ONE YEAR RANDOMIZED CONTROL TRIAL COMPARING THE EFFICACY OF DIATHERMY INCISION VERSUS SCALPEL INCISION OVER SKIN IN PATIENTS UNDERGOING INGUINAL HERNIA REPAIR IN KLES DR.PRABHAKAR KORE HOSPITAL BELGAUM.

Submitted by

DR. SHIVAGOUDA PATIL

Dissertation

Submitted to the

K L E University. BELGAUM.

In partial fulfillment of the requirements for the award of the degree of

M.S IN GENERAL SURGERY

Under the Guidance of :

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LIST OF ABBREVATIONS

AC-Alternate Current

Cm – Centimeter

CW-Continuous Wave

DC-Direct Current

DF- Degrees of freedom

EC- Electrocautery

i.e- that is

h/o- History of

KLES – Karnataka Lingayat Education Society

MF-Medium Frequency

No – Number

OOK- On and Off Keys

pod – Post operative day

PR- Pulse Rate

BP- Blood Pressure

SC- Scalpel

Sec – Second

t - student's t test

Vol – Volume

X2- Chi square test

ABSTRACT

Background:

Electrocautery in surgery is widely used except for the skin incision s ,this is because of fear of scarring of tissues ,post operative pain, and wound infection in view of devitelisation of tissues. This study compares the scalpel incisions with electrocautery incision over skin in patients undergoing hernia repair.

Materials And Methods:

In this study prospective randomized study 60 patients undergoing mesh repair for inguinal hernia are divided in to two groups . in Group A skin incision is taken with electrocautery, and in Group B incision is taken with scalpel. Postoperative pain , wound complication and requirement of analgesic are compared between the two groups. The results are finally analyzed and compared for the two groups using Mann-Whitney U Test

Results:

The two groups did not differ in relation to post operative pain . Post operative analgesic requirement are similar in two groups and post operative complications seroma, hematoma ,purulent collection are comparable in two groups.

Conclusion:

Although results are comparable in two groups ,electrocautery can be safely used in making skin incisions as results are comparable in two groups .We recommend further broad study of electrocautery usage in other surgical procedure and its further evaluation

Key words: electrocautery, scalpel, skin incision.

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INTRODUCTION

Incision is a cut or slit to gain access to underlying structures[1] . Cauterization is a medical term describing burning of body to remove or close a part of it. Electrocautery is used increasingly for tissue dissection, although fears of excessive scarring and poor wound healing have curtailed its widespread use for skin incision. Traditionally incisions are made with stainless steel scalpel . These incisions are supposed to be more bloody and painful . To overcome this problem many advanced techniques have come viz, , laser and cavitron electron surgical aspirator but the cost of above said methods are costly and relative unavailability of instruments in peripheries.

Electrocautery which is available in all surgical theaters is less frequently used for skin incisions for the fear of tissue damage, fear of post operative pain and scarring

Recent advances and studies have shown that electrocautery can be used for skin incision without any postoperative complications like wound infection and scarring and less post operative pain[2-6] .

This study is undertaken to alleviate the fear of using electrocautery for skin incisions in surgical community.

AIM AND OBJECTIVES

PRIMERYOBJECTIVE :

To evaluate and compare the post operative pain in electrocautery incision and scalpel incision over skin in patients undergoing hernia repair. .

SECONDERYOBJECTIVE :

To calculate percentage of post operative complication in two different type incision.

REVIEW OF LITERATURE

HISTORICAL ASPECTS

The development of the first commercial electrosurgical device is credited to Dr. William T. Bovie, who developed the device during the period of 1914 to 1927 while employed at Harvard University[7,8]. The first use of an electrosurgical generator in an operating room occurred on October 1, 1926. The surgery was performed by Dr. Harvey Williams Cushing.

Special medical instruments called **cauters** were used to cauterize arteries. These were first described by Abu al-Qasim al-Zahrawi (Abulcasis) in his *Kitab al-Tasrif*[9]**.**

Etymology

The verb to cauterize; known in English since 1541; from Medieval French cauterizer; from Late Latin *cauterizare* "to burn or brand with a hot iron"; itself from Greek *kauteriazein*; from *kauter* "burning or branding iron"; from *kaiein* "to burn."

ELECTROCAUTERY

Electricity generates heat

Electrosurgery works in the same manner as the heating coil in an electric toaster or hairdryer. Applying a voltage causes current flow which in turn causes the material (the heating coil in the case of the toaster, or the tissue in the case of electrosurgery) to rise in temperature.

To perform electrosurgery, a voltage source is applied across the tissue, which causes an electrical current to flow. The voltage source and tissue form a simple electrical circuit, with the tissue acting as a resistor. The resistance of the tissue determines the current flow:

$$I = \frac{V}{R}$$

This relationship is known as Ohm's law. Current flowing through a resistor causes the generation of heat. This heat is generated in the tissue itself, and the heat is the destructive power that causes the tissue damage. In other words, the resistance of the tissue converts the electrical energy of the voltage source into heat (thermal energy) which causes the tissue temperature to rise:

Heat produced = Electrical energy expended.

The electrical power (energy per time) expended and can be calculated using:

$$P = I \cdot V = I^2 \cdot R = \frac{V^2}{R}$$

where P represents the electrical power, typically measured in watts. This result also gives the heat production rate (heat produced per unit time)[10].

Why doesn't the electrode heat up? The answer to this question is that the resistance of the metal electrode and metal wire is so much smaller than that of the tissue that very little power is expended inside the metal conductors. The same principle explains why a toaster gets exceedingly hot, but (thankfully) the power cord and the wires in the wall do not heat appreciably.

The voltage source used in electrosurgery is a specialized electronic instrument. It is sometimes referred to as an *electrosurgical generator*.

Temperature rise and current density

The change in temperature that an object experiences when heated is inversely proportional to its heat capacity; the heat needed is proportional to the mass of the object. Considering two objects of the same material but of different sizes, a larger amount of heat is required to increase the temperature of the larger of the two objects by (for example) one degree. Moreover, when heat is added to a small region of an object, the temperature of that localized region will rise much higher than when the heat is evenly dispersed over the entire object[10].

Current density is a measure of the concentration of electrical current. A higher current density results in a higher concentration of heat generation. By this result and those of the previous paragraph, the local temperature in a piece of tissue will rise in proportion to the current density in that region.

Frequency of the electricity

A steady electrical current is referred to as DC current or 0 Hz. A varying current is referred to as AC current and consists of waves of one or more frequency (greater than 0 Hz).

The human nervous system is very sensitive to low-frequency (0 Hz to about 1000 Hz) electricity, due to the fact that the nervous system is in itself a complex web of electrical circuits. Application of low-frequency electricity stimulates the nervous system. At even low currents low-frequency electricity causes electric shock which may involve acute pain, muscle spasms, and/or cardiac arrest. The sensitivity of the nervous system to electricity decreases with

increasing frequency. At frequencies above 100 kHz, electricity does not stimulate the nervous system.

To avoid electric shock, electrosurgical equipment operates in the frequency range of 200 kHz to 5 MHz. This region of the frequency spectrum corresponds roughly to that of the Medium Frequency (MF) band where AM radio stations can be found. However, electrosurgery does NOT use propagating radio waves; electrosurgery uses an electrical circuit that comprises the voltage source and the tissue that it is applied to, as explained above[11].

Common Electrosurgical modalities:

Monopolar and Bipolar[12,13]

There are two commonly used *electrosurgical modalities* or circuit topologies: *monopolar* and *bipolar*. The *bipolar modality* is used less often, but is easier to explain. Voltage is applied to the patient using a special forceps, with one tine connected to one pole of the A.C. voltage source and the other tine connected to the other pole of the voltage source. When a piece of tissue is held by the forceps, a high frequency electrical current flows from one to the other forceps tine, through the intervening tissue. The direction of this current alternates at high frequencies, but heating takes place no matter which direction the current flows. In this manner, the intervening tissue is heated.

