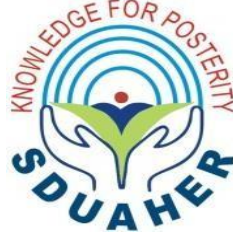


**COMPARATIVE STUDY OF COBBLER NEEDLE SUTURING VERSUS  
CONVENTIONAL SUTURING IN PORT CLOSURE IN LAPAROSCOPIC  
SURGERIES**

BY  
**DR. AKHIL VINCENT MBBS**



**DISSERTATION SUBMITTED TO  
SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH ,  
TAMAKA, KOLAR, KARNATAKA**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF**

**M.S. GENERAL SURGERY**

**UNDER THE GUIDANCE OF**

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Comparative Study of Cobbler Needle Suturing Versus Conventional Suturing in Port Closure in Laparoscopic Surgeries


**Background**  
Effective laparoscopic port closure is crucial for minimizing postoperative complications such as seroma, herniation, and surgical site infections (SSI). The Cobbler Needle Suturing technique has been proposed as an alternative to Conventional Hand Suturing, potentially offering better outcomes. However, limited studies have compared these techniques in clinical settings.

**Objectives**

- To assess the outcome of port closure in laparoscopy using Cobbler Needle
- To assess the outcome of port closure in laparoscopy using Conventional Hand Suturing
- To compare outcomes in above mentioned 2 groups in terms of seroma, herniation, surgical Site Infection in patients undergoing laparoscopic cholecystectomy or appendicectomy.

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A comparative observational study was conducted at R.L. Jajjee Hospital And Research Centre, Karnataka, from May 2023 to October 2024. A total of 60 patients undergoing laparoscopic cholecystectomy or appendicectomy were enrolled and evenly divided into two

  
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**Dr. Akhil Vincent**

## **ABSTRACT**

### **Title**

**Comparative Study of Cobbler Needle Suturing Versus Conventional Suturing in Port Closure in Laparoscopic Surgeries**

### **Background**

Effective laparoscopic port closure is crucial for minimizing postoperative complications such as seroma, hematoma, and surgical site infections (SSI). The Cobbler Needle Suturing technique has been proposed as an alternative to Conventional Hand Suturing, potentially offering better outcomes. However, limited studies have compared these techniques in clinical settings.

### **Objectives**

- To assess the outcome of port closure in laparoscopy using Cobbler Needle
- To assess the outcome of port closure in laparoscopy using Conventional Hand Suturing
- To compare outcomes in above mentioned 2 groups
- in terms of seroma, haematoma, surgical Site Infection in patients undergoing laparoscopic cholecystectomy or appendicectomy.

### **Methodology**

A comparative observational study was conducted at R.L. Jalappa Hospital And Research Centre, Karnataka, from May 2023 to October 2024. A total of 60 patients undergoing laparoscopic cholecystectomy or appendicectomy were enrolled and evenly divided into two groups using the even-odd allocation method: the Cobbler Needle Suturing group (n=30) and the Conventional Hand Suturing group (n=30). Patients were assessed for seroma, hematoma, and SSI on postoperative days 3, 5, and 7 through physical examination. Microsoft Excel was used to enter the data, and SPSS version 26.0 was used for Analysis .

## **Results**

Seroma formation was significantly lower in the Cobbler Needle group (6.7% on Day 3 vs. 33.3% in the Conventional Suturing group,  $P = 0.01$ ; 6.7% on Day 5 vs. 30%,  $P = 0.02$ ). By Day 7, only one case remained in the Cobbler Needle group, and no cases were observed in either group from Day 14 onward. Hematoma was also significantly less frequent in the Cobbler Needle group (3.3% on Day 3 vs. 30% in the Conventional group,  $P = 0.006$ ), with no cases in either group beyond Day 7. Similarly, SSI was higher in the Conventional Suturing group, with 30% affected on Day 3 compared to none in the Cobbler Needle group ( $P = 0.001$ ). By Day 5, SSI rates declined, and no infections were recorded after Day 14.

## **Conclusion**

Cobbler Needle Suturing demonstrated a significantly lower incidence of seroma, hematoma, and SSI in the early postoperative period compared to Conventional Hand Suturing. These results imply that the Cobbler Needle technique may be a superior option for laparoscopic port closure, improving patient outcomes and reducing postoperative complications. Additional large-scale studies are recommended to confirm these results.

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## LIST OF ABBREVIATIONS

|              |  |
|--------------|--|
| <b>MIS</b>   | <b>Minimally Invasive Surgery</b>                      |
| <b>SSI</b>   | <b>Surgical Site Infection</b>                         |
| <b>VATS</b>  | <b>Video Assisted Thoracic Surgery</b>                 |
| <b>NOTES</b> | <b>Natural Orifice Transluminal Endoscopic Surgery</b> |
| <b>PCNL</b>  | <b>Percutaneous Nephrolithotomy</b>                    |
| <b>RFA</b>   | <b>Radio Frequency Ablation</b>                        |
| <b>TSH</b>   | <b>Trocar Site Hernia</b>                              |
| <b>PSI</b>   | <b>Port Site Infection</b>                             |
| <b>PSM</b>   | <b>Port Site Metastasis</b>                            |
| <b>PSHC</b>  | <b>Port Site Hydatid Cyst</b>                          |
| <b>PST</b>   | <b>Port Site Tuberculosis</b>                          |

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# INTRODUCTION



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## **INTRODUCTION**

Minimally invasive surgery (MIS) are advanced surgical techniques that accesses internal organs via small incisions or natural sources within the body as opposed to the large substantive incision typically associated with traditional surgery. MIS is aimed mainly at reducing tissue damage due to the non-requiring cutting through the skin, muscles, and other structures. With newer surgical instrumentation such as laparoscopes, endoscopes, and robotic devices, surgeons can now do much of this with improved precision with less impact on the body. This approach offers numerous advantages over open surgery, including reduced pain, fewer complications, faster recovery, and smaller scars. Laparoscopy, endoscopy, thoracoscopy, and robotic-assisted surgery are some of the most frequently performed MIS. <sup>(1,2)</sup> Where laparoscope a small camera inserted via small incisions in the abdomen, means that laparoscopic surgery is minimally invasive. It enables doctors to visualize the inner organs clearly and operate with a great level of precision. Within the general surgery field, laparoscopy is primarily employed for cholecystectomy and appendectomy procedures. In urology, techniques minimizing invasion like MIS are well-used for prostatectomy or nephrectomy. Gynecologists are another group that uses these techniques for surgeries like hysterectomy and oophorectomy. In addition, MIS also plays a role in thoracic surgery, including lung resections, as well as colorectal, bariatric, and vascular surgeries. We keep up the great work and surpass boundaries through these innovations that have turned surgical practices around; shortening recovery periods <sup>(1-3)</sup> and improving overall care. (1-3)

