

**“A COMPARATIVE STUDY BETWEEN ONLAY AND SUBLAY MESH  
REPAIR IN THE TREATMENT OF VENTRAL HERNIAS”**

A DISSERTATION SUBMITTED TO



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

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**STANLEY MEDICAL COLLEGE AND HOSPITAL**

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

**CHENNAI**

**MAY 2018**

This is to certify that this dissertation titled “*A Comparative study between onlay and sublay mesh repair in the treatment of ventral hernias*”

is a bonafide work done by *Dr.Ben Abraham Daniel* , Post Graduate student (2015 – 2018) in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under my direct guidance and supervision, in partial fulfilment of the regulations of The Tamil Nadu

Dr. M.G.R Medical University, Chennai for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in May 2018.

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*“A Comparative study between onlay and sublay mesh repair in the treatment of ventral hernias”* is a bonafide work done by me in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under the guidance and supervision of my unit chief.

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Place: Chennai.

Date:

**DR.BEN ABRAHAM**

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## INTRODUCTION

More than 1 million ventral hernia surgeries are done annually in india . Suture repair techniques have dominated ventral and incisional hernia repair over a century. The most popular of these techniques was the Mayo duplication. In larger hernias, suture repair requires the application of tension to the fascia in order to close the orifice. Therefore, many suture repairs failed mechanically, and recurrence rates were found to be as high a 54%. The advantages of mesh **implantation** have first been confirmed by an influential trial by Luijendijk et al. [1]

The choice of a type of open operative repair is controversial; the technique of **hernia** repair is often based on tradition rather than evidence [1]. According to databases [2] and reviews there is a good evidence that open mesh repair is superior to suture repair in terms of recurrences and an insufficient evidence as to which type of mesh or which mesh position (on- or sublay) should be used.

The main goal of this study is to compare the outcome of mesh repair in sublay and onlay position of mesh reconstruction in care of small and large hernias.

Ventral hernia repair is among the most common surgical operations performed worldwide ,and the two operative techniques most frequently used in case of ventral hernia are the onlay and sublay repair. However, it remains unclear which technique is superior.

Many studies demonstrate an increased risk for wound complications with mesh placement including surgical site infections, seroma and flap necrosis . The risks of these complications are affected by where the mesh is placed. For example, mesh exposed to intra-abdominal contents potentially increases the risks of adhesions, bowel obstruction, and fistula formation .

While repair of ventral hernias with mesh is considered routine, there is no consensus on the best location to place the mesh. Hence, this study aims to compare the outcome of the onlay versus sublay mesh repair for treatment of ventral hernias.

## **AIM OF STUDY**

This study aims to compare the duration of surgery and postoperative complications of sublay and onlay meshplasty in the treatment of ventral hernias.

## **PRIMARY OBJECTIVE**

To compare the duration of surgery and early postoperative complications like seroma, surgical site infections, flap necrosis and duration of hospital stay in sublay and onlay mesh repair in the treatment of ventral hernias.

## **SECONDARY OBJECTIVE**

To decide which is the best method of ventral hernia repair among the two in terms of operative time and early postoperative complications.

## **JUSTIFICATION OF STUDY**

The most scientific way to come to conclusion over superiority of one method over other is based on evidence-based medicine.



I hereby share our experience regarding the safety of the two widely practiced methods of ventral hernia repair to decide on the best method in terms of complication rates.

## **STUDY POPULATION**

All cases operated for ventral hernias in the elective theatre of department of general surgery at Stanley Medical College were included in the study.

## **SAMPLE SIZE**

Group A (25 Cases- Onlay meshplasty)

Group B (25 cases-Sublay meshplasty)

## **STUDY DURATION**

10 months (NOVEMBER 2016 TO AUGUST 2017)

## **INCLUSION CRITERIA**

All Patients undergoing onlay and sublay mesh repair for ventral hernias including incisional hernia, supra umbilical and epigastric hernias.

## **EXCLUSION CRITERIA:**

Below 18 and above 70 years

Infraumbilical hernias

Planned other gastrointestinal surgery

Immunosuppressive disorders like diabetes, HIV and Hepatitis

Severe renal or **hepatic failure**

Advanced stage of **tumours** or currently treated malignancies

Recurrent Hernias

## **TYPE OF STUDY**

- Single centre prospective study.

## **STUDY CENTRE**

- Government Stanley Medical College.

## **METHODOLOGY**

Written informed consent will be obtained from all study subjects before enrolment in the study.

All subjects undergoing onlay and sublay mesh repair for ventral hernias will be evaluated intraoperatively for duration of surgery and postoperatively for complications like surgical site infections, seroma formation, flap necrosis and duration of hospital stay.

## **STATISTICAL ANALYSIS**

Observations are tabulated according to the pre-designed proforma.

The collected data were analysed with IBM.SPSS statistics software 23.0 Version.

To describe about the data descriptive statistics frequency analysis, percentage analysis was used for categorical variables and the mean & S.D were used for continuous variables.

The Shapiro Wilk's test for normality shows the data was skewed hence to find the significant difference in the multivariate analysis the Kruskal Walli's test was and followed by the Mann-Whitney U test was used.

To find the significance in categorical data Chi-Square test was used. In all the above statistical tools the probability value .05 is considered as significant level.

## REVIEW OF LITERATURE

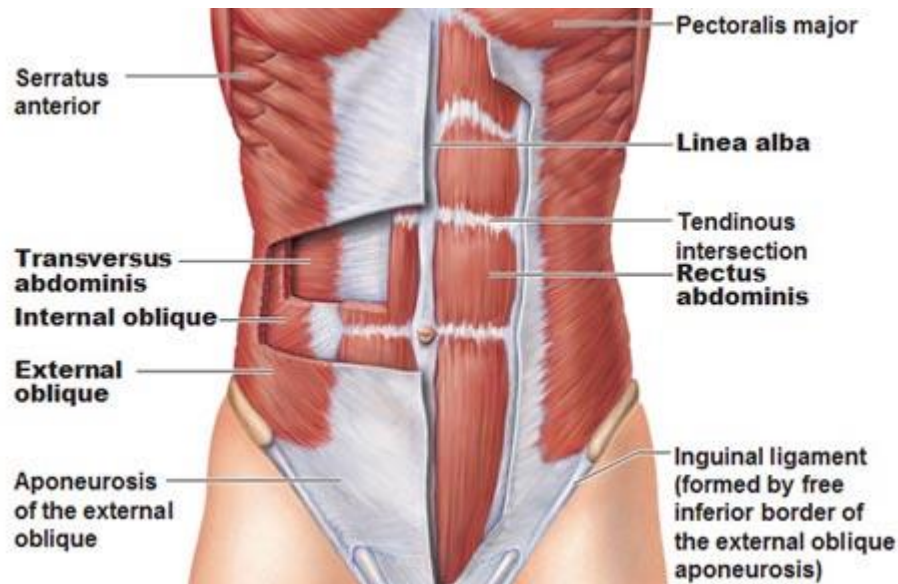
### ANATOMY OF ANTERIOR ABDOMEN

The layers of the abdominal wall are (from superficial to deep):

- Skin
  - Subcutaneous tissue
  - Fascia
    - Camper's fascia
    - Scarpa's fascia
  - Muscle
    - External oblique abdominal muscle
    - Internal oblique abdominal muscle
    - Rectus abdominis
    - Transverse abdominal muscle
    - Pyramidalis muscle
  - Fascia transversalis
  - Peritoneum
-

## RECTUS ABDOMINIS MUSCLE

---



The **rectus abdominis muscle**, also known as the "**abdominals**" or "**abs**", is a paired muscle running vertically on each side of the anterior wall of the human abdomen, as well as that of some other mammals. There are two parallel muscles, separated by a midline band of connective tissue called the linea alba.

It extends from the pubic symphysis, pubic crest and pubic tubercle inferiorly, to the xiphoid process and costal cartilages of ribs V to VII superiorly.<sup>[1]</sup>

The proximal attachments are the pubic crest and the pubic symphysis. It attaches distally at the costal cartilages of ribs 5-7 and the xiphoid process of the sternum.<sup>[2]</sup>

The rectus abdominis muscle is contained in the rectus sheath, which consists of the aponeuroses of the lateral abdominal muscles. Bands of connective tissue called the tendinous intersections traverse the rectus abdominus, which separates this parallel muscle into distinct muscle bellies. The outer, most lateral line, defining the "abs" is the linea semilunaris.

- Structure
  - 1Size
  - 2Blood supply
  - 3Nerve supply
  - 4Variation

## **Structure**

---

The rectus abdominis is a long flat muscle, which extends along the whole length of the front of the abdomen, and is separated from its fellow of the opposite side by the linea alba.

The upper portion, attached principally to the cartilage of the fifth rib, usually has some fibers of insertion into the anterior extremity of the rib itself.

## **Size**

It's typically around 10 mm thick (compared to 20 mm thick superficial fat), or 20 mm thick in young athletes such as handball players.<sup>[4]</sup> Typical volume is around 300 cm<sup>3</sup> in non-active individuals, or almost 500 cm<sup>3</sup> in athletes (tennis players).<sup>[5]</sup>

## **Blood supply**

The rectus abdominis has many sources of arterial blood supply. In reconstructive surgery terms, it is a Mathes and Nahai<sup>[6]</sup> Type III muscle with two dominant pedicles. First, the inferior epigastric artery and vein (or veins)



run superiorly on the posterior surface of the rectus abdominis, enter the rectus fascia at the arcuate line, and serve the lower part of the muscle.