In the *monopolar modality* the patient lies on top of the *return electrode*, a relatively large metal plate or a relatively large flexible metalized plastic pad which is connected to the other electrode of the A.C. current source. The surgeon uses a single, pointed, probe to make contact with the tissue. The electrical current flows from the probe tip, through the body and then to the return electrode, from which it flows back to the electrosurgical generator. It might seem that the monopolar modality would cause heating of the entire body cavity. However, the heating

is actually very precisely confined to the tissue that is near the probe tip. This results from the fact that the current rapidly spreads out laterally as it enters the body, causing a dramatic decrease in the current density. Because the current density is much greater near the tip than it is in the interior of the body, or at the large surface return electrode, the heating occurs in a very localized region, only near the probe tip.

On an extremity such as a finger or penis, however, there is limited crosssectional area for the return current to spread across, resulting in high current density and heating throughout the volume of the extremity. For this reason **monopolar** electrocautery must not be used for circumcision.

Prevention of unintended burns in anesthetized patients

For high power surgical uses during anesthesia the *monopolar modality* relies on a good electrical contact between a large area of the body (typically at least the entire back of the patient) and the return electrode. If such a contact is not made, severe burns (3rd degree) can occur in unintended areas on the patients skin and beneath the skin.

To prevent unintended burns, the skin should be clean and dry and a conductive jelly should be used to enhance contact. Proper electrical grounding practices must be followed in the electrical wiring of the building. It is also recommended to use a newer electrosurgical unit that includes alarms for ground circuit interruption[14].

Electrosurgery should only be performed by a physician who has received specific training in this field and who is familiar with the techniques used to prevent burns.

Electrosurgical waveforms

Different waveforms can be used for different electrosurgical procedures. For cutting, a continuous single frequency sine wave is generated. This produces rapid heating. At the cellular level, rapid heating causes tissue cells to boil and burst. At a larger scale, the ruptured cells create a fine tear in the tissue, creating a clean incision.

For coagulation, the sine wave is turned on and off in rapid succession. The overall effect is a slower heating process, which causes cells to coagulate. The proportion of on time to off time can be varied to allow control of the heating rate. A related parameter, duty cycle, is defined as the ratio of the on time to the period (the time of a single on-off cycle)[14].

In the terminology of electrical engineering, this process of altering a sinewave is called modulation. More specifically, it is referred to as a continuous wave (CW) modulation or on-off keying (OOK).

Figure 1. Electrocautery machine

Figure 2 Electrocautery scalpel

Figure 3: Scalpel

Scalpel

A scalpel is extremely sharp knife used for surgery, anatomical dissection. Scalpels may be disposable or re-usable. Re-usable scalpels can have attached, resharpenable blades or, more commonly, non-attached, replaceable blades. Disposable scalpels usually have a plastic handle with an extensible blade (like a utility knife) and are used once, then the entire instrument discarded.

Scalpel blades are usually of hardened and tempered steel. Medical blades are made of 440c stainless steel, while craft blades can be made of high carbon steel; in addition, titanium, ceramic, diamond and even obsidian knives are not uncommon. For example, when performing surgery under MRI guidance, metallic blades are unusable (the steel blades would be drawn to the magnets) or may cause image artifacts. Alternatives to scalpels in surgical applications include electrocautery and lasers.

Surgical scalpels consist of two parts, a blade and a handle. The handles are reusable, with the blades being replaceable . Medical scalpel handles come in two basic types. The first is a flat handle used in the #3 and #4 handles. The #7 handle is more like a long writing pen, rounded at the front and flat at the back. A #4 handle is larger than a #3, and while some blades fit both others are too large or small and can only fit one or the other

THE LENGTH AND DIRECTION OF THE INCISION —

A properly planned incision is sufficiently long to afford sufficient optimum exposure. When deciding upon the direction of the incision, the surgeon must bear the following in mind:

- The direction in which wounds naturally heal is from side-toside, not end-to-end.
- The arrangement of tissue fibers in the area to be dissected will vary with tissue type.

- The best cosmetic results may be achieved when incisions are made parallel to the direction of the tissue fibers. Results may vary depending upon the tissue layer involved.

DISSECTION TECHNIQUE

When incising tissue, a clean incision should be made through the skin with one stroke of evenly applied pressure on the scalpel. Sharp dissection should be used to cut through remaining tissues. The surgeon must preserve the integrity of as many of the underlying nerves, blood vessels, and muscles as possible.

TISSUE HANDLING —

Keeping tissue trauma to a minimum promotes faster healing. Throughout the operative procedure, the surgeon must handle all tissues very gently and as little as possible. Retractors should be placed with care to avoid excessive pressure, since tension can cause serious complications: impaired blood and lymph flow, altering of the local physiological state of the wound, and predisposition to microbial colonization.

HEMOSTASIS — Various mechanical, thermal, and chemical methods are available to decrease the flow of blood and fluid into the wound site.

Hemostasis allows the surgeon to work in as clear a field as possible with greater accuracy. Without adequate control, bleeding from transected or penetrated vessels or diffused oozing on large denuded surfaces may interfere with the surgeon's view of underlying structures. Achieving complete hemostasis before wound closure also will prevent formation of postoperative hematomas. Collections of blood (hematomas) or fluid (seromas) in the incision can prevent the direct apposition of tissue needed for complete union of wound edges. Furthermore, these collections provide an ideal culture medium for microbial growth and can lead to serious infection. When clamping or

ligating a vessel or tissue, care must be taken to avoid excessive tissue damage. Mass ligation that involves large areas of tissue may produce necrosis, or tissue death, and prolong healing time.

ANATOMY OF GROIN

The groin or inguinal region is a transitional area in which the thigh and the abdomen are joined.[15,16]

The pelvic skeleton

The pelvic bones include the iliac bones, pubic bones and ischial bones which with sacrum forms a complete circle. These pelvic bones attached to the lumbar vertebral column via sacrum at approximately 60^0

Superficial fascia of anterior abdominal wall

The superficial fascia above umbilicus is single layer and contains fat. Below umbilicus, it divided into

1) Superficial fatty layer (fascia of Camper).
2) Deep membranous layer (fascia of Scarpa) which is continuous below with Colle's fasica and above umbilicus it merges with fatty layer.

The Fasciae contain -

(a) Variable quantity of fat

(b) Cutaneous nerves

(c) Cutaneous vessels

(d) Superficial lymphatics

Cutaneous nerves of anterior abdominal wall

1) Lower six thoracic nerves
2) First lumber nerve (iliohypogastric)
3) Ilioinguinal nerve

Cutaneous arteries

1) Anterior cutaneous arteries, branches of superior and inferior epigastric arteries
2) Lateral cutaneous arteries, branches of lower intercostal arteries
3) Superficial inguinal arteries which supply lower abdomen,
    a) Superficial epigastric artery
    b) Superficial external pudendal artery
    c) Superficial circumflex iliac artery

Cutaneous veins:

These veins accompany the arteries and the superficial inguinal veins drain into great saphenous vein.

Lymphatics

Lymphatics above the umbilicus, drain into the axillary lymph nodes and those below the umbilicus, drain into the superficial inguinal lymph nodes.

Anterior abdominal wall musculature

The muscle bundles and fibrous tissues are arranged in layers and each muscle is covered by fascia. The flat lateral abdominal muscles are inserted via a laminated aponeurotic sheet which further enhances integrity of abdominal wall. These laminae contribute to rectus sheath. Ultimately, it inserts in the midline, thereby forming the linea alba.

Muscles

(1) External oblique muscle

(2) Internal oblique muscle

(3) Transverse abdominis

(4) Rectus Abdominis

(5) Cremaster muscle

(6) Pyramidalis muscle

Ligaments and Fasciae

I. Inguinal Ligament -

Formed by lower border of the external oblique aponeurosis, is thickened and folded backward on itself which extends from anterior superior iliac spine to pubic tubercle. The lateral half is rounded and oblique, medial half is grooved upward and horizontal.