Laparoscopy, especially, constituted a surgical revolution once Dr. Mouret first introduced it in 1987 for abdominal surgery. A key improvement over conventional open surgery was that surgeons could now perform much of the operation via smaller incisions, resulting in much more favourable outcomes in patients. Over the years since its introduction, laparoscopy has progressed with technological advances, including high-definition cameras, sophisticated instrumentation, and robotic assistance, to become an indispensable part of modern surgery. It has found numerous applications in different disciplines of medicine and is now the approach of choice for the majority of surgeries performed in the abdomen and pelvis. Reduced risk of infection, short recovery time, and better cosmetic results are the benefits of laparoscopy that have evolved as a surgical routine, therefore enhancing overall patient care. <sup>(2-4)</sup> The use of laparoscopy has become one of the cornerstone techniques of contemporary surgery, and laparoscopic procedures such as laparoscopic - cholecystectomy, laparoscopic - hernia repair, laparoscopic - appendectomy, laparoscopic - colorectal surgery, laparoscopic - bariatric surgery have been demonstrated to be the most commonly performed surgical operations worldwide. Laparoscopic cholecystectomy used to treat

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problems with the liver and gallbladder accounts for 70-80% of laparoscopic surgical cases, and laparoscopic hernia repair 10-15%. Appendectomies, for appendicitis, account for 5-10%, and laparoscopic colorectal surgeries, including colectomies, for the same proportion, or 5-8%. Approximately 3–5% of laparoscopic bariatric surgeries are performed for weight management. Laparoscopy is an innovative surgical technique that involves performing surgeries through small incisions, which enhances recovery when compared to open surgeries. The complexity of its procedures due to the use of robotic surgery, which enables difficult surgeries with reduced invasiveness in the body thus contributing to the safety and success of surgical interventions in several different medical disciplines. <sup>(3-5)</sup>

Laparoscopic surgery involves a series of precise steps designed to minimize surgical trauma and accelerate recovery. The procedure commences with patient positioning under GA. After the sterile preparation, an initial incision is made, typically around 1-2 cm, to insert a trocar, such as the Veress needle or the Hasson trocar, for pneumoperitoneum induction, typically maintaining intra-abdominal pressure at 12-15 mmHg using carbon dioxide. Once adequate insufflation is achieved, a 10-12 millimetres port is inserted through the trocar for the laparoscope, which provides high-definition video visualization of the abdominal cavity. <sup>(5-7)</sup> Additional trocars, usually spanning from 5 mm to 12 mm in size, are placed depending on the surgical requirements, with specialized instruments such as the Endo-Closed, LigaSure, or harmonic scalpel used for tissue dissection and hemostasis. After the completion of the surgery, the port closure phase begins, which is critical in preventing complications such as port-site hernias and wound infections. Port closure is performed through fascial suturing, where the fascia is re-approximated using techniques like the conventional hand-sewing method with absorbable sutures (e.g., 0-2 Vicryl or PDS) or advanced techniques like the cobbler needle method. The last step is to ensure that the skin closes securely, often with a subcuticular stitch or tissue adhesive via Dermabond followed by placing a sterile dressing. Correct closure of the port sites is vital in preventing postoperative complications and promoting recovery. <sup>(6,7)</sup>

Laparoscopic port closure is to close the access sites, in laparoscopic and robotic surgeries, to minimize the occurrence of complications like hernias and hematomas. Trocars for laparoscopic procedures are inserted, typically into the abdomen, requiring subsequent effective incision closure to restore abdomen wall integrity. There are multiple techniques for port closure — from direct hand suturing to advanced techniques that make use of mechanical devices, for example, the Carter-Thomason suture passer. of the specific method is determined by trocar size, patient BMI, and surgeon's preference. The cobbler needle method is simpler and faster compared

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with conventional hand-sewing techniques, and has the benefits of decreased closure time, while conventional hand-sewing is common, but also takes longer and is possibly associated with more complications. In the event, port closure is an important procedure to minimize post-surgical problems by reducing the risk of infections and herniation where patients are considered high-risk. Furthermore, advancements in port closure have resulted in rapid recovery, decreased postoperative discomfort, and improved cosmetic outcomes, all of which elevate the success of laparoscopic surgeries. <sup>(1-3, 6,7)</sup>

The cobbler needle is an essential instrument for port closure during laparoscopic procedures and is frequently utilized for securing various incisions, especially those exceeding 10 mm in size. Made of high-quality stainless steel, it has a blunt curved tip to reduce trauma. Usually measures 12–15 centimeters long, 2–3 millimeters wide allowing for placement of precise sutures with something such as Vicryl. The needle was introduced at 5–10 mm from the edge of the wound, with suture intervals of about 5–10 mm to provide uniform tension. It serves as a low-cost and reliable solution to close the location of the laproscopic ports and may help prevent complications, such as hernia formation. Recent innovations include disposable varieties and more ergonomic designs for greater precision. The cobbler needle is still widely used, despite newer devices, because it is simple and effective with low tissue damage. <sup>(8-11)</sup> Conventional suturing (polyglactin 910 or polypropylene) is employed to close laparoscopic port sites larger than 10 mm. The technique consists of passing a needle through the fascial edges, anchoring the tissue with knots, and placing 5–10 mm apart sutures. Although useful, it can be time-consuming and requires skill, with potential complications such as needle-stick injury and herniation if performed incorrectly. Novel devices such as suture passers have been developed to streamline this process; however, the closure of the port with suturing still needs to be performed in a conventional manner. <sup>(10-13)</sup>

Hernias, hematomas, surgical site infection (SSI), and seromas are common port-site complications in laparoscopic surgery. Improper closure or trauma during the surgery can lead to these complications. Among such infections, SSIs are of particular concern as they can result in prolonged recovery, prolonged hospital stay, and, additional treatment. Hematomas and seromas also delay healing and are painful, by accumulating blood or fluid at the port site. Correct methods to close and sterile techniques are of great importance to decrease complications and achieve optimal healing. Complications at the port site, which happen in 1% to 6% of cases, can be limited with various techniques. Examples of these techniques include the use of the Carter Thompson port closure system, Cobbler needles, and S-retractors for adequate closure. An

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insufficient fascial suture, infection, or suture failure, can lead to complications including seroma, hematoma, and surgical site infections, hence the proper closure of laparoscopic ports is important.<sup>(12-14)</sup> This technique is a one-step technique using a custom curved needle, facilitating precise closure of the fascial layers. This technique has been reported to achieve quicker closure times, shorter procedure times, and lower complication rates compared to traditional suturing.<sup>(11-13)</sup> On the contrary, classical suturing is a two-step method with a straight needle, usually using absorbable sutures (e.g., Vicryl or PDS) which is time-consuming and needs more skill. While certainly effective, this technique can be more error-prone and complicated, especially in terms of securing the fascial layers. Port closure is particularly important for any port larger than 10 mm, and adequate closure is vital to prevent port-site hernias. While both techniques are well described, the cobbler needle method is preferred for its efficiency and decreased complication rate and is particularly desirable in patients with multiple risk factors or complex laparoscopic surgeries.<sup>(12-15)</sup>

The rationale of this study is being devised, is to identify if the cobbler needle would be a comparatively accurate, more time-saving, and useful way than traditional suturing which is generally time-consuming, and authority-dependent. This study is important to identify the optimal technique for minimizing complications such as hernias, infection, or seromas, in these combinations, and ultimately improve recovery and effectiveness of surgical treatment by comparing the outcomes and port site complications between both techniques. The innovation appears to be in potentially utilizing the cobbler technique to ease port closure, operative time, and complications such as hernia formation, hematoma, seroma, and infection. Clinically, based on a widely accepted standardized technique, this study offers a simple, reproducible, and dependable technique for laparoscopic port closure that could improve patient outcomes and surgical efficiency, particularly in complex or challenging cases.<sup>(12-15)</sup> Therefore, against this background, our study's objective was to assess and compare the outcomes of Cobbler needle suturing versus conventional suturing for port closure in laparoscopic surgeries.