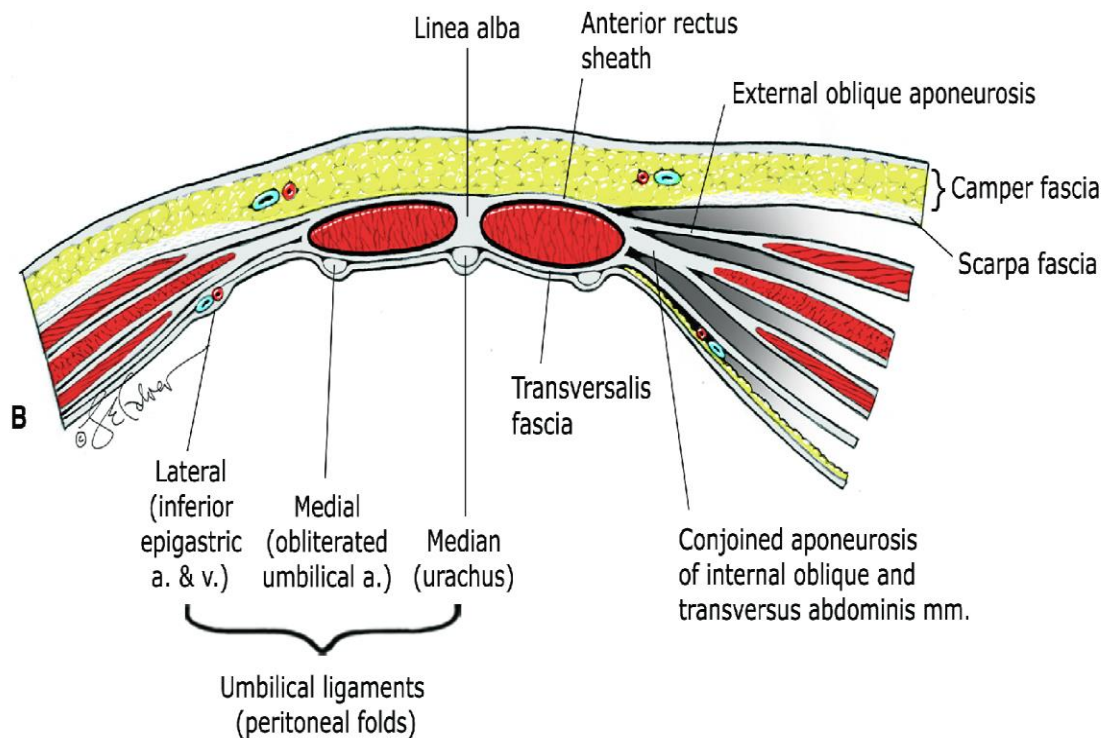
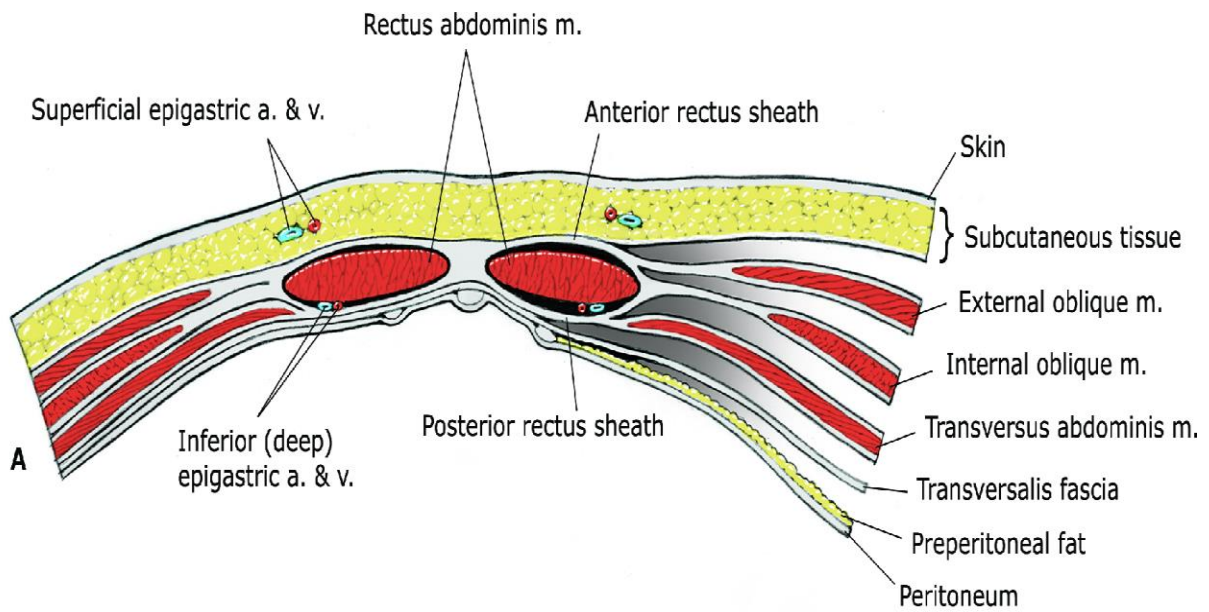
Second, the superior epigastric artery, a terminal branch of the internal thoracic artery, supplies blood to the upper portion. Finally, numerous small segmental contributions come from the lower six intercostal arteries as well.

### **Nerve supply**

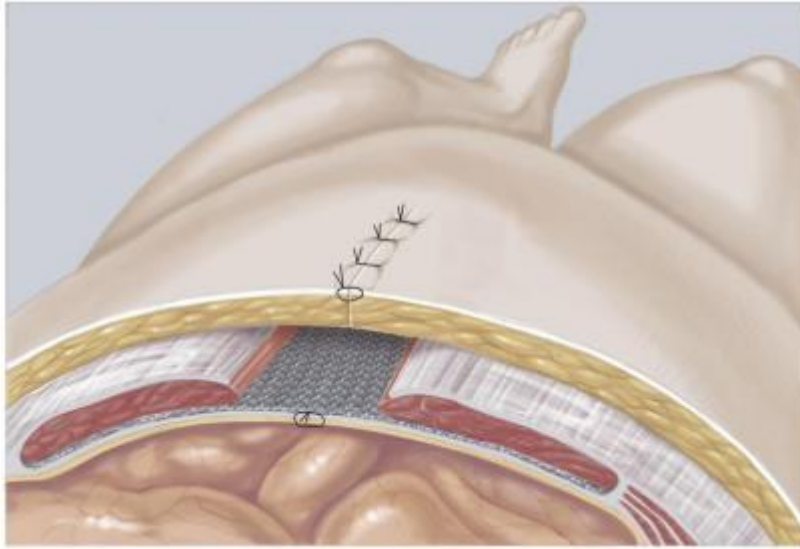
The muscles are innervated by thoraco-abdominal nerves, these are continuations of the T7-T11 intercostal nerves and pierce the anterior layer of the rectus sheath. Sensory supply is from the 7-12 thoracic nerves

### **Variation**

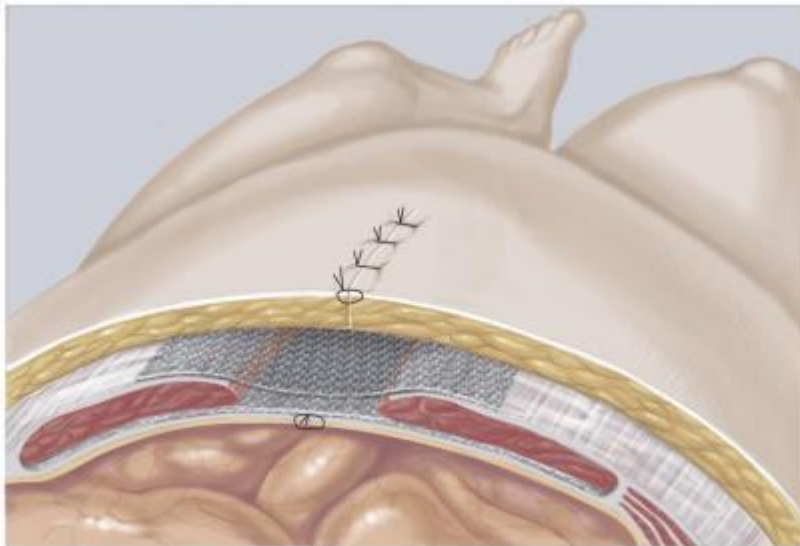
The sternalis muscle may be a variant form of the pectoralis major or the rectus abdominis. Some fibers are occasionally connected with the costoxiphoid ligaments, and the side of the xiphoid process.



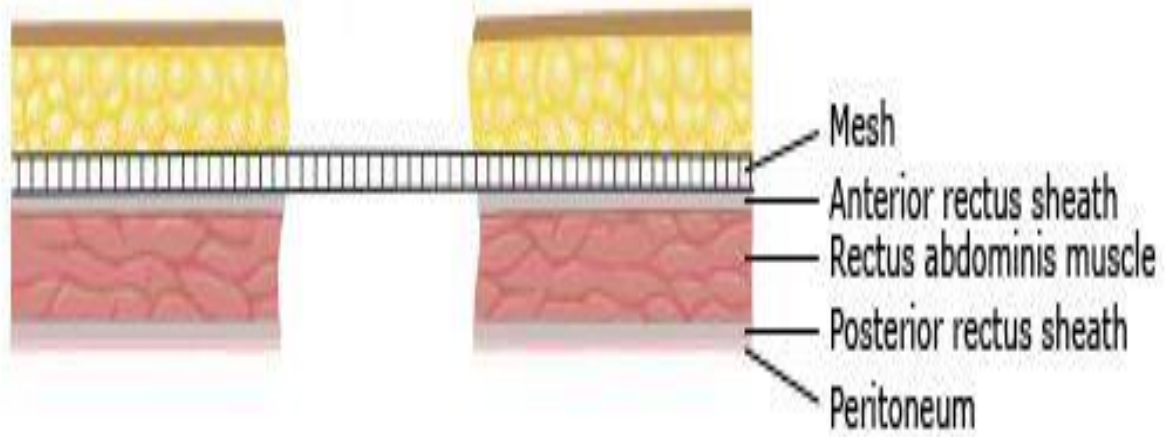
## SUBLAY MESH



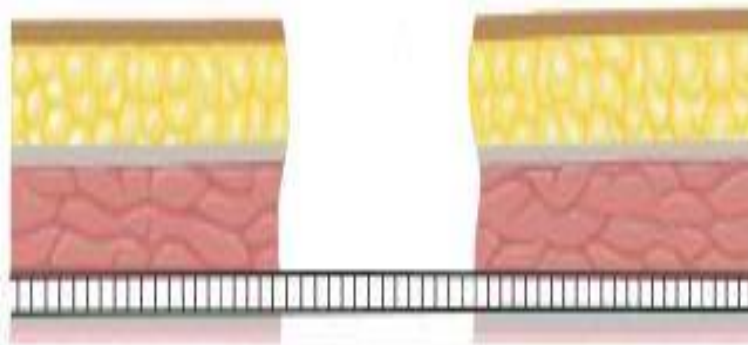
## ONLAY MESH



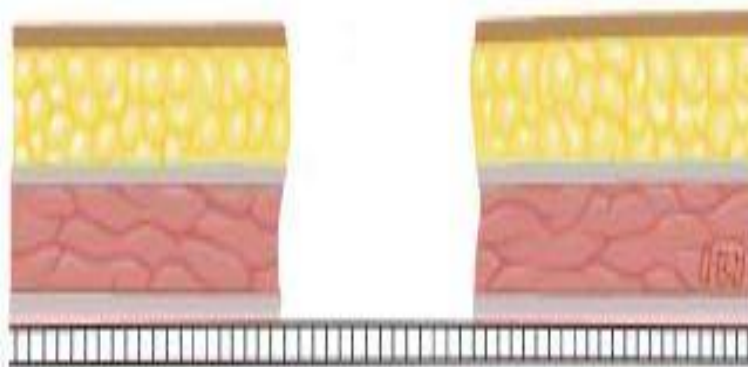
### A. Onlay mesh



### B. Sublay mesh



### C. Intraperitoneal onlay mesh



## **EXTRAPERITONEAL SPACE**

The extraperitoneal space is the portion of the abdomen and pelvis which does not lie within peritoneum.