Extensions form:

1) Lacunar ligament

2) Ligament of Cooper

3) Lateral crus of superficial inguinal ring

II. Fascia Transversalis

It lines the inner surface of transverses abdominis and separates the anterior abdominal muscles from the peritoneum

Consists of 2 laminae:

1) Posterior Lamina

2) Anterior Lamina

Rectus Sheath

This is an aponeurotic sheath covering the rectus abdominis muscle. It has 2 walls, anterior and posterior.

a) Above the costal margin

Anterior wall –- External oblique aponeurosis

Posterior wall – Deficient, rectus rest directly on costal cartilage

b) Between costal margins and the arcuate line

Anterior wall – Aponeurosis of external oblique

Anterior lamina of the aponeurosis of internal oblique

Posterior wall – Posterior lamina of the aponeurosis of internal oblique

Aponeurosis of transverses muscle

c) Below the arcuate line (semilunar line of Dogulas)

Anterior wall – Aponeurosis of all the three flat muscles of abdomen

Posterior wall – Deficient, rectus rests on fascia transversalis

Contents of rectus health

(A) Muscles –-

1) Rectus abdominis

2) Pyramidalis muscle

(B) Arteries –

1) Superior epigastric artery

2) Inferior epigastric artery

(C) Vein –

1) Superior epigastric vein

2) Inferior epigastric vein

(D) Nerves – Terminal parts of lower six thoracic nerves.

INGUINAL CANAL

This is an oblique passage in the lower part of the anterior abdominal wall situated just above the medial half of inguinal ligament. It is about 4 cm (1.5 inches) long and is directed downwards, forwards and medially which extends from the deep inguinal ring to superficial inguinal ring.

Deep inguinal ring is an oval opening in the fascia transversalis situated half an inch (1.5 cms) above the midinguinal point.

Superficial inguinal ring is a triangular gap in the external oblique aponeurosis. It is shaped like an obtuse angled triangle. The base of triangle is formed by pubic crest. The two sides of the triangle forms lateral and medial margins of the opening. At and beyond the apex of the triangle the two crura unite by intercrural fibres.

Boundaries

A) Anterior wall – formed by

In its whole extent by - (1) skin (2) superficial fascia (3) external oblique aponeurosis

In its lateral 1/3 by - fleshy fibers of the internal oblique muscle.

B) Posterior wall – formed by

In its whole extent by - (1) The fascia transversalis (2) extra peritoneal tissue (3) The parietal peritoneum.

In its medial 2/3 by - conjoint tendon and reflected part of inguinal ligament

In its lateral 1/3 by - the interfoveolar ligament.

C) **Roof –** It is formed by the arched fibers of the internal oblique and transverus abdominis muscle.

D) **Floor –** It is formed by the grooved upper surface of the inguinal ligament and medial end by the lacunar ligament.

Structures passing through the canal

1) The spermatic cord in males or round ligament of uterus in females enters the inguinal canal through deep inguinal ring and passes out through superficial inguinal ring.

2) The ilioinguinal nerve enters the canal through the interval between external and internal oblique muscles and passes through superficial inguinal ring.

Constituents of spermatic cord

1) The ductus deferens

2) The testicular arteries, cremasteric arteries and artery of the ductus deferens

3) The pampiniform plexus of veins

4) The genital branch of genitofemoral nerve

5) The plexuses of sympathetic nerves around artery to Ductus deferens

6) Remnants of processus vaginalis

Coverings of spermatic cord

From within outwards –

1) Internal spermatic fascia derived from fascia transversalis and it covers the cord in its whole extent.

2) The cremasteric fascia consists of the muscle loops of cremasteric muscle and the intervening areolar tissue. It is made up of internal oblique and transverses abdominis muscles and covers the cord below the level of these muscles.

3) The external spermatic fascia is derived from external oblique aponeurosis and covers the cord below the superficial inguinal ring.

Hesselbach's triangle - It is a weak spot in the anterior abdominal wall through which the direct inguinal hernia protrudes. It is bounded

1) Medially by outer border of rectus abdominis muscle

2) Laterally by inferior epigastric vessels

3) Inferiorly by medial part of inguinal ligament.

The floor of this triangle is formed by fascia transversalis. This triangle is bisected by median umbilical fold which is formed by obliterated umbilical artery.

HERNIOPLASY

Earlier in the 1960, techniques using biocompatible meshes were introduced. Later in the1980's and 1990's amazing spread of prosthetic methodologies took place and in 1984 Lichtenstein introduced tension free hernioplasty.

It is herniotomy and reinforced repair of post wall of the inguinal canal by filling the gap between the conjoined tendon and inguinal ligament by either autogenous material or heterogeneous material.

Indications of hernioplasty-

(1) Cases of indirect hernia – in patients with poor muscle tone

(2) All cases of direct hernias

(3) All cases of recurrent hernias

(4) Patient who do strenuous jobs or suffering from chronic bronchitis, enlarged prostate etc

(1) LICHTENSTEIN TENSION – FREE HERNIOPLASTY

A 5cm skin incision which starts from the pubic tubercle and extends laterally within Langer's line is made. External oblique aponeurosis is opened and its lower leaf freed from spermatic cord and upper leaf from underlying internal oblique muscle. The cord with its cremasteric covering is separated from the floor of inguinal canal and pubic bone.[17.] Cremasteric sheath is incised longitudinally and indirect hernial sac is freed from the cord to a point beyond the neck of sac and inverted into the abdomen. In complete

nonsliding scrotal hernia, the sac is transected at the midpoint of the canal leaving the distal section in place and anterior wall of distal sac is incised to prevent postoperative hydrocele. In case of direct hernias, the large sacs are inverted with absorbable suture.A thorough exploration of groin is necessary to rule out co- existing femoral hernia.

A sheet of 6 x 11 cm of mesh[17] is used. The medial end of the mesh is cut to the shape of the medial corner of inguinal canal with the cord retracted upwards, the rounded corner is sutured with nonabsorble monofilamented suture material to the anterior rectus sheath above the public bone and overlapping the rectus sheath by 1 to 1.5 cm. This is a crucial step in the repair, because failure to cover this bone with the mesh can result in recurrence. This suture is continued to attach the lower edge of the mesh to the inguinal ligament up to a point just lateral to internal ring. If there is a concurrent femoral hernia, the mesh is also sutured to Cooper's ligament 1 to 2 cm below its suture line with the inguinal ligament to close the femoral ring. A slit is made at the lateral end of the mesh, creating two tails, a wide (2/3) one above and a narrower (1/3) below. The upper wide tail is grasped with hemostat and passed underneath the spermatic cord, this positions the cord between two tails of the mesh. The wider upper tail is crossed and placed over the narrower one and held with hemostat and sutured to the inguinal ligament lateral to the deep ring. The upper edge of the patch is sutured in place with two interrupted abosorbable suture, one to rectus sheath and other to the internal oblique aponurosis just medial to the internal ring.Upward retraction of upper leaf of external oblique during this phase of repair is important because it results in the appropriate amount of laxity in giving a dome like configuration for the patch when the retraction is released. This laxity assures a true tension free repair.

Using a single nonabsorbable monofilament suture the lower edges of each of the two tails are fixed to inguinal ligament just lateral to completion knot of the lower running suture. This creates new internal ring made of mesh and maintains normal integrity of internal ring. The excess mesh on lateral side is trimmed, leaving at least, 5cm beyond the internal ring. This is tucked underneath the external oblique aponeurosis which is then closed over the cord with an absorbable suture.