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# AIM & OBJECTIVES



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## **AIM**

To compare the effectiveness of port closure using the Clobber Needle Technique versus Conventional Hand Suturing in patients undergoing laparoscopic cholecystectomy or laparoscopic appendicectomy, focusing on postoperative complications such as seroma, hematoma, and surgical site infection.

## **OBJECTIVES**

- To assess the outcome of port closure in laparoscopy using Clobber Needle .
- To assess the outcome of port closure in laparoscopy using Conventional Hand Suturing .
- To compare outcomes in above mentioned 2 groups in terms of seroma ,haematoma , surgical Site Infection in patients undergoing laparoscopic cholecystectomy or laparoscopic appendicectomy .

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# REVIEW OF LITERATURE



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## **REVIEW OF LITERATURE**

### **ANATOMY AND SURGICAL PART:-**

#### **I. MINIMALLY INVASIVE SURGERIES (MIS)**

Minimally invasive techniques, commonly termed minimally invasive surgeries (MIS), utilize surgical approaches requiring smaller cuts, thereby minimizing recovery duration, discomfort, and infection risks. Essentially, MIS signifies surgical interventions performed through minimal incisions, leading to quicker healing. Also recognized as laparoscopic or keyhole methods, these procedures starkly differ from conventional open surgeries, which necessitate larger openings and may result in substantial wounds that are often painful and demand extended recovery periods. MIS techniques involve creating tiny openings through which specialized tools and a small camera are introduced, enabling surgeons to perform operations while observing high-resolution visuals on a monitor. Frequently, patients leave with only minor dressings over their incision sites. Progress in medical innovations has revolutionized these practices, ensuring greater safety and accessibility while enhancing patient experiences by reducing surgical trauma and expediting rehabilitation. MIS aims to reduce hospital stays and recovery periods after surgery by minimizing damage to soft tissues, often involving a smaller incision on the skin. <sup>(16)</sup>

Interventional radiologists were the pioneers of minimally invasive techniques. The term “minimally invasive surgery” can refer to an established surgical technique conducted through smaller cuts to the skin and soft tissues. They used complex imaging systems to thread instruments via catheters through the body, eliminating the large cuts usually made in traditional surgery. It paved the way for many of the world’s medical conditions to be treated without the lengthy and invasive processes of traditional surgery. In contrast, non-invasive procedures refer to diagnostic techniques that do not penetrate the body's skin, involve puncturing, or implanting foreign material into the body. Most treatment options also come under this non-invasive category. An excellent example of such non-invasive solutions is radiation therapy or radiotherapy, a non-surgical solution for different medical needs. Radiotherapy is used for cancer treatment by emitting focused rays of radiation on the malignant cells while limiting damage to normal tissues, and it spares risk in surgery. These innovations have greatly improved treatment options, providing safer and less invasive medical solutions. <sup>(16, 17)</sup>

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## **II. TYPES OF MIS**

MIS methods are currently employed for abdominal conditions such as appendicitis and gall bladder disorders; hip joint and knee replacement; hiatal hernia repair; select cardiac and lung surgeries; and, when necessary, bariatric (weight reduction) procedures, along with many other medical interventions. There are many different types of MIS for different medical conditions and parts of the body. Laparoscopy, a common approach, includes tiny slashes to the abdomen in order to insert cameras and instruments for procedures such as gallbladder removal, hernia repair, and appendectomy. Thoracoscopy, which is also referred to as video-assisted thoracic surgery (VATS), is performed for thoracic operations, including lung resections or biopsies. Endoscopic methods use flexible instruments with cameras to reach inner bodies such as the gastrointestinal tract or sinuses from the inside out, avoiding wounds to the surface. Robotic-assisted systems use robotic arms that surgeons manipulate to improve precision in surgeries, including hysterectomies and prostate-removal surgery. Moreover, “minimally invasive” catheter-based angioplasty and stenting deal with vascular problems through small punctures. These various MIS alternatives provide less trauma, faster recovery and fewer complications compared to conventional open surgeries. <sup>(16-18)</sup>

| <b>Procedure</b>   | <b>Description</b>  |
|--|---|
| <b>Laparoscopy</b>   | Utilizes small cuts to insert a tube with a camera and light to view organs or perform surgeries with minimal patient trauma. Often used for abdominal procedures or tissue sampling. |
| <b>Arthroscopy</b>   | A thin, flexible camera (arthroscope) is introduced through a small incision near joints like the knee to inspect, diagnose, and occasionally repair joint issues.                    |
| <b>Bronchoscopy</b>  | A tube with a camera and light is guided through the nose or mouth into the airways, aiding in lung evaluations, tissue sampling, and removal of foreign objects.                     |
| <b>Endoscopy</b>   | A flexible tube with a camera (endoscope) is used to explore the digestive tract & collect tissue samples for diagnostic purposes.  |
| <b>Natural orifice transluminal endoscopic surgery (NOTES)</b> | Accesses the abdominal cavity through natural openings (e.g., mouth, rectum), minimizing scarring and recovery time.  |
| <b>Hysteroscopy</b>  | A narrow telescope (hysteroscope) is inserted via the vagina to visualize and treat uterine conditions like polyps, fibroids, or scars without any external                           |

|  |   |
|--|---|
|  | incision.   |
| <b>Parathyroidectomy</b>                           | Removes abnormal parathyroid glands through a small neck incision under local-anesthesia, typically performed as an outpatient .  |
| <b>Robotic surgery</b>                             | The surgeon operates robotic arms from a console that features 3D imaging, allowing for incredibly precise procedures in hard-to-reach places such as the pelvis or throat.   |
| <b>Sigmoidoscopy</b>                               | This procedure involves looking at the rectum and sigmoid colon with a flexible tube equipped with a camera. It's used for diagnostic reasons or to carry out minor medical procedures.                                   |
| <b>Video-assisted thoracoscopic surgery (VATS)</b> | This technique involves making small incisions in the chest to insert a camera, known as a thoracoscope, along with specialized instruments. It's used for diagnosing and treating various lung or esophageal conditions. |
| <b>Cystoscopy</b>                                  | A slender tube equipped with a camera is gently inserted through the urethra to take a closer look at the bladder and urinary tract, helping with diagnosis or minor surgical procedures.                                 |
| <b>Angioplasty</b>                                 | A catheter featuring a balloon is carefully introduced into blood vessels to help widen narrowed arteries, and this is often done alongside placing a stent.  |
| <b>Myomectomy</b>                                  | This procedure involves removing uterine fibroids through small incisions while keeping the uterus intact, and it's typically performed using laparoscopic or robotic techniques.   |
| <b>Percutaneous nephrolithotomy (PCNL)</b>         | This procedure involves removing kidney stones via a tiny incision in the back, using specialized tools that are often guided by imaging technology.  |
| <b>Cryoablation</b>                                | It employs extreme cold, delivered through a probe, to eliminate abnormal tissues, such as tumors found in organs like the kidney or liver.   |
| <b>Radiofrequency ablation (RFA)</b>               | Additionally, it uses heat energy through a probe to target and destroy cancerous cells or troublesome tissues, and it's commonly applied for treating liver tumors or providing relief from nerve pain.                  |