It is divided into:

- **Retroperitoneal space:**

Situated posterior to the peritoneum

- **Preperitoneal space:**

Situated anterior to the peritoneum

- Retropubic space, deep to the pubic bone

- Retro-inguinal space, deep to the inguinal ligament

By definition, the preperitoneal (also called *extraperitoneal* or *properitoneal*) space lies in the abdominal cavity between the peritoneum internally and the transversalis fascia externally.

Although the term *preperitoneal* is the popular choice of nomenclature, the more inclusive term, *extraperitoneal*, is probably preferable because it more clearly includes all of the potential space just external to the peritoneum, including the retroperitoneal area, whereas *preperitoneal* implies the ventral portion of the extraperitoneal space. Another name for the space is *parietoperitoneal*, [10] which the authors believe to be a good term, although somewhat unwieldy.

Within the preperitoneal space is a variable quantity of adipose tissue, loose connective tissue, and membranous tissue. Membranous tissue lies just internal to the transversalis fascia. Perhaps the classic definition of the preperitoneal space is correct, but if one accepts the bilaminar formation of the transversalis fascia into the anterior and posterior laminae, two spaces are formed: (1) one between the peritoneum (i.e., the innermost layer of the abdominal wall) and the

posterior lamina of the transversalis fascia and (2) one between the two laminae of the transversalis fascia. In some cases, the posterior lamina is not well developed and the space is limited by the peritoneum internally and the anterior lamina of the transversalis fascia externally (previously referred to as the *transversalis fascia*).

Both laminae of the transversalis fascia insert inferiorly on the ligament of Cooper. Superiorly, they are perhaps united somewhere at the anterior abdominal wall and then continue upward as the transversalis fascia.

The extensions of the [new] and [old] spaces, laterally and posteriorly, have not yet been clearly defined because they extend into the at-large preperitoneal spaces, including the posterior retroperitoneal space and the highly complex preperitoneal spaces of the pelvis.

The preperitoneal space of the abdomen is filled with a variable amount of connective tissue and other anatomic entities, such as arteries; veins; nerves; and various organs, such as the kidneys and ureters.

Ventral hernia repair is a challenge in surgical practice and a wide spectrum of surgical techniques have been developed ranging from direct suture techniques to the use of various types of mesh to close the defect and strengthen the musculofascial tissues to avoid recurrence

Mesh placement in the preperitoneal and retro muscular sublay position with overlapping the hernia defect in all directions was introduced in the late 1980s . The introduction of sublay meshplasty decreased the recurrence rates and gave better outcome and has been the standard of care of ventral hernias .

In previous studies, the mean operative time was longer in sublay than onlay techniques due to the time consumed to create the preperitoneal tunnel . The time taken to completely drain the discharge resulting from other surgical consequences is significantly longer in onlay than sublay techniques.

In agreement with our data, other studies of same interest reported same significant distribution between the onlay and sublay maneuvers.

Seroma formation is a common complication after repair of abdominal wall hernia, which can lead to significant morbidity . In previous studies, the rate of seroma formation in sublay repair is much less than in onlay repair with statistical significant distribution .



The incidence of seroma formation is highest following onlay meshplasty because during an onlay procedure, not only the blood vessels are transected during the required wide mobilization of subcutaneous tissue flaps, but also the insertion of foreign material temporarily establishes an effective barrier between the circulatory system of the subcutaneous tissues and that of the deeper parietal layers .

In sublay meshplasty, the retro-muscular space is an already existing anatomical plane, requiring no dissection, and the bare posterior surface of the of the rectus muscles is rich in lymphatic is capable to absorb any collecting seroma .

Onlay technique is associated with a higher rate of wound infection that remains one of the most common complications of this technique with reported incidence rate ranging between 8-14% .Studies have reported lower incidence of wound infection in sublay group patients when compared with onlay group but still with insignificant distribution.

Retromuscular plane is highly vascular and thus helps preventing infection, and if any infection occurs in the subcutaneous plane, the mesh will not be affected, as the mesh is retromuscular in a deeper plane .

The location of the reinforcement appears to influence outcomes. Sublay mesh placement is associated with lower recurrence rates.

Ventral hernias with mesh as opposed to suture has substantially improved long-term outcomes and is accepted as the standard of care. But many studies demonstrate an increased risk for wound complications with mesh placement like infections, seroma, and mesh erosion. The risks of these complications is affected by where the mesh is placed.

If mesh exposed to intra-abdominal contents potentially increase the risk of adhesions, bowel obstruction, and fistula formation.

For laparoscopic ventral hernia repair, the mesh is usually placed in the intra-peritoneal position. But in open surgery, there are many options for mesh placement . Onlay repair places the mesh over the anterior fascia, which typically involves dissection of flaps and primary closure of the fascia below the mesh.

In inlay repair the mesh is placed over the hernia defect and secured circumferentially to the edges of the fascia. Sublay meshplasty refers to retro-rectus or preperitoneal mesh placement. It is also commonly referred to as a Rives-Stoppa or retromuscular repair. Underlay repair is when mesh is placed

in the intra-peritoneal position and secured to the anterior abdominal wall. Each mesh location has its own risks and benefits. With onlay repair, skin flaps must be created, which increases the risk of wound complications and mesh infection.

However, onlay repair is technically easy to perform. In addition, for large complex hernias, this space is often already dissected with excision of the hernia sac or with myo-fascial release (i.e., anterior component separation).

Inlay repair is technically easy. However, the mesh often exposed to the intra-peritoneal contents, and also vulnerable to superficial wound complications. Lack of overlap precludes mesh-tissue integration and theoretically increases the risk of recurrence. Sublay meshplasty is often more challenging and complex to perform. Dissection of this plane can risk damaging the muscle, blood supply, and nerves to the rectus abdominus. In addition, this mesh location may not be appropriate for off midline defects.

However, this space potentially protects the mesh from both superficial wound complications and intra-peritoneal contents. In addition, it also allows for load-bearing tissue in-growth from two directions. Underlay repair or intra-peritoneal repair was popularized with the advent of laparoscopy.

Placing mesh in this location can be technically cumbersome requiring sutures to be placed closely to prevent intra-abdominal contents from sliding between the mesh and anterior abdominal wall. Even though protected from superficial wound complications, the mesh is exposed to intra-peritoneal contents. Mesh placed in this location must have an anti-adhesive barrier or anti-adhesive properties on the peritoneal side. In this study, we conducted a systematic review and performed a multiple treatment meta-analysis to identify the best location for mesh placement with open ventral hernia repair.

Incidence of ventral hernia is highest in the fourth and fifth decades of life, with a female to male ratio of 1.5 : 1. The difference in age group and higher female incidence was due to the higher number of lower midline incisions among women for obstetric and gynecological surgeries, which result in incisional hernia, which was the most common type of ventral hernia.

Sublay meshplasty is technically more difficult than onlay meshplasty, thus making the operative time longer in the sublay group. This difference was highly significant . However, sublay meshplasty is limited in patients with damaged posterior rectus sheath or damaged rectus abdominis muscle, which will render this space difficult to create.

Among the common postoperative complications encountered in previous studies there was transient seroma formation in 22% of the onlay meshplasty patients; this difference was statistically significant, compared to only 4% in sublay group .

Direct contact between mesh and subcutaneous fat contributes to seroma formation and purulent complications that result in hernia recurrence [9,10]. Studies show that postoperative superficial infection occurred in 22% of onlay meshplasty patients and was significantly lower in the sublay group .

The mean duration of postoperative hospital stay, which is an indicator of postoperative outcome has shown to be quite longer in the onlay meshplasty group, and this difference was highly significant between the two groups .

# **SURGICAL OPTIONS IN TREATMENT OF VENTRAL HERNIA**

Perhaps in all aspects of surgery, hernia repair provides the greatest conundrum with respect to choices of materials to use (or not) and techniques that may be utilized to achieve the desired result. When it comes to discussing the component separation technique, even the desired result has been changed. indications and contraindications for each of the methods are discussed below

## **To Mesh or Not to Mesh?**

For the overwhelming majority of ventral hernias, some sort of mesh will be necessary. Pulling tissue together under tension that for some reason has already developed a defect assuredly will only lead to a recurrence. Not to mention the pain caused by pulling the abdominal wall tightly closed. Additionally, the pressure applied on intra-abdominal organs will push on the diaphragm and may lead to respiratory difficulties. In fact, it is the development of mesh that has lead to the ability to effectively repair

large abdominal wall defects in a single procedure. The possible exception to this is the case of a small umbilical hernia in which many cases the defect is only about the size of a quarter or even smaller. Under these circumstances the tissues are easily re-approximated in a double layer of fascia with sutures and without tension. Some surgeons will place a small mesh plug in these defects and suture that in place for the repair. Under these specific circumstances.

### **Choice of Mesh**

There are at least 50 different varieties of mesh available on the market,

The main disadvantage of any mesh is the possibility of infection because of placement of a foreign body. There are four basic categories of mesh and I will discuss each of these with respect to risk of infection, cost and efficacy.

#### **A) Plastic Mesh-**

Prolene, Mersilene or other types of plastic mesh are very inexpensive and are effective in repairing even large abdominal defects. They cannot be left in direct contact with abdominal viscera because the adhesion formation will be intense and the risk of a fistula development is significant. Either of these complications can be extremely difficult

to treat in the face of an incorporated mesh. The mesh causes a very intense reaction with tissue and the mesh becomes invested within a very dense scar which leads to a good repair of the hernia.

## **B) Gortex**

In the case of hernia repair, a gortex patch makes an effective repair of a hernia defect and it may be left in contact with the abdominal viscera. It does not incorporate into tissue like prolene, and it often causes the formation of seroma. In the event of an infection involving a gortex patch, the gortex separates easily from the surrounding tissues unlike prolene or mersilene. Gortex is slightly more expensive than prolene or mersilene mesh. Because gortex does not incorporate as intensely into tissue, it is not a good choice for large hernias, as the repair will always be dependent on your fixation sutures and not the dense scar that forms with mesh.

