINNASAMY**	**56/M**	**59107**	**(L) DIRECT**	**NIL**	
12	**MUNIYAPPAN**	**51/M**	**66222**	**(R) DIRECT**	**NIL**	
13	**RAMASAMY**	**65/M**	**69154**	**(L) DIRECT**	**NIL**	
14	**KASI VISHWANATHAN**	**45/M**	**69391**	**(L) INDIRECT**	**NIL**	
15	**RAJAKADHAM**	**65/M**	**55291**	**(R) DIRECT**	**NIL**	
16	**NAGARAJAN**	**65/M**	**36928**	**(R) DIRECT**	**PRESENT**	**S. AUREUS**
17	**NELLAMEGAM**	**42/M**	**69651**	**(L) INDIRECT**	**NIL**	
18	**JAGADEESAN**	**39/M**	**51144**	**(L) INDIRECT**	**NIL**	
19	**SANTHOSH**	**38/M**	**60182**	**(R) INDIRECT**	**NIL**	
20	**VELUSAMY**	**55/M**	**53211**	**(R) DIRECT**	**NIL**	
21	**AYAARU**	**56/M**	**51729**	**(L) DIRECT**	**NIL**	

22	**DORAIRAJ**	**38/M**	**21420**	**(R) INDIRECT**	**NIL**	
23	**PALANIVEL**	**39/M**	**22779**	**(R) INDIRECT**	**NIL**	
24	**MUTHAIYAA**	**57/M**	**24151**	**(R) DIRECT**	**NIL**	
25	**NANJAPPAN**	**77/M**	**24627**	**(L) DIRECT**	**NIL**	
26	**KARTHIKEYAN**	**33/M**	**27043**	**(R) INDIRECT**	**NIL**	
27	**YUNNI**	**64/M**	**27076**	**(L) DIRECT**	**NIL**	
28	**KITTAN**	**60/M**	**29860**	**(R) DIRECT**	**NIL**	
29	**MARIMUTHU**	**56/M**	**52821**	**(L) DIRECT**	**NIL**	
30	**VELUSAMY**	**53/M**	**36596**	**(R) DIRECT**	**NIL**	
31	**NATARAJAN**	**70/M**	**60621**	**(L) DIRECT**	**PRESENT**	
32	**MANICKAM**	**32/M**	**35598**	**(R) INDIRECT**	**NIL**	
33	**NACHIMUTHU**	**65/M**	**53241**	**(L) DIRECT**	**NIL**	
34	**PALANI**	**80/M**	**35556**	**(R) DIRECT**	**NIL**	
35	**SUBRAMANI**	**46/M**	**33328**	**(R) INDIRECT**	**NIL**	
36	**SHANMUGAM**	**45/M**	**39972**	**(L) INDIRECT**	**NIL**	
37	**THANGARAJ**	**52/M**	**41239**	**(R) DIRECT**	**NIL**	
38	**PRASANTH**	**31/M**	**41281**	**(R) INDIRECT**	**NIL**	
39	**KARUPUSAMY**	**50/M**	**38557**	**(L) DIRECT**	**NIL**	
40	**ARUMUGAM**	**60/M**	**41246**	**(R) DIRECT**	**NIL**	
41	**PALANISAMY**	**75/M**	**41254**	**(L) DIRECT**	**NIL**	
42	**MARIMUTHU**	**65/M**	**56421**	**(L) DIRECT**	**PRESENT**	
43	**VADIVEL**	**34/M**	**69761**	**(R) DIRECT**	**NIL**	
44	**DEVARAJ**	**39/M**	**69901**	**(R) INDIRECT**	**NIL**	
45	**RAMASAMY**	**54/M**	**56602**	**(L) DIRECT**	**NIL**	
46	**ASARAF**	**38/M**	**67004**	**(R) INDIRECT**	**NIL**	
48	**MUNUSAMY**	**37/M**	**58216**	**(R) INDIRECT**	**NIL**	
49	**MYILSAMY**	**55/M**	**51124**	**(R) DIRECT**	**NIL**	
50	**MARIYAPPAN**	**60/M**	**51472**	**(R) DIRECT**	**NIL**	
51	**SARANANGAM**	**33/M**	**63421**	**(L) INDIRECT**	**NIL**	
52	**MANI**	**63/M**	**51762**	**(R) DIRECT**	**NIL**	
53	**MURUGAVEL**	**43/M**	**62738**	**(R) INDIRECT**	**NIL**	
54	**SUNDARAM**	**55/M**	**62017**	**(R) DIRECT**	**NIL**	
55	**ALLIE**	**72/M**	**61170**	**(L) DIRECT**	**NIL**	
56	**SHANMUGAM**	**63/M**	**52921**	**(R) DIRECT**	**NIL**	
57	**SWAMINATHAN**	**56/M**	**43281**	**(L) INDIRECT**	**NIL**	
58	**SURYA**	**31/M**	**63281**	**(R) INDIRECT**	**NIL**	