**Table 1: Various types of MIS** <sup>(16-19)</sup>

### **III. ADVANTAGES OF MIS**

While Minimal Invasive Surgery has several advantages over traditional open surgeries making it a more effective and less agonizing option for patients. MIS minimizes tissue disruption by employing smaller incisions, resulting in faster recovery and a reduced risk of complications. Here are some key advantages:

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- Less tissue damage: Smaller incisions can be less damaging to surrounding organs, tissues and muscles.
  - Much quicker recovery time: A lot of procedures can be performed on OPS basis, eliminating prolonged hospital stays.
  - Less scarring: Because those incisions are so small, scars are much less visible.
  - Lower infection risk: Less-invasive procedures with smaller cuts lead to a lower risk of postoperative infections.
  - Less complication: MIS usually causes less troubles such as adhesion or wound separation.
  - Fast recovery: Patients return in days rather than weeks, allowing them to resume normal activities sooner.
  - Reduced pain: Smaller cuts means you'll experience less post-surgery pain.
  - Shorter procedure time: Most MIS techniques take less time to complete, although this can vary.
  - Minimal Blood loss: MIS normally produces less bleeding throughout the surgery.
  - Lower dependence on analgesics: Less postoperative pain reduces the need for narcotics.
  - Lower treatment costs: The combination of faster recovery and shorter hospital stays often leads to reduced overall costs.
  - Enhanced patient experience: The less invasive nature of MIS generally leads to higher satisfaction due to quicker recovery and fewer complications. <sup>(16-18)</sup>

#### **IV. THE EVOLUTION OF MIS**

The evolution of MIS has revolutionized surgery, beginning with the use of the cystoscope for bladder lesions. In 1931, *Takagi* from Tokyo introduced a 3.5 mm arthroscope, later advanced by his student *Marski Watanabe*, who published the *Atlas of Arthroscopy* in 1957. This innovation led to arthroscopy becoming a key method for diagnosing and treating knee conditions. Over the years, MIS expanded into various specialties, driven by the need for less invasive procedures and technological advancements, transforming surgical practices with reduced trauma and improved outcomes. By the 1980s, laparoscopic techniques gained traction, particularly with the advent of laparoscopic cholecystectomy, which redefined abdominal surgery by reducing recovery time and postoperative pain. This decade marked a pivotal shift, with MIS becoming increasingly accessible to surgeons worldwide. <sup>(17-20)</sup>

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In the 1990s, MIS expanded further with advancements in instrumentation and imaging. The introduction of high-definition cameras and energy devices allowed complex procedures like laparoscopic colectomy and fundoplication to be performed safely. The early 2000s witnessed the rise of robotic-assisted surgery, with systems like the da Vinci robot enabling enhanced precision and dexterity. In the 2010s, minimally invasive techniques advanced into more complex and demanding fields like cardiac and thoracic surgery, including off-pump surgery and endoscopic methods. The 2020s have been centered around the integration of artificial intelligence, augmented reality, and telepresence technologies to deliver safer procedures and optimal outcomes. Pioneers such as Dr. Paul DeCamp at the Ochsner Clinic, who introduced thoracoscopy in the mid part of 20th century, contributed well to the MIS. Laparoscopic cholecystectomy then transformed abdominal surgery, reducing pain and recovery time. Advancements in MIS, such as robotic cameras, began to enhance the approach, as did the introduction of robotic systems, particularly in cardiac procedures. Though this may be innovative and game-changing, I believe nothing wrong with MIS patient safety and cost effectiveness can be achieved without careful training and evaluation. <sup>(18-22)</sup>

## **V. LAPAROSCOPIC SURGERIES**

Laparoscopic surgery, often hailed as the cornerstone of MIS, represents a groundbreaking shift in how we approach surgical procedures today. This technique allows surgeons to perform operations through tiny incisions, using specialized instruments and a laparoscope. The journey of laparoscopic surgery began back in 1901, thanks to Georg Kelling, a pioneering German physician. This innovative method involves carrying out procedures within the abdominal or pelvic cavity through small cuts, typically between 0.5 to 1.5 cm, all while utilizing a camera for better visualization. The laparoscope itself is a slim tool equipped with a high-resolution camera, providing surgeons with a magnified and detailed view of the internal anatomy displayed on a video monitor. This technology not only facilitates diagnostic assessments but also allows for treatments, all through just a few small openings in the abdomen. The fundamental tool in this technique is the laparoscope, a thin, flexible fiber-optic instrument that provides a detailed view of the affected region by maneuvering it from a remote yet accessible entry site. This innovation significantly reduces the need for large incisions, which were characteristic of traditional open surgeries, thereby minimizing tissue disruption and postoperative discomfort. Emerging in the late 20th century, laparoscopic surgery marked a pivotal shift in surgical practice by improving precision, decreasing recovery times, and enhancing patient outcomes. <sup>(21, 22)</sup>

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The versatility of laparoscopic techniques has made them pivotal in managing a variety of abdominal and pelvic conditions. Frequently performed laparoscopic procedures include cholecystectomy for gallbladder removal, appendectomy for appendicitis, and hernia repair for inguinal and abdominal wall defects. Additionally, laparoscopic surgery plays a key role in bariatric procedures such as gastric sleeve and gastric bypass for weight management. In gynecology, it is widely employed for hysterectomy, ovarian cyst removal, and the treatment of endometriosis, while in urology, it is used for nephrectomy and prostatectomy. Innovations like robotic-assisted surgery and single-incision laparoscopic approaches have further expanded their utility, making laparoscopic techniques an integral part of advanced surgical care. <sup>(22-24)</sup>