## **C) Collagen**

Collagen is the protein matrix that all of our cells sit upon. Without collagen we would disintegrate. In fact there are many diseases of collagen metabolism which cause a variety of maladies for the human species, but this is for an entirely different discussion. Collagen



matrices are used for hernia repairs and can be obtained from a variety of human and non-human sources. They are very expensive. For example a piece of plastic mesh that costs a couple of hundred dollars may be \$10,000 if it is made of collagen. Collagen mesh; however is very resistant to infection. One's own cells grow into the collagen matrix and serve as the basis for the hernia repair. Because of

its cost, collagen mesh is most useful in situations where there is contamination or infection already present where a hernia needs to be repaired. The typical circumstance is an incarcerated, strangulated ventral hernia where there is gangrenous intestine that must be removed. Placement of a prolene or gortex mesh carries virtually 100% risk of infection (Nothing is ever 100%, but you get my drift). Before the advent of collagen mesh one would either just pull the wound together under tension, or use an absorbable mesh and accept the immediate recurrence of the hernia in about 3 to 6 weeks.

Collagen mesh allows for the repair of the hernia even under these circumstances with a < 10% risk of infection. Even if an infection occurs it can be treated with antibiotics and local wound care with an acceptable result.

Aside from the cost of collagen mesh, they also tend to be rather lax and tend to stretch over a short period of time. So while they may help repair a complex abdominal wound, the result may still be a bulging abdomen which may later need another repair with a synthetic material.

#### **D) Composites**

The development of laparoscopic techniques for the repair of ventral hernias has necessitated the development of mesh products appropriate for those techniques. As stated above, prolene causes a very intense reaction from tissues it is left in contact with but when placed adjacent to bowel may cause serious complications. Gortex doesn't adhere to the bowel, but it doesn't really integrate with the tissue of the abdominal wall very well and may not be reliable for repairing a large defect. Collagen is very expensive and may stretch over time and once it is incorporated into the patient's own tissues may in fact become just a large hernia sac.

What if a mesh could be made that takes advantages of properties of one type of mesh on one side and another type of mesh on the other? That is what a composite is. There are composites of gortex and prolene, gortex and "other plastic" mesh, collagen and "plastic mesh" etc. Thus on one side you have a component that is safe to leave within the abdomen as it

will not cause too severe adhesions with the intestines, while the other side will evoke an intense reaction with the abdominal wall leading to a good hernia repair.

It should be noted that the peritoneum will rapidly grow over a collagen or gortex mesh left on the inside of the abdominal wall and protect the abdominal viscera. Prolene or Mersilene however, though they also will become peritonealized, still evoke a very strong inflammatory response resulting in dense adhesions.

## **CHOICE OF MATERIAL FOR FIXATION OF MESH**

### **A) Non-absorbable sutures-**

Most commonly utilized with open methods for fixing a hernia by direct tissue approximation with or without a mesh. One would want to use a non-absorbable suture to give lasting strength to the points of fixation of the mesh as well as tissue to tissue. Chief disadvantage is that the tails of the suture where they are tied, if left poking upwards toward the skin, particularly in a thin person, may cause discomfort if they begin to erode into the skin. They may even come to poking through the skin necessitating a minor procedure to trim back the tails.

However; sutures poking through the skin may provide a pathway for

bacteria to invade and cause a mesh infection. Fortunately, with just a little care and forethought, there are techniques for placing the sutures in such a way that the tails are buried in the subcutaneous tissue rendering this complication one of academic importance only.

## **B) Absorbable sutures**

These have the advantage of disappearing over time but also have the disadvantage of disappearing over time. If the entire repair depends on the fixation of the mesh to native tissue with sutures it would not be effective to use sutures that will be gone in a short period of time. On the other hand, depending on the surgical method to be employed for repair of the hernia, there may be a place for absorbable sutures.

## **C) Titanium, non-absorbable tacks**

Laparoscopic Hernia repair is much more easily performed because of the development of tacks for fixation of the mesh. These are tiny cork screw shaped tacks which are deployed through the mesh and fixate the mesh to the abdominal wall. The titanium tacks are non-absorbable, are compatible with MRI and are completely inert in tissue. They have two main disadvantages. Firstly, should a tack cause pain because of

its placement, the pain is not likely to resolve short of injection of the local nerve supply to the area. Secondly, and more theoretically, the ends of the tack are sharp,

and I for one am a little reticent placing a sharp tack in the abdominal wall where the abdominal viscera may rub against it. To my knowledge there has never been perforation of intestine or a fistula that has developed because of a hernia tack.

#### **D) Absorbable Tacks**

These are made of material similar to absorbable suture. The tacking device with tacks, are at least double the cost of the equivalent device with titanium tacks. There is no hesitation in using titanium tacks, however when doing a Laparoscopic Extra-peritoneal Hernia Repair with mesh as these tacks are outside of the abdominal cavity and are in contact with nothing. Absorbable tacks are gone in about 6 weeks, have a flat head but do not burrow as deep into tissue as do the titanium tacks, thus possibly necessitating the use of more of them.

## **CHOICE OF SUTURE METHOD**

### **A) Interrupted Suture**

The disadvantage is that for a large defect, you have to throw and tie a lot of sutures. This can be rather slow and tedious. The advantage is that if any one stitch should break or the knot should slip, your whole repair is not disrupted.

### **B) Running Suture-**

Much quicker to perform than interrupted suturing but should the stitch break or come loose through weak tissue at any point, you run the risk of your entire repair coming undone. Also, if you pull a running suture too tight as you go you may cause ischemia in the native tissue to which you are suturing your mesh. This may be a cause of recurrence.

### **C) Combination**

There are all kinds of combinations that exist. This may consist of U-sutures, figure of eights or running sutures to each quarter of the mesh or part way down a wound.

## **CHOICE OF PLACEMENT OF MESH**

### **A) ONLAY METHOD**

The subcutaneous tissue is dissected off of the hernia sack and off of the external fascia layer several centimeters back from the edge of the defect all around the entire defect. The hernia sack may then be opened to dissect adhesions if the patient is having obstructive symptoms. The sack should be preserved and closed so as to provide a barrier between the mesh and the abdominal viscera. If the fascia will come together without undue tension this can then be done. A mesh is placed over the fascia and sutured in place with two rows of suture. If the defect was not repaired primarily, then it is essential that the first row of sutures be placed around the defect and close together so as not to allow the sack or abdominal contents to pass between the anterior fascia and the mesh. Then an outer layer of sutures is placed along the edge of the mesh to secure the mesh to the fascia.

## **Advantages**

Easy to perform and does not require extensive undermining of extra-peritoneal layer.

## **Disadvantages**

Requires a lot of suturing to secure the mesh around the defect and then onto the surface of the fascia. Significant incidence of seroma formation over the mesh. May require placement of drains over mesh to avoid seroma formation. Most important is the fact that mesh secured to the outside of the abdomen is at a mechanical disadvantage against intra-abdominal pressure and gravity pushing against the mesh, and may lead to recurrence.

## **B) INLAY METHOD**

Essentially the same as the onlay method except that the mesh is secured to the edges of the defect only.

## **Advantages**

Easy to perform and does not require extensive undermining of extra-peritoneal layer. May be adequate for relatively small defects.

Less mesh in patient therefore less seroma formation and perhaps less risk of infection.



## **Disadvantages**

Suturing to the edge of the defect may involve sutures in attenuated and abnormal tissue. Again there is a mechanical disadvantage against intra-abdominal pressure and gravity which may lead to recurrence, especially if this method is used over large defects.

## **C) SUBLAY METHOD**

The mesh is placed inside in the extra-peritoneal plane

## **Advantages**

Mechanical advantage against intra-abdominal pressure and gravity obtained by placing mesh inside of defect with large overlap of mesh under fascia. Mesh not in subcutaneous tissue may result in lower risk of seroma and/or infection

## **Disadvantages**

Difficult dissecting pre-peritoneal space over broad area to make room for mesh. Difficulty in suturing or tacking mesh under fascia (though there are mesh products that make this easier).

## **D) LAPAROSCOPIC METHOD**

Using a camera and small incisions mesh is placed in the peritoneal cavity over the defect with large overlap.

### **Advantages**

Achieves mechanical advantage against intra-abdominal pressure and gravity by placing mesh inside defect with large overlap. Small punctures only for instruments used to do surgery. As with all Laparoscopic procedure there is a shorter recovery and return to normal function.

### **Disadvantages**

Placement of mesh can be difficult but there are techniques for making this fairly routine. Since the mesh is under the peritoneum, virtually all patients develop a seroma. Some surgeons will aspirate the seroma in the office though in most cases the seroma resolves on its own over time, but sometimes a long time.

## **E) COMPONENT SEPARATION**

The subcutaneous tissue is dissected off the fascia beyond the edge of the insertion of the external oblique fascia into the rectus sheath. A relaxing incision is made in the external oblique fascia just beyond that insertion point and continued along the entire length of the muscle from

the costal margin (just below the ribcage) to the iliac crest (the pelvic bone). The layer under the external oblique muscle is then freed up separating the external oblique muscle from the internal oblique and allowing the rectus to move several centimeters toward the midline.

Another similar incision may then be made internally through the inner rectus fascia allowing that layer to be turned toward the midline and both sides sutured together. This may be combined with an underlay mesh and/or an overlay mesh sutured to the cut edge of the external oblique. There is a laparoscopic method for performing the dissection of the external oblique fascia which may lessen some of the risks of this surgery.

### **Advantages**

Unlike any of the other procedures discussed prior, this operation brings the rectus muscle back to the midline and returns to the patient a functional abdominal wall. Results are excellent even for patients with huge hernias.

## **Disadvantages**

This is extensive surgery and is best for those with a primary incisional hernia involving most or all of the mid-line. Recurrent ventral hernias often involve missing tissue and this procedure may not be suitable for patients who have had a prior incisional hernia repair if there is significant loss of rectus fascia. The undermining of the skin and subcutaneous tissue as extensively as described may carry the risk of cutting off the blood supply to the skin and subcutaneous tissue overlying this area. This risk is higher in thinner patients. The results could be quite problematic especially if one has left a plastic mesh overlay as it will now be exposed if the skin should undergo necrosis.