COMPLICATIONS OF INGUINAL HERNIA REPAIR

(I) Wound infection in hernia repair

Bacterias commonly involved are – Staphylococcus auras

Staphylococcus Epidermidis[18]

Group A streptococcus[19]

E-coli[20]

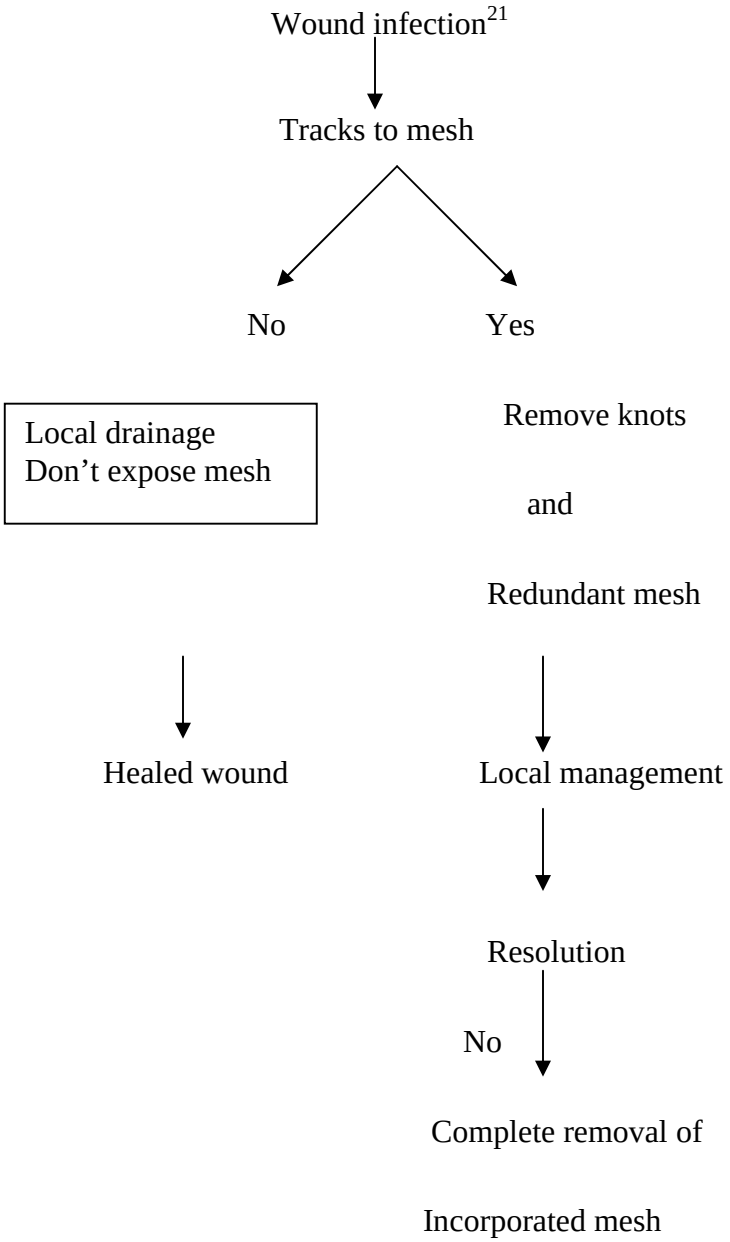
Clinical presentation– Fever, pain and signs of inflammation around infected area.

Treatment –

1) If a localized area of infection- drainage of pus

2) If extensive area of infection- requires opening of wound / debridement with antibiotics depending on culture sensitivity

3) If case of infected mesh-



(II) Cord and testicular complications

1) Hydrocele

2) Hematocele

3) Complications involving vas deference

(a) Dysejaculation syndrome

(b) Transsection of vas

4) Nerve injuries - Commonly genitofemoral and ilioinguinal nerve involved.

5) Damage to blood vessels of testicles

6) Ischemic orchitis and testicular atrophy

7) Testicular pain

8) Infertility

(III) Chronic pain after inguinal herniorrhaphy - classified as

(a) Nociceptive

1) Somatic

2) Visceral dysejaculation

(b) Neuropathic

1) Neuroma pain 2) Projected pain

Historical Review of studies on electrocautery:

Several studies are under taken to compare electrocautery incision with scalpel incision. Brief revive of studies are mentioned below.

Study in department of general surgery Sher E Kehir institute of medical sciences Srinagar[2]. ,it was a prospective study , 240 female patients undergoing cholecystectomy were randomized in to two groups A and B , Group A skin incision with scalpel and in Group B skin incision with electrocautery , following variables were observed ,

Comparison of pain score after 24 hrs of surgery

Pain score	Group A	Group B
	N -120 (%)	N -120 (%)
0 absent	2(16)	17(14.1)
1 mild	60(50)	92(76.6)
2 moderate	43 (35.8)	10(8.3)
3 severe	15(12.5)	1(0.8)
Mean (SD)	1.59(0..7)	0.96(0.51)

Results of pain assessment at 24 hr post surgery shows significantly less pain was appreciated in group B , total mean analgesic injections required were 3.09

COMPARISION OF WOUND COMPLICATION

Complication	Group A	Group B	P value
Hematoma	14 (11.6)	3 (2.5)	>0.5
Seroma	16 (13.3)	5(4.1)	>0.5
Sepsis	3(2.5)	4(3.3)	>0.5

Wound hematoma and seroma are more in group A but difference is not statistically significant

No cases of wound disruption after 6 weeks were observed

In this study they have concluded that electrosurgical incision are quite safe and significantly less painful and produce cosmetically better scar .they recommends wider use of electrocautery and further evaluation of study .

Study in Royal College of surgeon Ireland , by S.R.Kerans et al [3] , they studied diathermy verses scalpel incion in patients undergoing midline laparotomy incision , analysed

Patient demographs

	Scalpel	Diathermy
No of patients	50	50
Mean age	61(15-84)	60(32- 85)
Sex (M:F)	27:23	27:23

Peoperative demography

	Scalpel	Diathermy	P
Incision (sec)	509	4 69	0.36
Wound (mm)	78.8	86.4	0.3
Blood loss (ml)	105.5	64.4	0.003
Incision time(sec/m2)	7.5(0.5)	6.1(0,4)	0.04

Post operative pain

	scalpel		diathermy	
Pain score	Mean	median	mean	median
Day 1	2.7(0.1)		3(1-4)	2.3 2
Day 2	2.4 (0.1)		2.4(1-4)	2(0.1) 2
Day 3	1.9(0.1)		2(1-3)	1.6(1-3) 2
Day 4	1,4(0.1)		1(0-3)	1.3(0.1) 1
Day 5	1.2(0.1)		1(0-2)	1.1(0.1) 1

Wound complication

No significant difference in wound complication

In conclusion they mentioned , incision with diathermy is faster , less blood loss , lower post operative pain , no significant difference in wound and post operative complication

Chyoss.E et al compared diathermy and scalpel incision in tension free inguinal hernioplasty at department of general surgery in university hospital Herakhion Greece [4]. Total 125 patients undergoing hernioplasty were randomized in to ether scalpel (n -60) or diathermy (n-57) groups , 8 had bilateral 5 of them allotted scalpel group and 3 to diathermy group.

Parameters measured included blood loss during skin incision , and underlying tissue dissection,post operative pain and requirement of analgesics , presence of wound dehiscence and wound infection i.e on day of discharge , on day of stapler removal and after 1 month.

Results are analysed and found that blood loss is minimal and amount did not differ between two groups, Diathermy group received less analgesics, no difference were noted in wound strength , infections are totally absent in both groups.

In conclusion they mentioned skin incision with diathermy is safe as the use of scalpel in terms of wound healing and reduces the analgesic requirements in post operative period..

B .Sheik et al , neuro surgery department king Faisal **university** Saudi Arabia [6],performed a study stating safety and efficacy of electrocautery incision for skin opening in neurosurgery. Total 177 patients for neurosurgical procedures have been performed using micro needle electrosurgical and steel scalpel incision.

Results of the study were stated that blood loss is less with electrocautery incision , only two patients had wound infection and dehiscence and all other had normal wound healing.

The study recommends use of electrocautery for neurosurgical procedures to incise skin whenever blood loss is expected .

P.N.Meka et al [22], compared the superiority of electrocautery over scalpel incision in various abdominal surgeries . study included 60 patients , age ranged from 15 to 60 years , patients are randomized in to two groups electrocautery group and scalpel group for a various abdominal incisions like flank incisions , kochers incision and midline incision . compared for blood loss , time taken , wound infection , and cosmetic appeal.

In the study they have found that less blood loss , less pain score , and less time for incision in electrocautery group . post operative wound infection were comparable in two groups . cosmetic appeal is superior in electrocautery group .

In conclusion they have stated that electrocautery incision are easily learned , highly effective technique and associated with lesser complications . Study recommends use of electrocautery incision over skin.

Franchi M et al , department of obstetrics and gynecology , university of Insubria [23],,Italy performed study on use of cold scalpel and electrocautery for midline abdominal incision .

In this study patient undergoing midline laparotomies for malignancy are divided in to two groups according to method used to perform abdominal midline incision with scalpel or diathermy TOTAL 964 patients are included in the study

531 scalpel group

433 electrocautery group

Univariate analysis done for analysis of results . higher incidence of wound complication in scalpel group , 8 of scalpel group and 1 from electrocautery group , but after adjusting confounding variables (age, BMI) no difference is found between two groups

In conclusion of study they state d that choice of incision is surgeon's preference since no difference between two groups

Stolz .A. J . et al performed study titled I s scalpel required for thoracotomy ? [24] , study was conducted at Motol ,Prana.