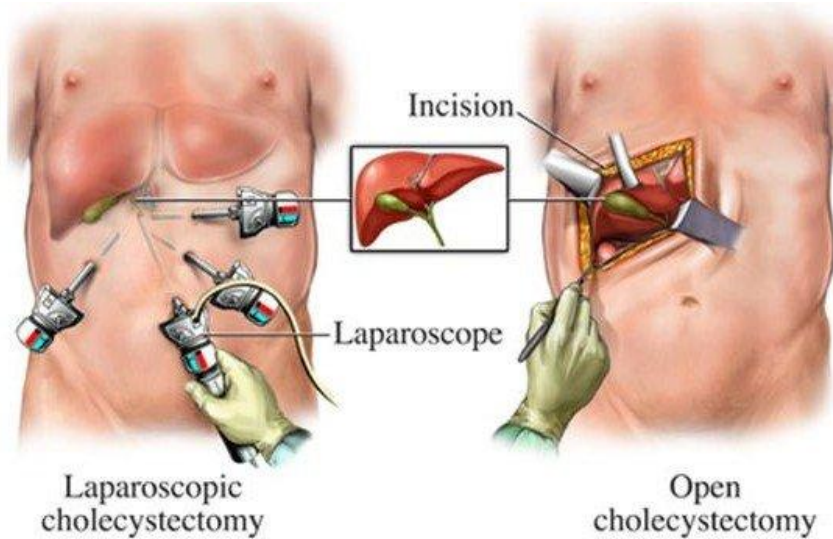


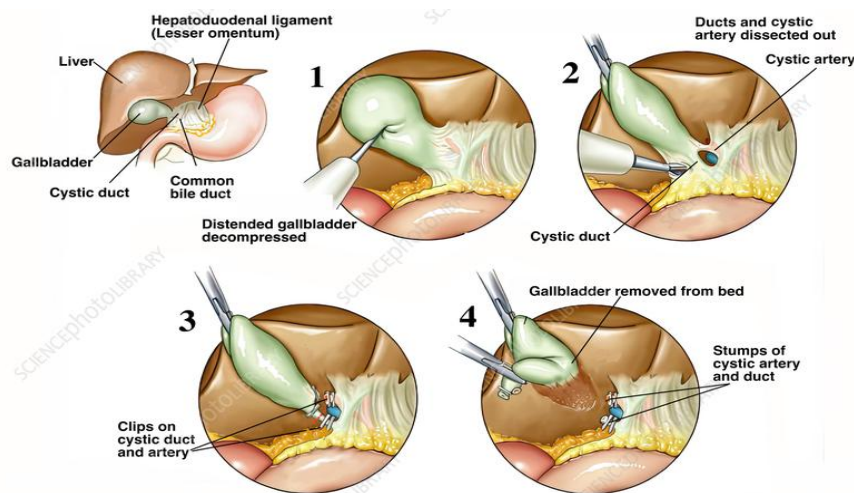
Figure 1: Laparoscopic and Open cholecystectomy <sup>(25)</sup>

## **VI. STEPS IN LAPAROSCOPIC SURGERIES**

Laparoscopic surgery entails using a laparoscope, a thin tube with a camera and light built into it. This allows for clear and precise visualization of the surgical area while keeping the procedure minimally invasive. Other essential instruments include trocars, which are used to create small access points (usually 5-12 mm) for inserting surgical tools. Graspers, dissectors, and scissors, typically ranging from 5-10 mm in diameter, are used for manipulation and cutting of tissues. Additionally, a suction-irrigation device (6-8 mm in diameter) is often employed for fluid removal and maintaining a clear surgical field. These instruments are carefully selected to ensure optimal performance while minimizing tissue damage and promoting quicker recovery. <sup>(23-25)</sup>

**LAPAROSCOPIC CHOLECYSTECTOMY:** Since the 1990s, laparoscopic cholecystectomy has become a popular minimally invasive procedure for gallbladder removal, often replacing traditional open surgery. This surgery is typically recommended for a range of issues, such as acute or chronic cholecystitis, symptomatic gallstones, biliary dyskinesia, acalculous cholecystitis,

gallstone pancreatitis, and gallbladder polyps. Before the operation, patients go through a comprehensive evaluation that includes their medical history, liver function tests, an ultrasound, and sometimes an ERCP to look for bile duct stones. It's crucial that patients are informed about the rare possibility of bile duct injury before they consent to the procedure. During the operation, a 5mm grasping forceps is inserted through a side port to lift the gallbladder and liver, which helps to expose Hartmann's pouch. The surgeon then pulls back the pouch to make dissection easier. They make a small incision in the peritoneum near the gallbladder and use minimal diathermy to locate and expose the cystic duct and artery, all while ensuring the CBD remains safe. Metal clips are placed on the cystic duct before it's cut, followed by the cystic artery. The gallbladder is then detached from the liver using diathermy with scissors or a hook. After confirming that there's no bleeding, the area is cleaned out. The gallbladder is removed through a 10mm port, and if any bile or stones spill out, a retrieval bag is used to catch them. Finally, all the ports are stitched up and securely closed. (24-27)



**Figure 2: Steps involved in laparoscopic cholecystectomy** (27)

**LAPAROSCOPIC APPENDECTOMY:** The procedure kicks off by inserting the camera into the periumbilical port, using either the “Hassan technique” or a direct cut-down approach. First, a diagnostic laparoscopy is performed, and then a 5mm port is placed in the right lower quadrant while keeping everything in view. A non-traumatic grasper helps to find the appendix. The small bowel is gently lifted to expose the inflamed appendix, which is handled with care to prevent any injury. Next, a 10mm port is positioned in the suprapubic area, and the appendix is grasped as the mesoappendix is carefully dissected using scissors and diathermy. The mesentery is scored, and a Maryland grasper is employed to isolate the appendicular artery. Three clips are applied, and the artery is cut. Diathermy is then used to sever the remaining mesentery. Three endo-loops are placed at the base of the appendix, making sure the knot is visible. The appendix is cut between

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the second and third endo-loop. After confirming that there's no bleeding, the appendix is placed in an endo-bag and removed through the periumbilical port. Finally, the remaining port is closed while still in view. The 5 millimeters port is sutured with monocryl, the fascia of the 10 millimeters port with vicryl, and the skin with monocryl. A local anesthetic is injected, and dressings are applied. (28-30)

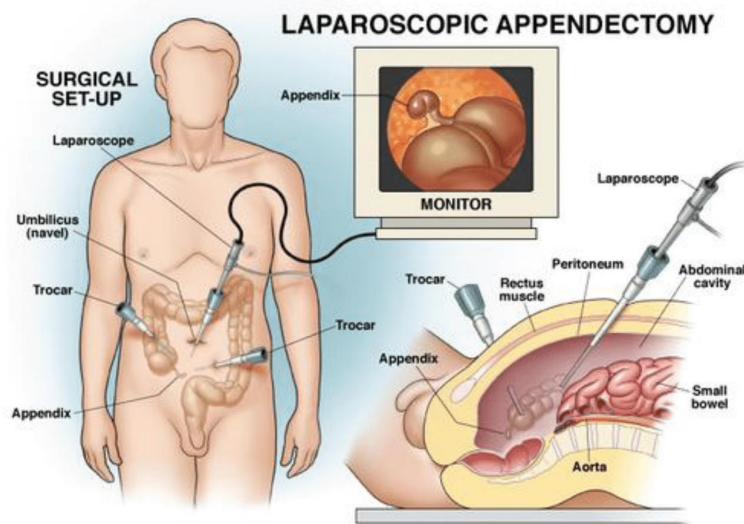


Figure 3: Steps involved in laparoscopic appendectomy (30)