## **OPERATIVE TECHNIQUE FOR THE STUDY**

### **A) ONLAY MESHPLASTY:**

The onlay repair was done under general anaesthesia with the skin incision over the bulge or the defect. Subcutaneous flaps raised above the anterior rectus sheath and the defect containing the hernia contents

were identified. The hernia sac was clearly dissected and the contents were reduced and the margins of the defect were held by Kocher forceps. The sac was dealt with and its contents were reduced into the abdominal cavity. With non-absorbable suture, the defect in the linea alba was closed and a proline mesh of adequate size was placed on the rectus sheath and secured with stitches. Hemostasis was secured and wound was closed over a suction drain. All the patients were given 1gm 3<sup>rd</sup> generation cephalosporin antibiotic preoperatively at the time of induction and continued till the 3<sup>rd</sup> postoperative day twice daily. The hospital stay of the patients was also recorded.



## **B) SUBLAY MESHPLASTY**

The steps preperitoneal mesh repair included two main steps; mesh placement deep to the recti muscles and mesh extension well beyond the hernia defect. After the sac was being dissected and delineated, the defect is opened and the preperitoneal space is created between the posterior rectus sheath and the rectus muscle for the placement of the mesh. The posterior rectus sheath and the peritoneum is closed with non-absorbable sutures. A proline mesh tailored to the size is placed in the already created plane behind the recti. The mesh is secured with few interrupted 2/0 polypropylene sutures. The anterior rectus sheath is closed with continuous 1/0 polypropylene suture and the skin closed. All the patients were given 1gm 3<sup>rd</sup> generation cephalosporin antibiotic preoperatively at the time of induction and continued till the 3<sup>rd</sup> postoperative day twice daily.



**OBSERVATION AND  
STATISTICAL ANALYSIS**

This study was conducted in the Department of General Surgery, Govt. Stanley Medical College & Hospital, Chennai for a period of ten months.

Patients who fulfilled the above mentioned inclusion and exclusion criteria were enrolled in this study, after obtaining an informed consent.

Total Number patients enrolled in the study – 50

Group A (Onlay meshplasty-25)

Group B(Sublay meshplasty-25)

The duration of surgery and early postoperative complications like Surgical site infections, flap necrosis , seroma and duration of hospital stay in both groups were evaluated and compared



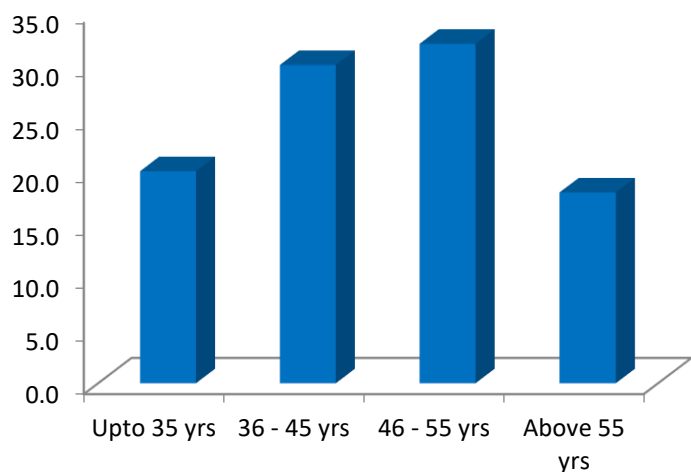
The collected data were analysed with IBM.SPSS statistics software 23.0 data descriptive statistics frequency analysis, percentage analysis were and the mean & S.D were used for continuous variables. To find the sig bivariate samples in Independent groups the Unpaired sample t-test wa in categorical data Chi-Square test was used similarly if the expected c 2×2 tables then the Fisher's Exact was used. In all the above statistical t considered as significant level.

P - Value	** Highly Significant at $P \leq .01$
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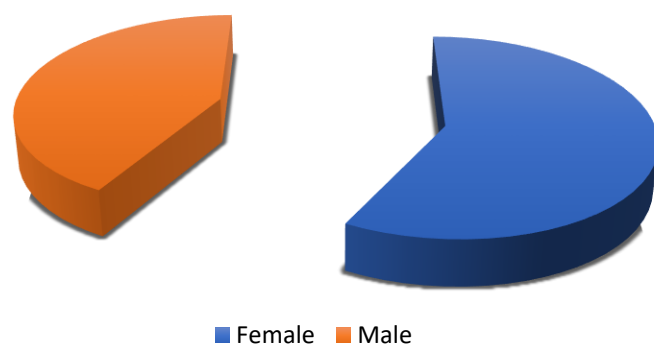
P - Value	# No Significant at $P > .05$
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### AGE AND GENDER DISTRIBUTION

**Age range distribution**



**Gender distribution**



		Frequency	Percent
Valid	Female	29	58.0
	Male	21	42.0
	Total	50	100.0

### Diagnosis

		Frequency	Percent
Valid	Epigastric	1	2.0
	Incisional	23	46.0
	Supraumbilical	26	52.0
	Total	50	100.0

		Frequency	Percent
Valid	Upto 35 yrs	10	20.0
	36 - 45 yrs	15	30.0
	46 - 55 yrs	16	32.0
	Above 55 yrs	9	18.0
	Total	50	100.0

CROSS TABS				Groups		Total
				Sublay	Onlay	
Sex	F	Count	15	14	29	
		% within Groups	60.0%	56.0%	58.0%	
	M	Count	10	11	21	
		% within Groups	40.0%	44.0%	42.0%	
Total		Count	25	25	50	
		% within Groups	100.0%	100.0%	100.0%	

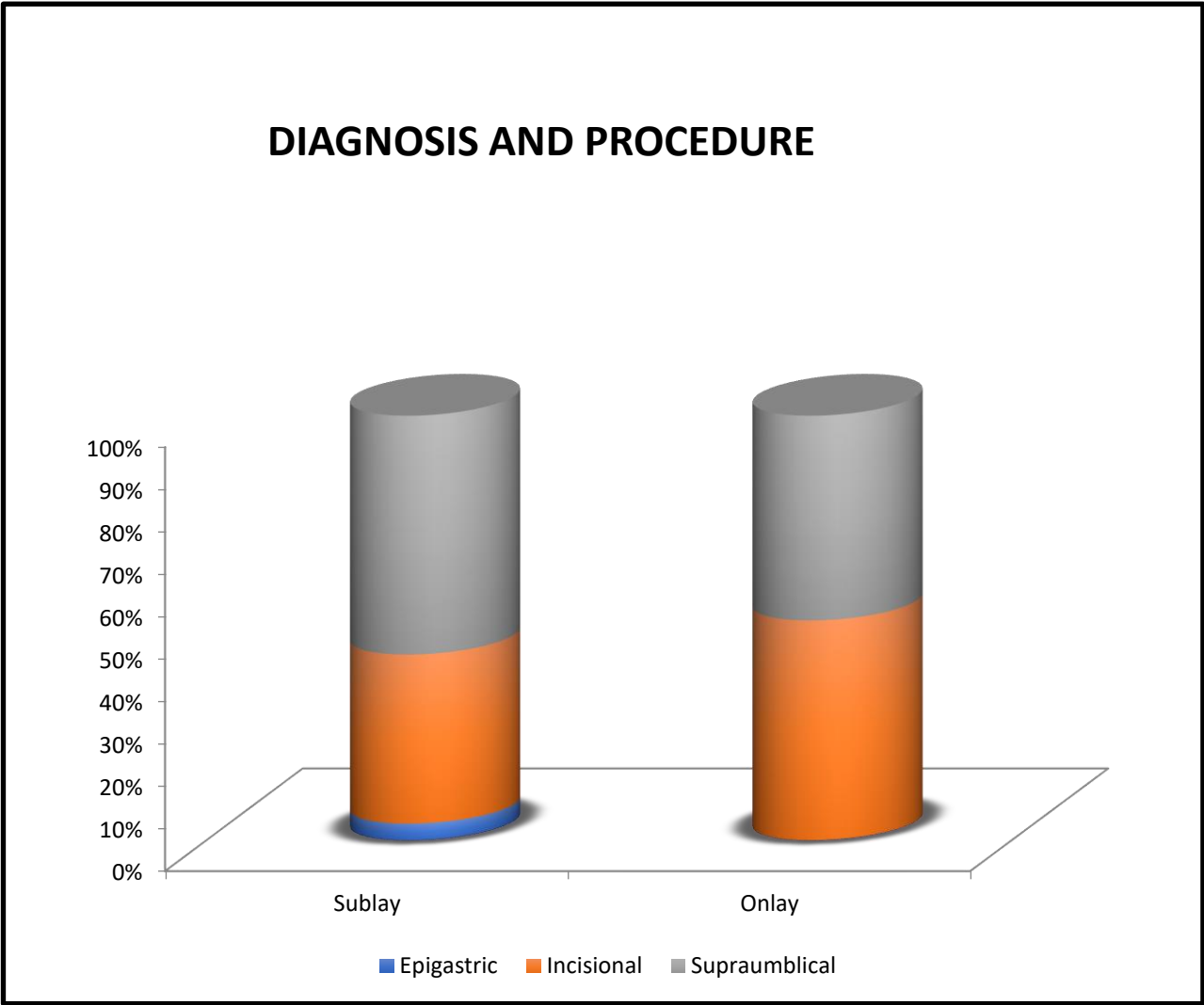
### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.082 <sup>a</sup>	1	.774		
Continuity Correction <sup>b</sup>	0.000	1	1.000		
Likelihood Ratio	.082	1	.774		
Fisher's Exact Test				1.000	.500
N of Valid Cases	50				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 10.50.