In this study total 73 patients are randomized in to two groups , scalpel group and electrocautery group , all wound complications are divided in to

Grade 1 – induration and erythema

Grade 2 - grade 1 and serous collection

Grade 3 – contaminated wound with purulent collection

Results are analyzed and found that two groups are similar in cases of early and late complications .

Author concluded that that choice of instrument is surgeons preference since no difference are found in present study .

Groot.G et al , department of surgery , university of Sasketelwen , Canada [25], conducted a prospective randomized blinded trial to determine weather electrocautery incision in abdomen and thorax increases the infection rates , study conducted for 15 months , 492 consecutively studied patients are randomized and placed in two groups .

Wound infection developed on 38 (15%) of 250 scalpel patients , and 30(12%) electrocautery patients. Study concluded that electrocautery use for skin incision does not increases the s infection rates ,so electrocautery can be used safely used for skin incision.

Study was conducted in dubin , Ireland , Keran's et al[26], diathermy verses scalpel incision for hemiarthroplasty a randomized prospective trial . aim of study was to study the traditional opening using scalpel to incise all layers with diathermy incision . 50 patients with fracture of femure are recruited prospectively , All patients received prophylactic antibiotics, intra operative parameters are measured. Like time taken to open wound , wound length and wound depth , wound related blood loss, total operative blood loss.

Result of the study showed operative blood loss is 30% of blood loss in scalpel group as compared to diathermy group where blood loss is 18.5 %. No infection and dehiscence in either group are noted..

Study reccomonds use of diathermy for hip hemiarthroplasty which reduses significant blood loss and incidence of post operative wound collection . routine uuse of diathermy to make inciosion around hip is effective in reducing wound related bleeding without adverse effect on wound healing and infection rate.

Kumagai.S .G . et al , department of surgery university medical center Tucson Arizona ,conducted study study stating effects of electrocautery on midline laparotomy wound infection[27].

In this study they compared the healing of midline fascial incisions made with either scalpel or electrocautery and inoculated with Escherichia coli in 57 Sprague-Dawley rats. At 7 days, tensile strength was significantly less when incisions were made with electrocautery than with a scalpel. Additionally, would strength was inversely related to the concentration of the inoculum of E coli. The use of electrocautery was also associated with more frequent bacteremia at 48 hours and higher mortality at 7 days. Their results suggested that the technique used to incise the abdominal fascia influences subsequent wound healing, particularly in contaminated wounds.

Experimental study was conducted on rats to study the effects of incision with scalpel and diathermy [28]. Objective of the study was to compare scalpel against electrocautery to create dermal incisions. In the study they measured skin color , gross appearance , elevation over dermis as well as inflammatory infiltrates , amount of fibroblast and collagen deposition after 6 weeks of creation of incision.

Results showed macroscopically indistinguishable in color, gross appearance and elevation over dermis. In regard histological evaluation there was no statistical difference between incisions created with scalpel or with electrocautery.

In conclusion: authors stated same wound result were obtained when incising rat's skin with scalpel or with electrocautery, after six weeks of observation. And electrocautery can be safely used for skin incision

A study was conducted in porcine model [5], comparing wound healing characteristics in electrocautery incisions at department of general surgery Charlotte North Carolina. .18 pigs are evaluated by creating skin incision over skin , intestine , uterus using electro cautery and scalpel blade. All incisions are re approximated with absorbable sutures. Incision sites are evaluated histologically at 3 ,7 and 14 days post incision according to randomization . Skin and small intestine are compared at 7 and 14 days for tensile strength.

Results of the study stated that no differences in tensile strength of two groups . Electrocautery showed decreased overall wound healing at 3. 7 and 14 days .

Study concluded that even though wound healing is delayed with electrosurgical group , but overall tensile strength of wound is unaffected

METHODOLOGY

Source of data :

60 cases undergoing hernia repair for inguinal hernia in KLES DR.PRABHAKAR KORE HOSPITAL, Belgaum over 1 year.

Method of Collection of Data:

Study Design:

Randomized control trial. Randomization done according to computerized randomization table with block length of 10x6

The observer will be blinded to the type of incision used and will give his observation based on the predefined criteria

Sample Size: 60 Cases

1) In 30 cases incision is taken with electrocautery over skin.
2) In 30 cases incision is taken with conventional scalpel

Sample size has been arrived based on pain score reduction in previous study [2], for pain score reduction of 30% , with p value of 0.05 and power of 80% at 24hrs , sample size will be 30 in each group to get significant results.

Duration: One year

Exlusion Criteria:-

1.comlecated inguinal hernia like irreducible hernia, obstructed hernia, strangulated hernia.

2.preoperative use of analgesics for > 3 days per week for >3 months.

3.Paediatric [<12 yrs] and geriatric [>50yrs]patients.

4.patients with chronic pain >3 months.

5.h/o drug or alcohol abuse 6.severe hepatic ,renal , cvs dysfunction.

7.diabetesmellitus. 8.ImmunocompromisedStatus.

OUTCOME -

1. Postoperative pain will be measured using pictorial visual analogue scale at 6, 12 and 24 hours. If pain score is >4 inj diclofinac 50 mg im will be given.

2. During post operative period (up to 7 days) complication are noted in hospital stay are measured by means of

Seroma-collection of serous discharge in suture site .

Hematoma-collection of blood clots

Purulent – collection of purulent discharge

STATIATICAL ANALYSIS-

The results are finally analyzed and compared for the two groups using Mann-Whitney U Test, and percentage of type of complication at incision site are measured.

METHOD-

After taking the informed consent, patients are randomized and divided in two groups A and B .

In Group A-Incision is taken with electro coutery needle using pulse sine wave current and power setting of 70 watts. Heamostasis will be achieved with forcef coagulation.

In Group B-Skin incision is taken with scalpel , bleeding controlled by forcef coagulation using pulse sine wave on power supply 30 watts.

All standardized incision will be medial 3/5 and 2.5 cms above and parallel to inguinal ligament All the procedures are carried under standardized spinal anesthetia.

Premedication is given ciprofloxacin 100 ml and metronidazole 100 ml ,two hour before procedure .

Closure of the abdominal layer are done with continuous proline for external aponeurosis, intermittent plane catgut for subcutaneous tissue and mattress suture with 2-0 silk for skin closure.