## **VII. PORT CLOSURE TECHNIQUES**

Securing closure of ports exceeding 10 mm is vital to minimize the risk of hernia development. Despite significant progress in surgical tools and methods, wound closure generally relies on conventional suturing techniques, adhesive tapes, or skin adhesives containing topical cyanoacrylate (TCAs). The reported frequency of hernias at port sites after laparoscopic procedures varies in between 0.02% and 3.6%, frequently remaining undetected until complications manifest. An ideal port closure technique should ensure a secure and robust surgical wound closure while facilitating quicker completion of the procedure. It should promote improved cosmetic outcomes with minimal scarring, function as an effective barrier against microbial contamination, and minimize tissue damage and inflammation. The method should eliminate the need for removing sutures or staples postoperatively, be user-friendly with a straightforward learning process, and significantly lower the risk of needlestick injuries to enhance safety and reduce expenses. Additionally, it should provide a cost-efficient solution without compromising effectiveness or patient outcomes. (31-33)

**WITHDRAWAL OF PORTS AND INSTRUMENTS:** Following the completion of surgery, all instruments must be withdrawn with caution under direct observation. Secondary ports should be taken out first, ensuring the gas is released via the valves of the 10 mm cannulas. In the end, the

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port primarily placed is removed. Abrupt removal of the final port may create a suction effect, potentially drawing bowel or omentum into the port site, increasing the likelihood of hernia or adhesion formation. To mitigate this risk, inserting a blunt instrument or scope into the abdominal cavity during cannula withdrawal can prevent unintentional entrapment of abdominal structures. Any disruption to the abdominal wall must be repaired appropriately. Ports measuring 10 mm or larger require suturing of the rectus sheath with a single vicryl stitch, reducing the wound to 5 mm. Repairs are generally unnecessary for smaller, 5 mm port sites. The telescope's end should be carefully advanced into position, while the cannula is retracted over it to avoid drawing in the omentum. (31-33)

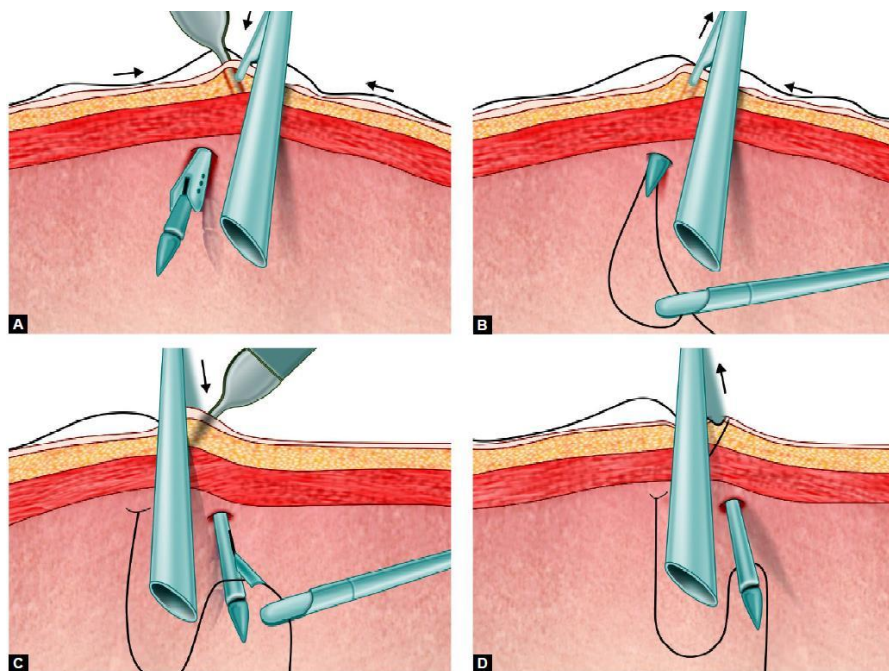


Figure 4: Closing the port using a suture passer. (31)

**PORTCLOSURE INSTRUMENTS:** Various instruments are designed for port closure, with the suture passer being a useful option. This tool allows a thread to be passed alongside the cannula, enabling external knotting. Another effective instrument is the port closure needle, resembling a cobbler's tool, with a blunt tip and a needle oriented toward the fascia, minimizing bowel injury risks. The aneurysm needle, which has an eye at its tip and a rigid structure, prevents bending or unintended rotation during use. Once the rectus sheath is secured & skin can be closed using techniques such as intradermal sutures, skin staplers, or adhesives like topical cyanoacrylate. (31-33)

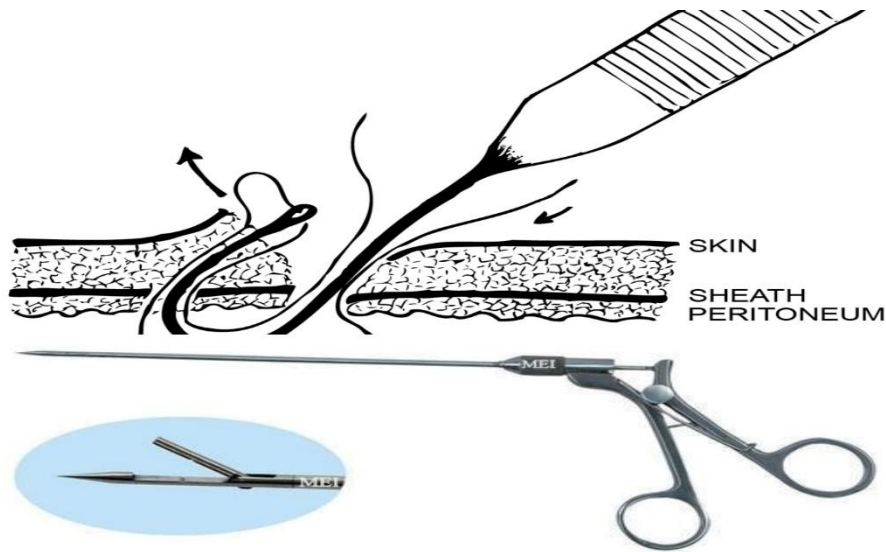


Figure 5: Top: Aneurysm needle. Below: Port closure needle <sup>(31)</sup>

## **VIII. THE COBBLER NEEDLE SUTURING TECHNIQUE FOR PORT CLOSURE**

**Introduction:** The cobbler needle, sometimes known as a suture passer, is a useful and efficient instrument that's commonly employed for closing ports in laparoscopic surgeries. Properly closing these port sites is vital to avoid postoperative complications like hernias, infections, and adhesions. This particular cobbler needle is tailored for hernia repairs and abdominal port closures, crafted from high-quality medical stainless steel to ensure it stands the test of time. It provides a budget-friendly and easy way to secure port-site wounds, especially for incisions that exceed 10 mm. <sup>(31, 34-37)</sup>

**History and background:** The cobbler needle takes its name and design cues from the traditional tools used in cobbling, where curved needles were essential for stitching leather pieces. When this needle was introduced into the surgical world, it quickly became an important instrument for suturing. In the late 20th century, as the need for secure port closure methods grew with the rise of minimally invasive techniques, the cobbler needle was adapted for laparoscopic surgeries. Over time, its design has evolved to enhance safety and provide better control during fascial closure. <sup>(31, 34-37)</sup>