b. Computed only for a 2x2 table

# DIAGNOSIS AND PROCEDURE



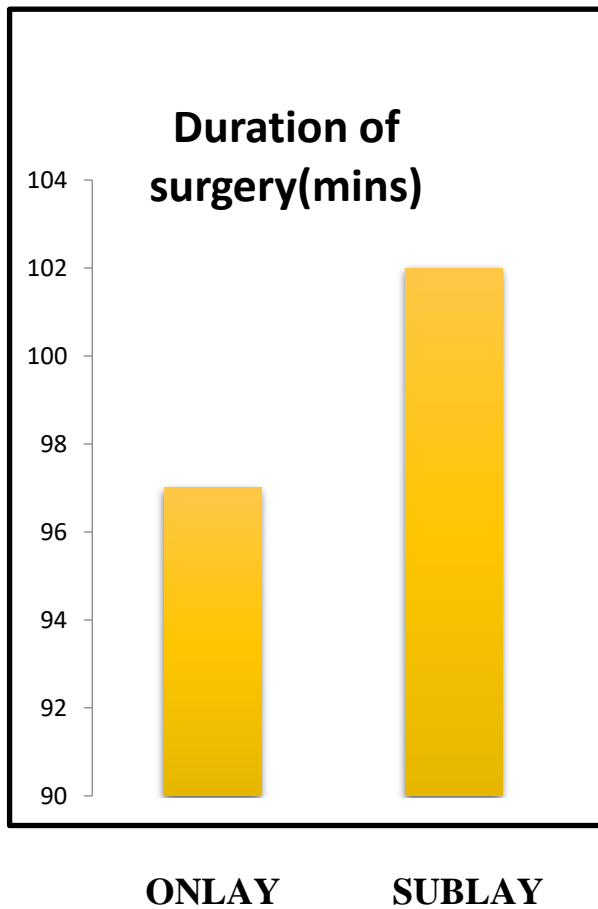
CROSS TABS			Groups		Total
			Sublay	Onlay	
Diagnosis	Epigastric	Count	1	0	1
		% within Groups	4.0%	0.0%	2.0%
		Count	10	13	23
	Incisional	% within Groups	40.0%	52.0%	46.0%
		Count	14	12	26
		% within Groups	56.0%	48.0%	52.0%
	Supraumbilical	Count	25	25	50
		% within Groups	100.0%	100.0%	100.0%
		Count	25	25	50
Total	% within Groups	100.0%	100.0%	100.0%	
	Count	25	25	50	
	% within Groups	100.0%	100.0%	100.0%	

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.545 <sup>a</sup>	2	.462
Likelihood Ratio	1.933	2	.380
N of Valid Cases	50		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is .50.

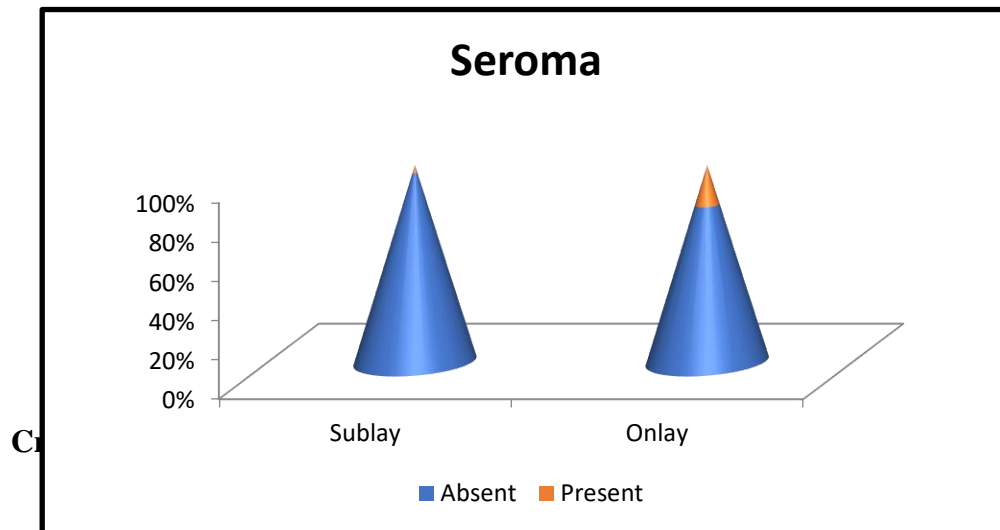
## DURATION OF SURGERY



### Mean Duration of Surgery

Mean duration of surgery in our series, in cases that underwent onlay mesh repair was 97 min, while in cases with pre-peritoneal Mesh repair took more time and the duration of surgery was 102 min in present series ( $P < 0.0001$ ).

## SEROMA:



The most common complication observed was seroma in 6 patients .

1 (4%) were in pre-peritoneal and 4 (20%) in onlay mesh repair group. This complication was managed with seroma drainage. Onlay technique had more of seroma formation, due to the fact that onlay techniques require significant subcutaneous dissection to place the mesh, which can lead to devitalized tissue with seroma formation or infection. The superficial location of the mesh also puts it in danger of becoming infected if there is a superficial wound infection.

Cross tabs			Groups		Total
			Sublay	Onlay	
Seroma	Absent	Count	24	20	44
		% within	96.0%	80.0%	88.0%
		Groups			
	Present	Count	1	5	6
		% within	4.0%	20.0%	12.0%
		Groups			
Total	Count	25	25	50	
	% within	100.0%	100.0%	100.0%	
	Groups				

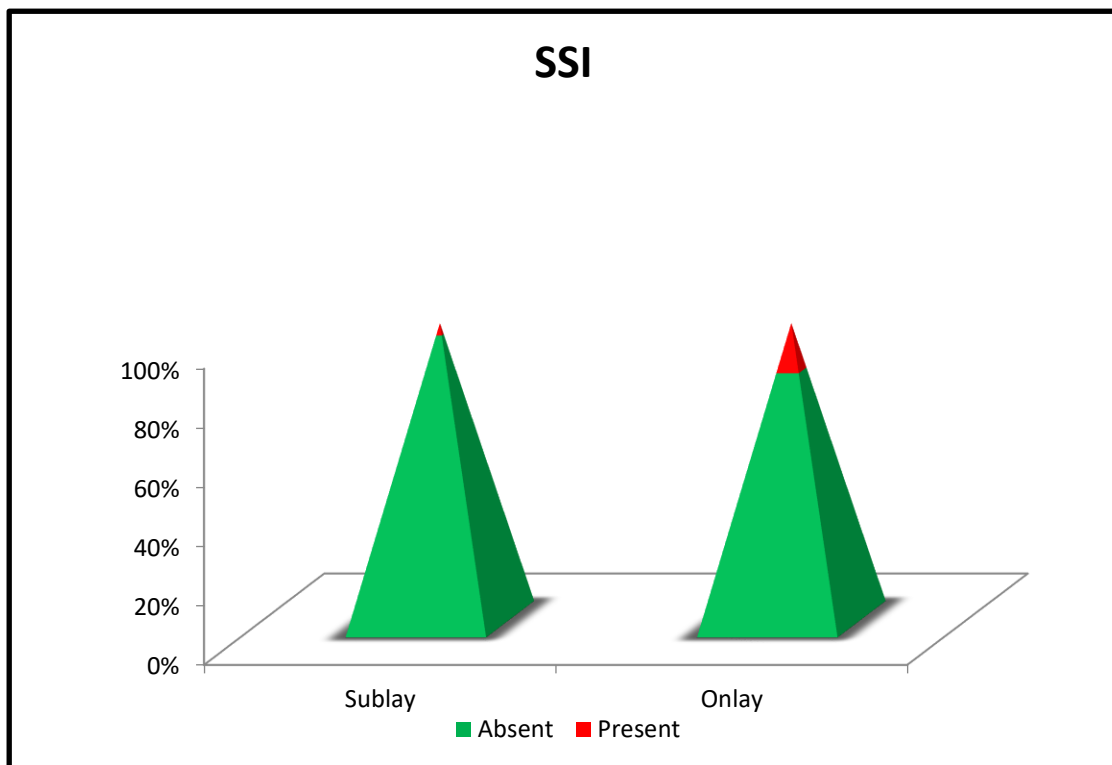
### Chi-Square Tests

	Value	df	Asymp. Sig. (2- sided)	Exact Sig. (2-sided)	Exact Sig. (1- sided)
Pearson Chi-Square	3.030 <sup>a</sup>	1	.082		
Continuity Correction <sup>b</sup>	1.705	1	.192		
Likelihood Ratio	3.275	1	.070		
Fisher's Exact Test				.189	.095
Linear-by-Linear Association	2.970	1	.085		
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.00.



## INFECTIONS:



Wound infection was found in 5 cases . Out of these, 1 (4%) were in a pre-peritoneal group and 4 (16%) were in onlay group. These patients were treated with appropriate antibiotics and regular dressing. No patient required removal of mesh because the infection was superficial and responded well to antibiotics

## Crosstab

				Groups		Total
				Sublay	Onlay	
SSI	Absent	Count		24	21	45
		% within		96.0%	84.0%	90.0%
		Groups				
	Present	Count		1	4	5
		% within		4.0%	16.0%	10.0%
		Groups				
Total	Count		25	25	50	
	% within		100.0%	100.0%	100.0%	
	Groups					