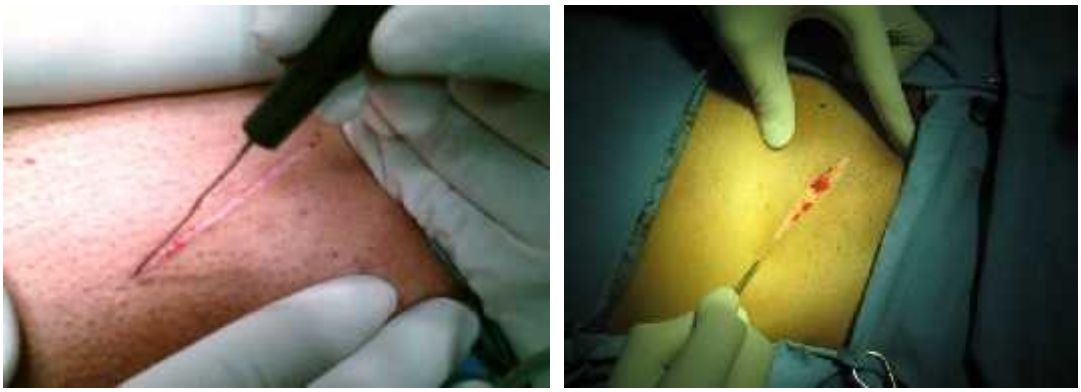


Figure 4: Incision with a]electrocautery b]scalpel

Figure 5 : Incion wound site a] electrocautery b] scalpel incision

Figure 6 : Suture site in a] electrocautery b] scalpel group

Figure 7 a

Figure 7 b

Figure 7 : Wound Complication with a] seroma and b] purulent collection

RESULTS

1.Patient Demographs

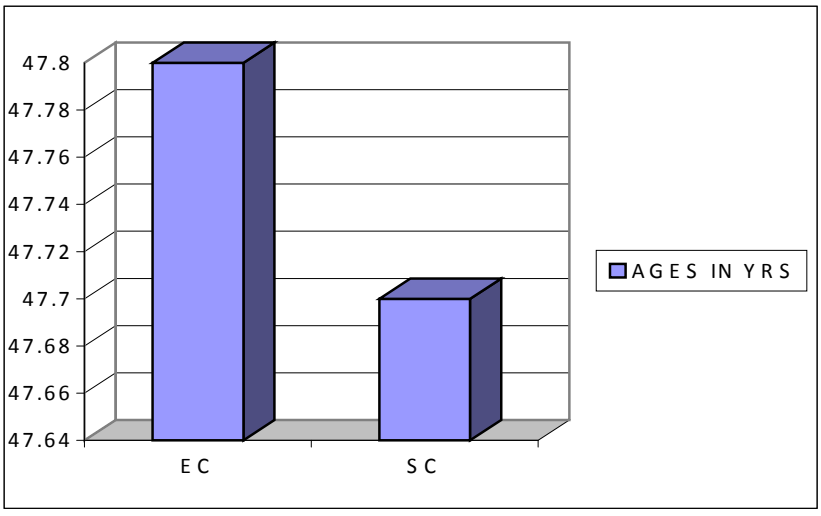
60 patients with inguinal hernia are randomized prospectively to either electrocautery group or scalpel group for skin incision . There were no significant demographic difference between two groups is noted [Table -1]. Mean age of patient in group A i.e electrocautery group is 47.8+_16.21 and in group B i.e scalpel group is 47.7+_ 13.95.

AGE (MEANïSD)

	EC	SC
Age in years	47.8±16.21	47.7±13.95

Table -1

t = 0.034 DF = 58 P = 0.97



Graph:1- Comparison Of Age Between Two Groups

2 Post operative pain.

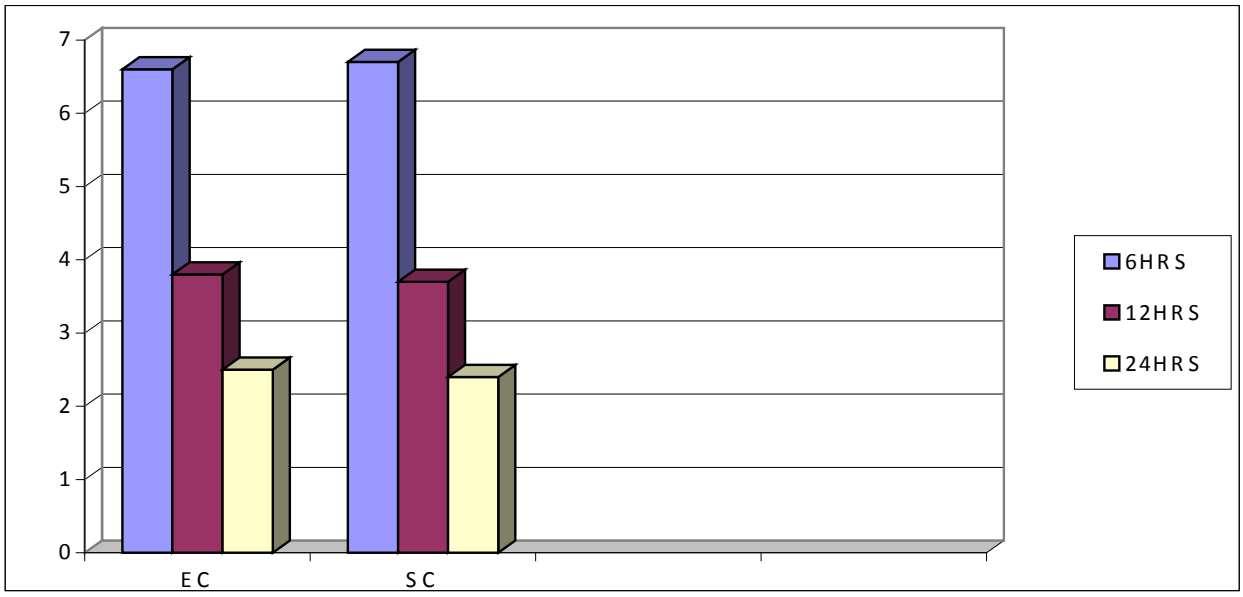
Post operative pain is assessed by visual analogue scale at 6 , 12 , 24 hrs after the surgery.

In our study results are analyzed with Mann Whitney U Test .results are shown in Table 2. There is no significant difference between two groups.

PAIN SCORE (MEANïSD)

Time	EC	SC	Mann-Whitney U test (Adjusted for ties)
6 hrs	6.6±0.81	6.7±0.53	P = 0.475
12 hrs	3.8±0.83	3.7±0.64	P = 0.556
24 hrs	2.5±0.86	2.4±0.51	P = 0.762

Table 2



Graph 2:- Comparison Of Pain Score

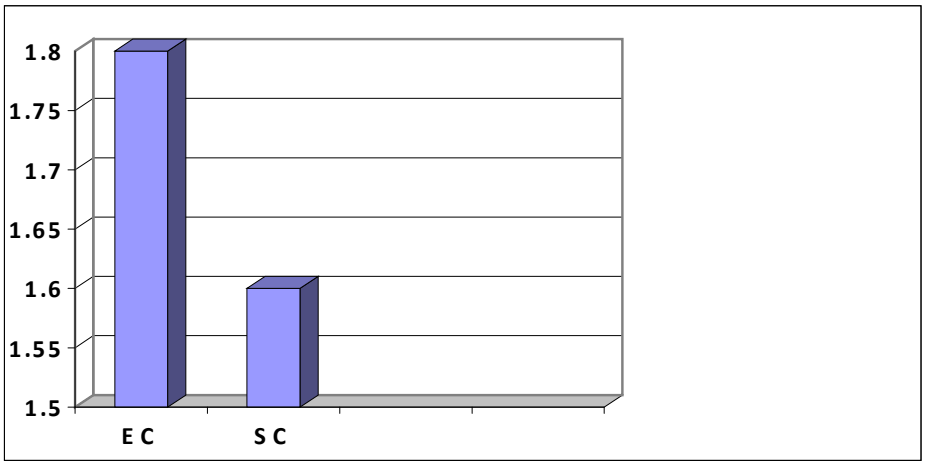
3. Analgesic requirements post operatively

Dose of analgesic i.e diclofenac 50 mg im are recoreded in both groups post operatively, results are shown in table 3. Results analysed using Mann Whitney U test. Dose requirements are similer in two groups .

	Doses of analgesic (Mean±SD)
EC	1.8 ± 0.66
SC	1.6 ± 0.48

P = 0.499 Mann-Whitney U test (Adjusted for ties)

Table 3



Graph 3: Comparison Of Dose Of Analgesics

4. Local wound complications

Overall wound complications are assessed for 7 days post operatively In our study we assessed complications like seroma .haematoma, and purulent collection . results are shown in table 4.