**Equipment specification:** The cobbler needle is a strong and reusable tool, usually made from surgical-grade stainless steel. The Cobbler Suture Passer Needle is a fundamental device designed to ensure that port sites in laparoscopic surgeries are closed securely and effectively. This high-quality instrument allows for the smooth placement of sutures through the port incision, minimizing tissue damage and promoting quicker healing. Built for precision, durability, and ease

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of use, it's the perfect tool for surgeons working on port site closures in minimally invasive procedures. Some of its standout features include: <sup>(35,36)</sup>

- ✓ *Length*: Roughly 12–15 cm, which gives enough reach for closing abdominal ports.
- ✓ *Diameter*: Approximately 2–3 mm, perfect for threading common suture materials like Vicryl or absorbable sutures.
- ✓ *Tip*: Blunt and slightly curved, designed to ensure safety while passing through tissues and minimizing the risk of abdominal organ injury.
- ✓ *Handle*: Ergonomically designed for a solid grip, allowing the surgeon to make precise movements.
- ✓ *Durability*: Built to resist corrosion and wear, making it suitable for multiple uses after proper sterilization. <sup>(31, 35-37)</sup>



Figure 6: Cobble needle for port closure <sup>(35)</sup>

**Procedure and Measurements:** In laparoscopic surgeries, the cobble needle plays a crucial role in closing port sites by bringing the fascial layers together. Its diameter allows for a smooth passage through the tissue, and the blunt tip helps to minimize any trauma. Here's how we typically measure when placing sutures:

- ✓ *Distance from the wound edge*: We place sutures about 5–10 mm from the edge of the wound to help distribute tension evenly.
- ✓ *Spacing between sutures*: We maintain a spacing of 5–10 mm to ensure a secure and uniform closure.
- ✓ *Depth*: The needle is inserted deep enough to engage the fascial layer, but we take care to avoid damaging any underlying structures. <sup>(31, 35-37)</sup>

**Steps in Cobble Needle Suturing:**

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- To get started, make sure to clean and sterilize the port site really well. Then, gather your cobbler needle along with the right suture material. Typically, you'll want to use absorbable sutures like polyglactin (Vicryl) for closing the port, as they provide a secure fascial closure and reduce the hassle of having to remove sutures later on.
  - Next, when it comes to needle insertion, carefully insert the needle just next to the port site while keeping an eye on it.
  - For engaging the fascia, guide the needle through the fascial layer on one side of the incision, making sure to capture the suture material.
  - After that, pull the needle and suture it out on the outside. You'll want to repeat this on the other side of the incision to form a loop.
  - When it's time to tie the suture, make sure to tie the ends securely to bring the fascial edges together.
  - Finally, double-check that the fascial edges are aligned properly and ensure that no tissue, like omentum or bowel, is caught in the wound. <sup>(38-41)</sup>

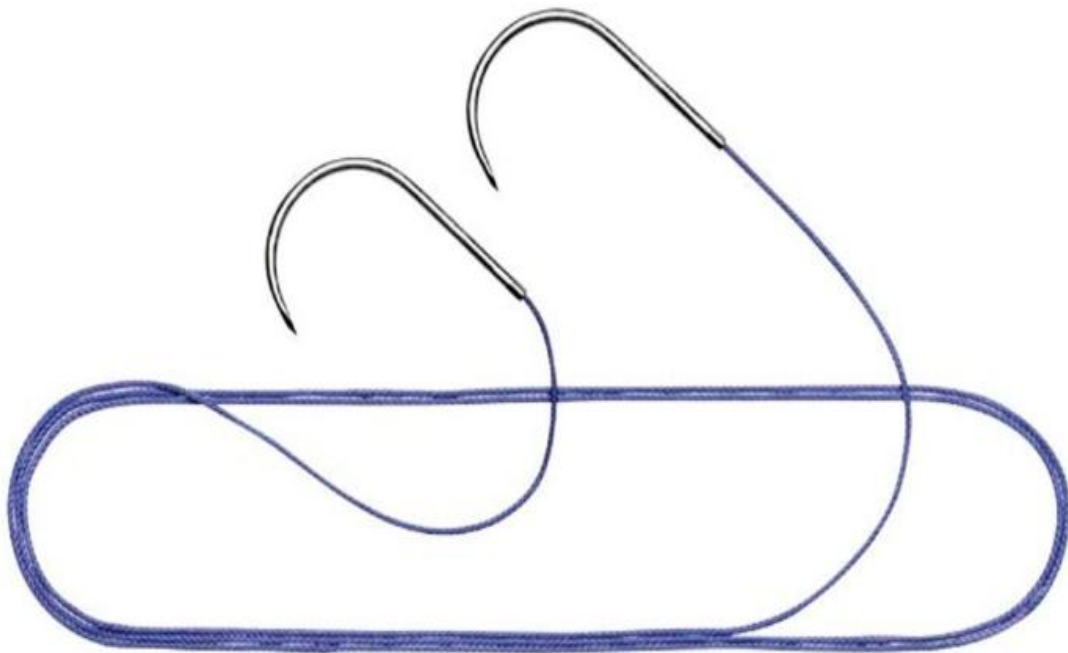


Figure 7: Vicryl used in Cobbler needle for port closure <sup>(38)</sup>

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**Uses:** The cobbler needle is mainly used for closing up port sites during laparoscopic surgeries, particularly for incisions that are 10 mm or larger. It's also really helpful for fixing fascial defects that can happen with various minimally invasive techniques. This tool offers a dependable way to achieve secure closures in tricky spots where other suturing devices might not work as well. Its versatility and precision make it an essential tool for achieving the best possible results in many surgical situations. Designed for precise suture placement, it gives surgeons excellent control and accuracy during procedures. Plus, the handle is crafted for comfort and efficiency, making it easier to handle during complex laparoscopic tasks. Made from durable, rust-resistant materials, it promises long-lasting performance. The sleek design minimizes tissue damage, reducing the risk of injury while suturing. The best part is that it's completely sterilizable, so you can use it multiple times without compromising its quality. <sup>(38-41)</sup>

**Recent Advances:** The cobbler needle remains to be an essential tool in surgical practise, with ongoing improvements enhancing its design and functionality. Today's versions come with ergonomically designed handles that make them easier to use and more precise during procedures. We've also seen the introduction of disposable options, which help maintain sterility and reduce the chances of cross-contamination. These modern tools are now compatible with advanced suture materials, which aid in better tissue alignment and healing. At the same time, innovative alternatives like automated closure devices and barbed sutures are being developed to make procedures quicker while still ensuring safety and effectiveness, often matching or surpassing traditional methods. The cobbler needle is especially important in laparoscopic surgeries, providing a dependable and cost-effective solution for closing port sites. Even with the rise of advanced closure devices, its straightforward design, versatility, and effectiveness keep it as a key player in surgical practice. With the right training and careful use, we can overcome its limitations and achieve the best possible outcomes for patients. <sup>(38-41)</sup>