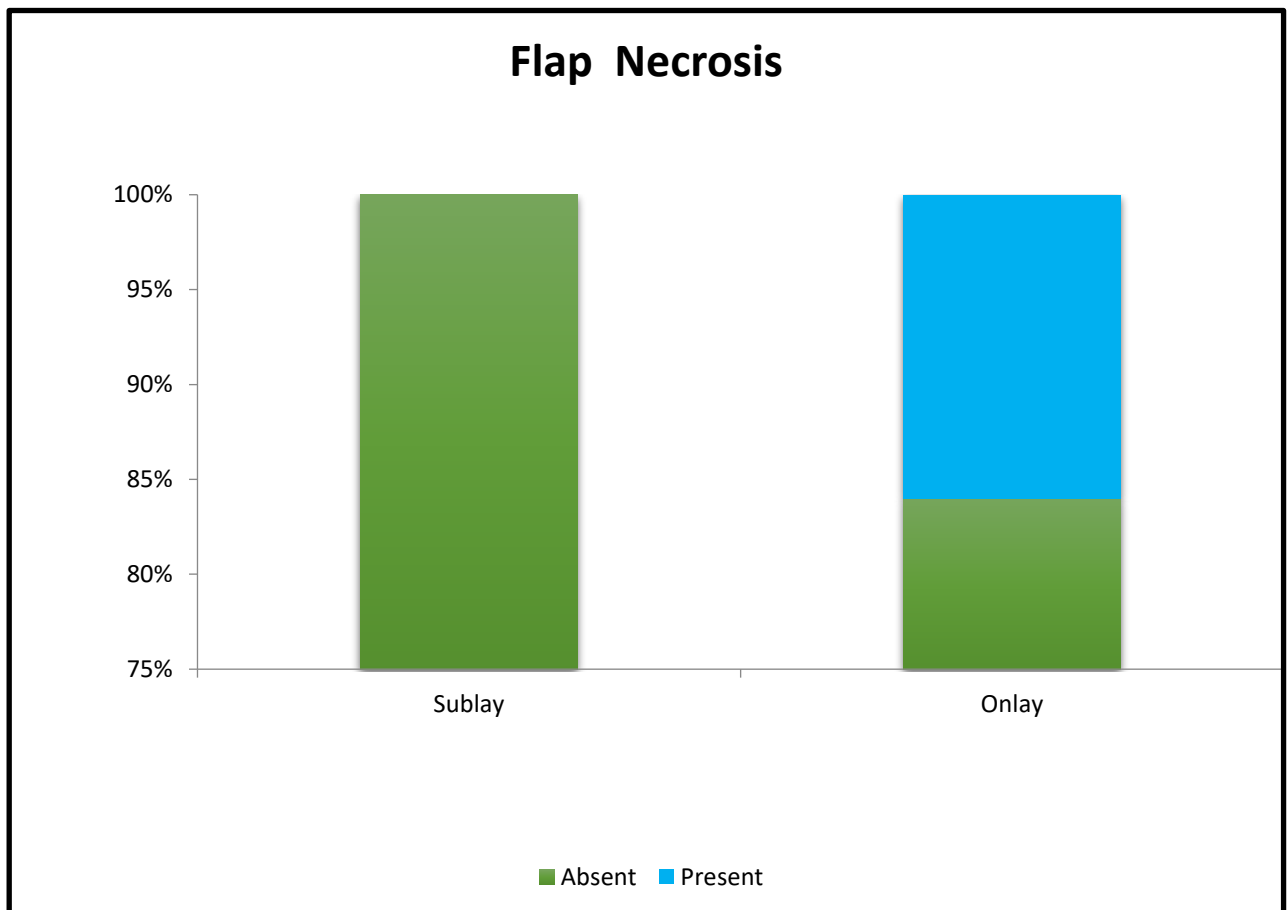
## Chi-Square Tests

	Value	df	Asymp. Sig. (2- sided)	Exact Sig. (2-sided)	Exact Sig. (1- sided)
Pearson Chi-Square	2.000 <sup>a</sup>	1	.157		
Continuity Correction <sup>b</sup>	.889	1	.346		
Likelihood Ratio	2.128	1	.145		
Fisher's Exact Test				.349	.174
Linear-by-Linear Association	1.960	1	.162		
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.50.

## FLAP NECROSIS:

Among 25 patients who underwent onlay meshplasty, flap necrosis was reported in 4 patients (16), compared to nil incidence in sublay mesh repair.



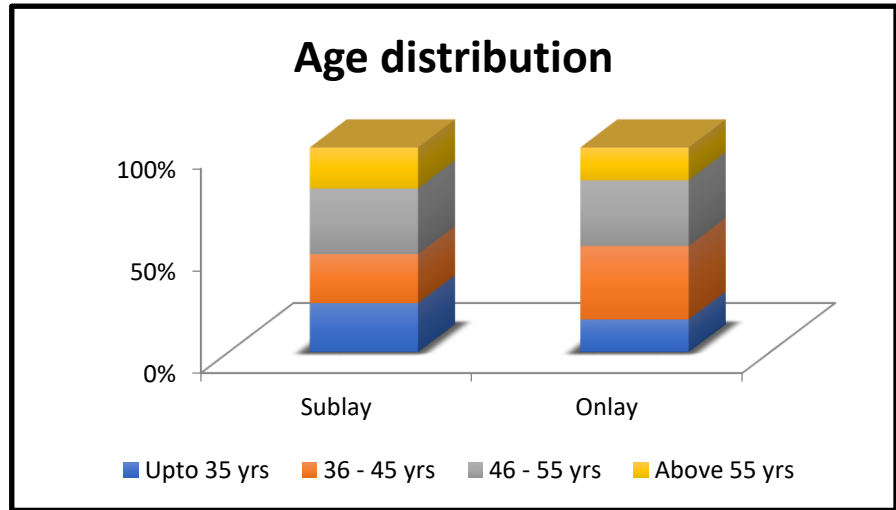
<b>CROSS TABS</b>				Groups		Total
				Sublay	Onlay	
Flap Necrosis	Absent	Count	25	21	46	
		% within Groups	100.0%	84.0%	92.0%	
		Count	0	4	4	
	Present	% within Groups	0.0%	16.0%	8.0%	
		Count	25	25	50	
		% within Groups	100.0%	100.0%	100.0%	
Total						

### Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.348 <sup>a</sup>	1	.037		
Continuity Correction <sup>b</sup>	2.446	1	.118		
Likelihood Ratio	5.893	1	.015		
Fisher's Exact Test				.110	.055
Linear-by-Linear Association	4.261	1	.039		
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 2.00.

Age :



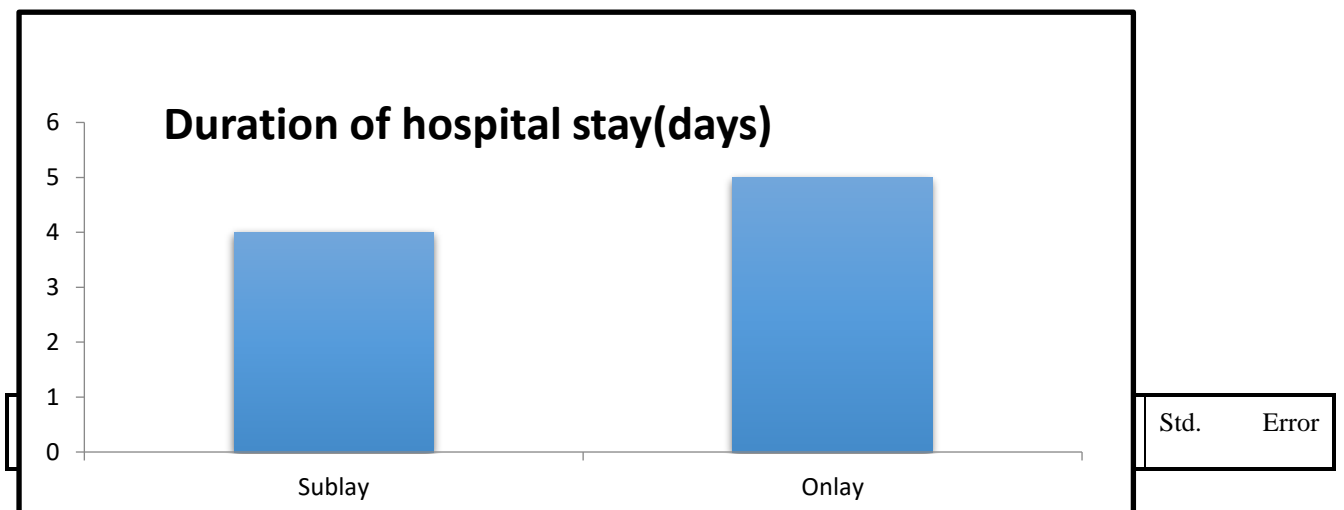
			Groups		Total	
			Sublay	Onlay		
<b>CROSS TAB</b>	Age	Upto 35 yrs	Count	6	4	10
			% within	24.0%	16.0%	20.0%
		Groups				
		36 - 45 yrs	Count	6	9	15
			% within	24.0%	36.0%	30.0%
		Groups				
	46 - 55 yrs	Count	8	8	16	
		% within	32.0%	32.0%	32.0%	
	Groups					
	Above 55 yrs	Count	5	4	9	
		% within	20.0%	16.0%	18.0%	
	Groups					
Total	Count	25	25	50		
	% within	100.0%	100.0%	100.0%		
	Groups					

<b>CHI SQUARE</b>	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.111 <sup>a</sup>	3	.774
Likelihood Ratio	1.118	3	.773
Linear-by-Linear Association	0.000	1	1.000
N of Valid Cases	50		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 4.50.

## DURATION OF HOSPITAL STAY

Average post-operative hospital stay period in present series for onlay mesh repair was 5 days, as compared to 4 days average hospital stay for pre-peritoneal mesh repair ( $P < 0.0002$ )



				Deviation	Mean
Age	Sublay	25	46.12	11.403	2.281
	Onlay	25	45.68	10.131	2.026
Duration of hospital stay(days)	Sublay	25	3.84	.987	.197
	Onlay	25	4.88	1.301	.260
Duration of surgery(mins)	Sublay	25	97.20	30.348	6.070
	Onlay	25	101.60	37.824	7.565

### Independent Samples

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Age	.144	48	.886	.440	g3.051
Duration of hospital stay	-3.184	48	.003	-1.040	.327
Duration of surgery(mins)	-.454	48	.652	-4.400	9.699

	Age		Duration of hospital stay(days)
Sublay	46	Sublay	4
Onlay	46	Onlay	5

# **DISCUSSION**



## **DISCUSSION:**

When considering the best location for placement of mesh, a number of features are to be considered.

Firstly, techniques that avoid the devascularisation of flaps will prevent wound complications like infections, flap necrosis and surgical site infections.

Secondly, technical ease and duration of surgery may affect the surgeon's choice .

Sublay repair allows tissue integration from two load-bearing tissues from both sides: posterior rectus sheath and the anterior myo-fascial complex. In addition, sublay mesh placement protects the mesh from exposure from superficial wound complications, intra-abdominal adhesions, and contamination. Creation of devascularizing skin flaps is avoided.

Onlay allows for tissue in growth from two directions, the skin flaps are not load bearing. Mesh placed in the onlay location is vulnerable forcing the surgeon to create devascularizing skin flaps and leaving the mesh susceptible to superficial wound complications.

## **1) DURATION OF SURGERY**

Mean duration of surgery in our study, in cases that underwent onlay mesh plasty is 95min and in pre-peritoneal Mesh repair it took more time and the average duration of surgery was 102 mins ( $P < 0.0001$ ). The difference could be accounted to more time required for dissection for creating pre-peritoneal space.

Ease of operation was largely subjective and depends on surgeons' experience, exposure, quality of assistance, and conducive facilities. Godara et al., reported a mean duration of 49.35 min for onlay and a mean duration of 63.15 min for pre-peritoneal mesh repair ( $P < 0.0001$ ), while in Gleysteen<sup>23</sup> series the mean duration for onlay and pre-peritoneal mesh repair were 42 and 70.5 min, respectively.

## **2) SEROMA:**

The most common complication observed was seroma in 5 patients .

Out of patients , 1 (4% ) were in preperitoneal and 5 (20%) in onlay mesh repair group. This complication was managed with seroma drainage. Onlay technique had more seroma formation, due to the fact that onlay technique requires significant subcutaneous dissection to place the mesh, which can lead to devitalized tissue . Liaqat ali zia et.al ina study of 100 patients reported 14 percent in onlay group and 4% in sublay group [40]. Julie L. Holihan reported

18 and 4 percentage in onlay sublay group respectively, which is similar with our study

### **3) SURGICAL SITE INFECTIONS:**

The superficial location of the mesh also puts it in danger of becoming infected if there is a superficial wound infection. Wound infection was found in 5 cases . Out of these, 1 (4%) were in a pre-peritoneal group and 4 (16%) were in onlay group. Bantu Rajsiddharth et al. in a study of 60 patients found surgical site infection in 6 cases (10%). Out of these, 2 (6.66%) were in a pre-peritoneal group and 4 (13.33%). This is similar to our study.