Table 4 **A) Hematoma**

Group	Yes	No	Total
EC	1 (3.3%)	29	30
SC	6 (20%)	24	30

Table 4a

X_2 with Yate's correction = 2.588 DF = 1 P = 0.108

B) Seroma

Group	Yes	No	Total
EC	9(30%)	21	30
SC	10(33.3%)	20	30

Table 4b

X_2 with Yate's correction = 0.077 DF = 1 P = 0.108

C) PURULENT COLLECTION

Group	Yes	No	Total
EC	4 (13.3%)	26	30
SC	5 (16.6%)	25	30

Table 4c

X_2 with Yate's correction = 0 DF = 1 P = 1

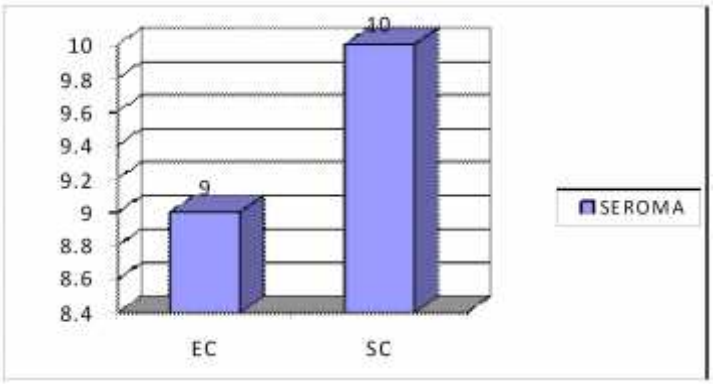
DF = Degrees of freedom

X2 = Chi-square

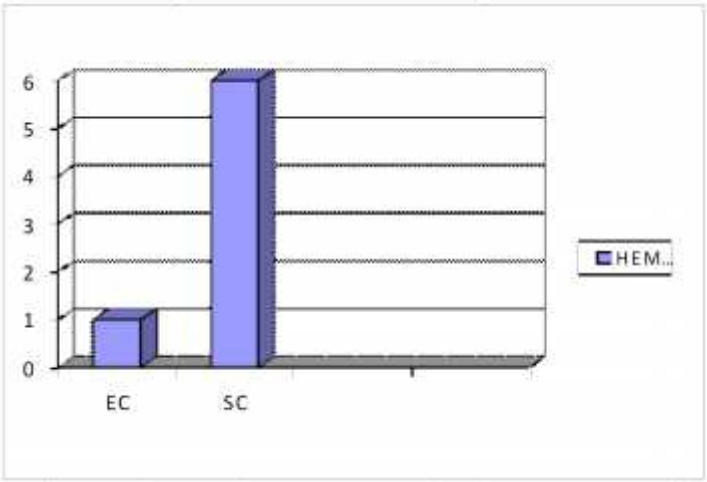
t = student's 't'

Seroma in both groups are comparable. Although scalpel group shows more hematoma [20%],difference is not statistically significant. Other complication i.e purulent collection in post operative wound are similar in two groups.

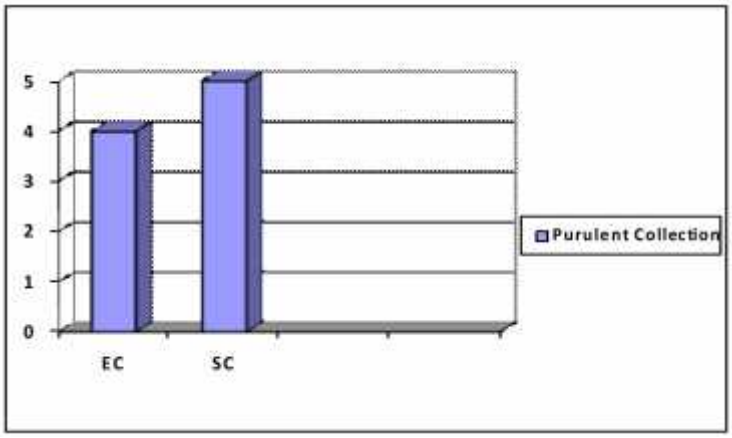
Graph 4a: Comparison of wound complication- Seroma



Graph 4b: Comparison of wound complication- Hematoma



Graph 4c: Comparison of wound complication-Purulent Collection



DISCUSSION

Surgeons have been always in search of an ideal method of making skin incision which would provide quick and adequate exposure with minimum loss of blood. Electrocautery mainly used for hemostasis and less often for skin incision.

Earlier days when explosive anesthetics agent were in use , electrosurgical instruments had limited use because of explosive risks associated with anesthetic agents. After the invention of nonexclusive anesthetic agents like halothane , electrosurgical instruments like diathermy are increasingly used for tissue dissections except for skin incision . This reluctance for use of electrocautery is attributed to the belief that electrosurgical instruments cause devitelisation of tissue within the wound which consequently lead to wound infection , delayed wound healing and wound scar formation[3].

The fear of injury tissues was first unfolded when this technique was used by Peterson in reconstructive and cosmetic faciomaxillary surgery[29] , Mann and Klippel in paediatric surgery [30], Kamer in rhitidoplasty [31] , Tabin in blepheroplasty [32] , with minimum scarring and excellent results . skin incisions in general surgery was reported by Dixon and Watkin [33] in patients undergoing inguinal herniorhaphy and cholecystectomy.

As mentioned above various studies [2-6,22-28] were undertaken to evaluate the efficacy of electrocautery over scalpel in making skin incision and

results are varying some showing better results with electrocautery some showing similar results.

In our study 60 patients are randomized in to two groups , incision is taken with either scalpel or electrocautery depending on the group allotted , and evaluated post operatively for pain , requirement of analgesic doses and post operative wound complications. This study showed no difference between the two groups in post operative pain , analgesic requirement and wound complication.

CONCLUSION

Based on observations made in this study , it has been concluded that results of the both groups i.e electrocautery group and scalpel group are similar in relation to

1. Postoperative pain
2. Requirement of analgesics
3. Postoperative wound complications.

SUMMARY

Our study "One Year Randomized Control Trial Comparing The Efficacy Of Diathermy Incision Versus Scalpel Incision Over Skin In Patients Undergoing Inguinal Hernia Repair".

Total 60 patients are randomized in to two groups ,group A (Electrocautery group) and Group B (Scalpel group), skin incision in patients undergoing inguinal hernia are taken with either electrocautery or scalpel depending on their group. Post operative pain, analgesic dose requirements and postoperative wound complication are measured. Results are analyzed using Mann Whitney U test , and Chi square tests.

Both the groups are having similar age groups electrocautery group (47.8±16.21) and scalpel group (47.7±13.95), P = 0.973. Post operative pain in both group are comparable in both the groups. Although hematoma are seen more in scalpel group , difference is not statistically significant. Post operative seroma and purulent collection are similar in both the groups.

Although results are similar in both groups still we recommend the use of electrocautery for skin incision , as it is an alternative , attractive and easily available new method. Traditional fear of wound strength and devitelisation are not reflected in this study.

Most importantly recent increase in blood borne infections like hepatitis C , hepatitis B , human immune deficiency virus infection makes exclusion of scalpel from operative field.

On the basis of this study we recommend a wider use of electrocautery in all surgical procedures to make skin incision as this technique is quite safe.

PROFORMA

GROUP-

Patient Name: **Address:**

Age/Sex:

I.P.No: **DOA:**

DOD:

Chief Complaints:

1.

2.

3.

General Physical Examination:

Vital signs –PR

--BP

-RR P I C K L E

Any other:

Local Examination:

Systemic Examination:

1.Respiratury system

2.Per abdomen

3.CVS

4.CNS

Provisional Diagnosis:

Final Diagnosis:

Operative Procedure:

Anaesthesia:

Operative Notes:

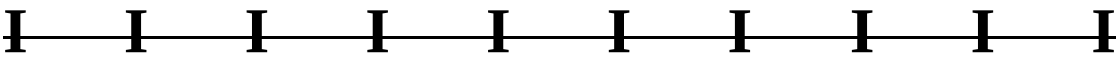
Incision taken with—

Length of incision:

Time started: Time finished:

EVALUATION OF PAIN:

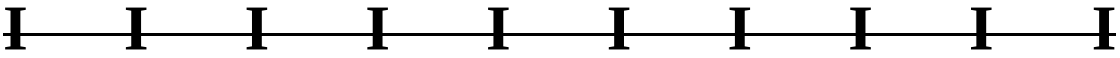
At 6 hours:



1 2 3 4 5 6 7 8 9 10

Dosage of analgesic given:

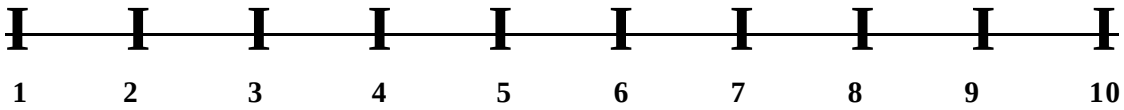
At 12 hours:



1 2 3 4 5 6 7 8 9 10

Dosage of analgesic given:

At 24 hour:



Dosage of analgesic given:

Evaluation Of Post Operative Complication(Up to 7 Days)-

Seroma-

Hematoma-

Purulent Collection-

CONSENT FOR PARTICIPATION IN RESEARCH

Mr./Mrs. _____ we are requesting you to enroll yourself in study titled conducted by DR.SHIVAGOUDA PATIL postgraduate student in M.S General Surgery under the guidance of DR B.V.GOGERI at J N Medical College, Belgaum

You have been requested to participate in research because you are into the study group. During the study you will be asked some questions and you are supposed to answer to the best of your knowledge.

Your participation in research is voluntary. Your decision whether or not to participate in the study will not affect your relationship with J.N.M.C.If you decide to participate you are free to withdraw at any time.

. The purpose of research is to compare the efficacy of diathermy incision versus scalpel incision over skin in inguinal hernia repair.

PROCEDURE INVOLVED:

If you agreed to participate in the study your are randomized and devided in to two groups. In one group skin incision is taken with diathermy knife, and in other group incision is taken with scalpel, to evaluate the effectiveness of the type of incision.

RISKS AND BENEFITS:

There are no extra risks involved and benefits are to be evaluated.

ALTERNATIVES:

Even if you decline the participation, you will get the routine line of management.

PRIVACY AND CONFIDENTIALITY:

The only people to know that you are a research subject are members of the research team. No information about you or provided by you during the research will be disclosed to others without your written permission except:

1 .In emergency to protect your rights and welfare.

2.If required by law.

AUTHORIZATION TO PUBLISH RESULTS:

When the results of the research are published or discussed, in a conference, no information will be displayed that would disclose your identity. Any information that is obtained in connection with this study and that can be identified with you will remain confidential.

FINANCIAL INCENTIVES FOR PARTICIPATION:

You will not be paid/offered any free gifts for participating in the research. You will not be reimbursed for expenses.

CONSENT STATEMENT

I undersigned_____ have been explained in my vernacular language about the study and my participation in the study is voluntary. If I want, I can withdraw at any time. Also I have been given enough time to clear my doubts and rights as study participant.

In case you have any questions related to the study, you can contact Dr SHIVAGOUDA PATIL (Ph No 9448838162)

In case you have any questions about my rights as a study participant, you can contact Dr V.D Patil (0831-2471350)

Signature or the Left Thumb print of Participant or legally authorized representative

Participants Name_____ Signature_____

Witness Name_____ Signature_____

Experimenter's Name_____ Signature_____

Date_____

Place_____

KEY TO MASTER CHART

Diag : Diagnosis

RDH ; Right direct inguinal hernia

LDH ; Left direct inguinal hernia

RID ; Right indirect inguinal hernia

LID ; Left indirect inguinal hernia

B/LDH ; Bilateral Direct Inguinal Hernia

MP ; Mesh Plasty

pod ; post operative day

GROUP A : ELECTRO CAUTERY INCISION

Sl No	IP NO	Name	Age/Sex	Diag	Procedure	Pain score		Complications			No of Analgesic	
						At 6 Hr	At 12 Hr	At 24 Hr	Haema	Seroma	Puru Coll	Doses
1	211994	Devendra	61/M	RDH	MP	9	4	3				3
2	213752	Shivanand	18/M	LIH	MP	6	3	3		3rd pod		2
3	214688	Mallappa	60/M	B/LDH	MP	7	5	4				3
4	214688	Mallappa	60/M	B/LDH	MP	7	5	4				3
5	216983	Madukar	63/M	RDH	MP	6	3	3		2nd pod		1
6	213957	Gangappa	60/M	RDH	MP	6	4	2			5th pod	2
7	219446	Sidlingapa	26/M	RDH	MP	6	3	2				1
8	220055	Parsuram	40/M	LIH	MP	6	5	2			5th pod	2
9	221674	Shivappa	65/M	LDH	MP	7	5	4		2nd pod	5th pod	3
10	216391	Vasudev	55/M	B/LDH	MP	7	5	4				2
11	216391	Vasudev	55/M	B/LDH	MP	7	5	4				2
12	224220	Yallappa	72/M	RDH	MP	8	4	1				2
13	224097	Maruti	60/M	B/LDH	MP	6	3	2		2nd pod		1
14	224097	Maruti	60/M	B/LDH	MP	6	3	2		2nd pod		1
15	224468	Dundappa	21/M	RIH	MP	7	4	1				2
16	224823	Vinayak	22/M	LIH	MP	7	3	2				1
17	228549	Kallappa	26/M	LIH	MP	7	3	2				1
18	229811	Dinakar	50/M	LDH	MP	7	4	2			5th pod	2
19	230471	Laxman	45/M	RDH	MP	7	4	3				2
20	233897	Imamsab	56/M	RDH	MP	5	2	2				1
21	234287	Marruti	50/M	RDH	MP	6	4	2		2nd pod		2
22	235217	Mahdev	60/M	LIH	MP	6	3	2				1
23	235970	Tukkappa	35/M	RIH	MP	7	3	2				1
24	238088	Ajit	37/M	LIH	MP	7	4	2		2nd pod		2
25	239281	Vinayak	23/M	RIH	MP	7	4	3				2
26	239201	Kemmana	36/M	RIH	MP	5	3	3		3rd pod		1
27	241529	Ishwar	60/M	LDH	MP	7	5	3				2
28	250371	Shrishail	75/M	LIH	MP	6	4	3	2nd pod			2
29	213891	Rajsaab	45/M	RDH	MP	7	4	2		2nd pod		2
30	251899	Nagappa	43/M	RDH	MP	6	4	3				2

GROUP B : SCALPEL INCISION												
Sl No	IP No	Name	Age/Sex	Diag	Procedure	Pain Score		Complications				No of Analgesic
						At 6 Hr	At12 Hr	24 Hrs	Haema	Seroma	Puru Coll	Doses
1	223354	Veerabadr	65/M	LIH	MP	7	4	3	3rd pod			2
2	223151	Vithal	40/M	RDH	MP	7	3	2				1
3	226162	Santosh	26/M	RDH	MP	6	4	3				2
4	231032	Basava	69/M	RDH	MP	7	3	2		3rd pod		1
5	232793	Shivkumar	27/M	LIH	MP	6	4	3				2
6	235206	Noorahm	40/M	RIH	MP	7	4	2			5th pod	2
7	236184	Ganesh	34/M	LIH	MP	6	3	2		2nd pod		1
8	239801	Basavraj	36/M	RIH	MP	6	3	2		2nd pod		1
9	239992	Ishwar	70/M	LDH	MP	7	4	3				2
10	241669	Balganesh	28/M	LIH	MP	6	4	3	3rd pod			2
11	241068	Mallesh	55/M	LDH	MP	7	4	3				2
12	242007	Somling	66/M	RDH	MP	7	4	2		2nd pod		2
13	242861	Nagendra	58/M	RDH	MP	7	4	3	3rd pod			2
14	243166	Ramesh	45/M	LIH	MP	7	4	3			5th pod	2
15	243474	Manohar	43/M	B/LDH	MP	7	5	3				2
16	243474	Manohar	43/M	B/LDH	MP	7	5	3				2
17	243658	Mahadev	36/M	RIH	MP	6	3	2		3rd pod		1
18	245801	Babu	62/M	B/LDH	MP	7	4	3		2nd pod		2
19	245801	Babu	62/M	B/LDH	MP	7	4	3		2nd pod		
20	245105	Damodar	56/M	RDH	MP	7	4	3	3rd pod			2
21	245180	Shankar	40/M	RDH	MP	8	5	2			5th pod	2
22	246812	Anand	55/M	RDH	MP	6	3	2				2
23	246719	Basavraj	60/M	RDH	MP	7	4	3		2nd pod		2
24	247454	Appanna	68/M	RIH	MP	7	3	2	2nd pod			1
25	247601	Sunil	43/M	RIH	MP	7	4	2			5th pod	2
26	247778	Pandurang	30/M	LIH	MP	6	3	2		2nd pod		1
27	249037	B C Sidnal	56/M	LDH	MP	6	3	2				1
28	251543	Ravikant	28/M	LIH	MP	7	4	2	3rd pod			2
29	252629	Vithal	42/M	RIH	MP	6	3	2			6th pod	1
30	254121	Chidanand	48/M	B/LDH	MP	7	3	2		3rd pod		1