These patients were treated with appropriate antibiotics and regular dressing. No patient required removal of mesh because the infection was superficial and responded well to antibiotics.

### **4) FLAP NECROSIS:**

It was seen totally in 4(16%) patients. All 4(16%) were seen in onlay group with a nil occurrence in sublay group. This is similar to a study conducted by Julie L. Holihan<sup>1</sup> • Duyen H. Nguy in a group of 100 patients, 8(16%) developed discolouration of skin in onlay meshplasty with nil occurrence in sublay group. All the patients were treated conservatively for flap necrosis.

## **5) HOSPITAL STAY:**

The duration of post-operative hospital stay is an indirect indication of the degree of morbidity in terms of postoperative complications. Average post-operative hospital stay period for onlay mesh repair was 5 days, as compared to 4 days for pre-peritoneal mesh repair ( $P < 0.0002$ ), which were comparable to series published by de Vries Reilingh et al. 24 and Gleysteen<sup>23</sup>.

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## **CONCLUSION**

Sublay mesh repair is a good alternative to onlay mesh repair that may be applicable to all forms of ventral hernia as the mesh related overall complication rate like seroma, surgical site infections, flap necrosis and hospital stay are less compared to onlay meshplasty. Although time taken for surgery in sublay mesh repair is significantly higher compared to onlay mesh repair, complications and morbidity associated with it are significantly lower than onlay repair. Hence, sublay mesh repair can be used as the preferred method of choice for the treatment of ventral hernias.

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40. Comparative Study between Sublay and Onlay Technique of Repairing Ventral Abdominal Hernia LIAQAT ALI ZIA, AJMAL FAROOQ, IMRAN AMIN

## **CERTIFICATE – II**

This is to certify that this dissertation work titled

***“A COMPARATIVE STUDY BETWEEN ONLAY AND SUBLAY MESH  
REPAIR IN THE TREATMENT OF VENTRAL HERNIAS”***

of the candidate **BEN ABRAHAM** with registration Number  
221511052 for the award of **M.S. DEGREE EXAMINATION**  
in the branch of **BRANCH OF GENERAL SURGERY.**

I personally verified the urkund.com website for the purpose of plagiarism  
Check. I found that the uploaded thesis file contains from introduction to  
conclusion pages and result shows 8 percentage of plagiarism in the  
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Guide & Supervisor sign with Seal.



## Urkund Analysis Result

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### Sources included in the report:

FULL DISSERTATION.docx (D31037305)  
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### Instances where selected sources appear:

20

**GOVT.STANLEY MEDICAL COLLEGE, CHENNAI- 600 001**

**INFORMED CONSENT**

***“A COMPARATIVE STUDY BETWEEN ONLAY AND SUBLAY MESH REPAIR IN THE TREATMENT OF VENTRAL HERNIAS”***

Place of study: Govt. Stanley medical college, Chennai

I ..... have been informed about the details of the study in my own language.I have completely understood the details of the study.

I am aware of the possible risks and benefits, while taking part in the study.

I agree to collect samples of blood/saliva/urine/tissue if study needs.

I understand that I can withdraw from the study at any point of time and even then, I can receive the medical treatment as usual.

I understand that I will not get any money for taking part in the study.

I will not object if the results of this study are getting published in any medical journal, provided my personal identity is not revealed.

I know what I am supposed to do by taking part in this study and I assure that I would extend my full cooperation for this study.

Volunteer:

Witness:

Name and address

Name and address

Signature/thumb impression:

Signature/thumb impression

Date:

Date:

# PROFORMA

*“A COMPARATIVE STUDY BETWEEN ONLAY AND SUBLAY MESH REPAIR IN THE TREATMENT OF VENTRAL HERNIAS”*

Investigator: **DR.BEN ABRAHAM** ( PG 2nd year – MS .General Surgery)

Guide: **Prof. Dr.BALAMURUGAN** (Chief, Unit S7)

• NAME :

• AGE /SEX:

• ADDRESS WITH CONTACT NUMBER:

• IP NO:

• DATE OF ADMISSION:

• DATE OF SURGERY:

• DURATION OF SYMPTOMS:

**FINAL DIAGNOSIS:**

**HISTORY OF PRESENTING ILLNESS:**

**PAST HISTORY:**

WHETHER A KNOWN CASE OF  
DM/HYPERTENSION/ASTHMA/TB/EPILEPSY/CARDIAC ILLNESS  
H/O PRIOR HOSPITALISATION IN THE PAST FOR SIMILAR EPISODES ,  
IF ANY:

H/O PREVIOUS SURGERIES, IF ANY:

**GENERAL EXAMINATION: TEMP: P.R: B.P: R.R**

**SYSTEMIC EXAMINATION:**

CVS

RS

PER ABDOMEN:



**DURATION OF SURGERY (MINS):**

**EARLY POST OP COMPLICATIONS:                      YES                      NO**

A) Wound Seroma

B) Flap Necrosis

C) Suture site infection

D) Total duration of hospital stay

S.NO	NAME	Age/Sex	I.p No.	Diagnosis	Procedure	Seroma	SSI	Flap	Durat
								Necrosis	
1	Bagiyam	45/F	1624661	Supraumblical	Sublay	0	0	0	
2	Ramu	50/M	1621825	Incisonal	Sublay	0	0	0	3
3	Banumathi	39/F	1622233	Supraumblical	Sublay	0	0	0	4
4	Malarvizhi	39/F	1630359	Incisonal	Sublay	0	0	0	3
5	Chandra	55/F	1628408	Supraumblical	Sublay	0	0	0	4
6	Arumugam	68/F	1631406	Incisonal	Sublay	0	1	0	5
7	Nithya	49/F	1634692	Supraumblical	Sublay	0	0	0	3
8	Shanthi	47/F	1675366	Supraumblical	Sublay	0	0	0	6
9	Pattammal	45/F	1620107	Incisonal	Sublay	1	0	0	7
10	Saraswathi	64/F	1620056	Supraumblical	Sublay	0	0	0	3
11	Ganesan	31/M	1623158	Incisonal	Sublay	0	0	0	3
12	Mahadevan	65/M	1622683	Supraumblical	Sublay	0	0	0	4
14	Malliga	55/F	1620930	Supraumblical	Sublay	0	0	0	4
14	Abdul	48/M	1624153	Incisonal	Sublay	0	0	0	4
15	Ravishankar	48/M	1622118	Supraumblical	Sublay	0	0	0	
16	Antonyammal	35/F	1631406	Supraumblical	Sublay	0	0	0	3
17	Srinivasan	49/M	1667910	Supraumblical	Sublay	0	0	0	3

18	Chelladurai	57/M	1674581	Incisonal	Sublay	0	0	0	3
19	Suganya	28/F	1673295	Epigastric	Sublay	0	0	0	4
20	Ravikumar	32/M	1674646	Supraumblical	Sublay	0	0	0	4
21	Sathya	32/F	1675157	Incisonal	Sublay	0	0	0	4
22	Sivasankar	40/M	1656152	Supraumblical	Sublay	0	0	0	4
23	Buvaneshwari	32/F	1655123	Incisonal	Sublay	0	0	0	4
24	Yogaraj	40/M	169035	Supraumblical	Sublay	0	0	0	3
25	Saradha	60/F	1631337	Incisional	Sublay	0	0	0	4
26	Murugan	43/M	1634883	Supraumblical	Onlay	0	0	0	3
27	Suseela	55/F	1630586	Incisional	Onlay	1	0	0	4
28	Selvi	47/F	1640307	Supraumblical	Onlay	0	0	1	7
29	Radhika	65/F	1640072	Incisional	Onlay	0	1	0	5
30	Chitra	38/F	1654308	Supraumblical	Onlay	0	0	0	5
31	Natarajan	51/M	1642904	Supraumblical	Onlay	0	0	0	5
32	Mohan	38/M	163453	Supraumblical	Onlay	1	0	1	7

33	Subramani	60/M	164348	Incisional	Onlay	0	1	0	8
34	Geetha	40/F	1641850	Incisional	Onlay	0	0	0	4
35	Subulak0shmi	30/F	1641851	Supraumblical	Onlay	0	0	0	4
36	Asokan	48/M	1665651	Incisional	Onlay	0	0	0	3
37	Kasthuri	65/F	16459653	Incisional	Onlay	1	1	1	7
38	Mary sheeba	39/F	1647054	Supraumblical	Onlay	0	0	0	4
39	Raiza begam	48/F	16461999	Incisional	Onlay	0	0	0	5
40	Kamaraj	32/M	1652714	Supraumblical	Onlay	1	0	0	5
41	Muniyammal	65/F	1651218	Incisional	Onlay	0	0	0	4
42	Manoharan	48/M	1654003	Supraumblical	Onlay	0	0	0	5
43	Rayar	47/M	1648596	Incisional	Onlay	1	0	0	6
44	Jerintha	34/F	1674338	Supraumblical	Onlay	0	0	1	4
45	Ranjani	40/F	1700175	Incisional	Onlay	0	1	0	4
46	Rajeshwari	44/F	1710113	Incisional	Onlay	0	0	0	4
47	Murugan	35/M	1705187	Supraumblical	Onlay	0	0	0	6
48	Tamilselvi	40/F	1715156	Incisional	Onlay	0	0	0	5
49	Philip	50/M	1659531	Supraumblical	Onlay	0	0	0	4
50	Anand	40/M	1716819	Incisional	Onlay	0	0	0	4

INSTITUTIONAL ETHICAL COMMITTEE,  
STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : Comparative Prospective Study Between onlay & Sublay  
Mesh Repair in Ventral Hernias

Principal Investigator : Dr. Ben Abraham

Designation : PG MS ( General Surgery )

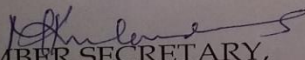
Department : Department of General Surgery  
Government Stanley Medical College,  
Chennai-01

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 24.02.2017 at the Council Hall, Stanley Medical College, Chennai-1 at 11am.

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

  
MEMBER SECRETARY,  
IEC, SMC, CHENNAI

**MEMBER SECRETARY  
ETHICAL COMMITTEE,  
STANLEY MEDICAL COLLEGE  
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