## IX. ADVANTAGES AND DISADVANTAGES OF COBBLER SUTURING

The cobbler needle is a handy and budget-friendly tool for closing port sites during laparoscopic surgeries. It's straightforward and flexible, which is great! But, it does depend on the skill of the person using it, so careful handling and proper training are really important to keep any risks in check. <sup>(38-41)</sup>

| Advantages  | Disadvantages  |
|---|--|
| <b>Cost-effective: Using a reusable design can really help cut down on costs overall.</b> | Skill dependency: To really get good at something, you need to put in the right amount of training.      |
| <b>Ease of use: Simple design with a short learning curve.</b>                            | Time-consuming: Manual process is slower than automated devices.   |
| <b>Safety: Blunt tip minimizes the risk of organ injury.</b>                              | Risk of incomplete closure: Mishandling may lead to inadequate fascial approximation.                    |
| <b>Versatility: Suitable for various laparoscopic procedures.</b>                         | Reusability concerns: Meticulous sterilization is necessary to prevent infection.                        |
| <b>Durable: Made of surgical-grade stainless steel for long-term use.</b>                 | Increased surgeon fatigue: Repeated manual suturing can lead to hand strain during prolonged procedures. |
| <b>Availability: Widely accessible and compatible with common suture materials.</b>       | Limited by tissue type: May not be suitable for dense or fibrotic fascia.                                |
| <b>Precision: Allows controlled and accurate suture placement.</b>                        | Potential for user error: Incorrect technique can result in poor wound healing or complications.         |
| <b>Improved peritoneal integrity: Enables precise suturing of the peritoneum</b>          |  |
| <b>Efficient maneuverability: Designed for ease of use in tight spaces</b>                |  |

Table 2: Advantages and disadvantages of cobbler needle suturing <sup>(35, 38-41)</sup>

## X. THE CONVENTIONAL SUTURING FOR PORT CLOSURE

Conventional suturing remains a fundamental method for closing laparoscopic port sites, particularly those larger than 10 millimeters, to decrease the possibility of port site hernia. The process involves using standard suture materials such as polyglactin 910 or polypropylene, which provide strength and durability. The main goal here is to securely close the fascial defect while keeping the abdominal wall intact. Traditional suturing is really effective because it can adapt to different clinical situations and effectively brings the tissue together with precision. <sup>(42-44)</sup>

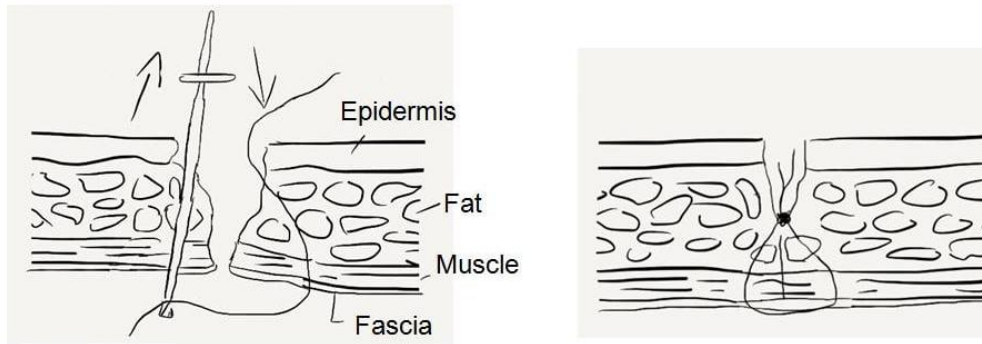


Figure 8: Suturing method for port closure <sup>(42)</sup>

When it comes to closing ports during laparoscopic surgeries, conventional hand suturing involves a series of careful steps to ensure everything is secure and effective. First, the surgeon identifies the fascia at the port site, often using a blunt dissector or even their fingers to find the edges of the defect. Next, a curved or straight needle, loaded with suture material like polyglactin 910 or polypropylene, is introduced. The needle is then gently passed through the fascial edges with a needle holder, making sure to maintain the right depth and alignment to steer clear of underlying structures such as the bowel or omentum. Once the suture has gone through each sides of the defect, the edges are brought together, and secure knots are tied—usually a square knot or a surgeon’s knot—to keep everything tight and prevent slippage. This process is repeated as necessary for multiple layers of fascia or larger defects, and finally, the skin is closed using sutures, staples, or adhesive materials. It’s crucial to pay close attention to technique and maintain sterility to decrease the risk of complications like herniation, infection, or tissue ischemia. <sup>(42-44)</sup>

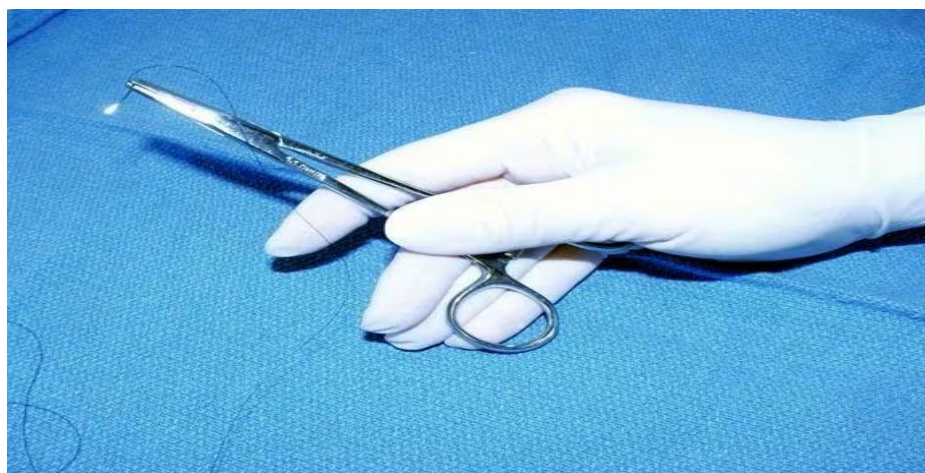


Figure9: Conventional suturing method for port closure <sup>(43)</sup>

While traditional suturing is effective, it does come with its own set of challenges. The manual process can be quite time-consuming and requires a significant amount of skill, especially when dealing with deeper or hard-to-reach areas. If the closure is improper , it can lead to issues like herniation or infection. Plus, there’s a greater risk of needle-stick injuries for the surgeon, which

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raises some serious safety concerns. Also, advancements in laparoscopic tools, such as suture passers and barbed sutures, are designed to tackle these problems, providing more efficient and safer options. Still, it's crucial for surgeons to grasp and perfect traditional suturing techniques, as they lay the groundwork for safe and effective laparoscopic procedures. <sup>(42-44)</sup>

## **XII. COMPLICATIONS DUE TO INEFFICIENT PORT CLOSURE**

Port site complications in laparoscopic surgeries often arise from factors like improper closure techniques, tissue entrapment, or inadequate sterilization. Mechanisms include fascial defects leading to herniation, which occurs when intra-abdominal contents protrude through improperly approximated port sites. Tissue ischemia or necrosis may result from excessive tension during suturing or inadequate blood flow to the surrounding tissue. Infection can develop due to contamination during the procedure or insufficient sterilization of instruments. Additionally, poor alignment of tissue layers may create weak points, increasing the risk of delayed healing or dehiscence. <sup>(45-47)</sup>

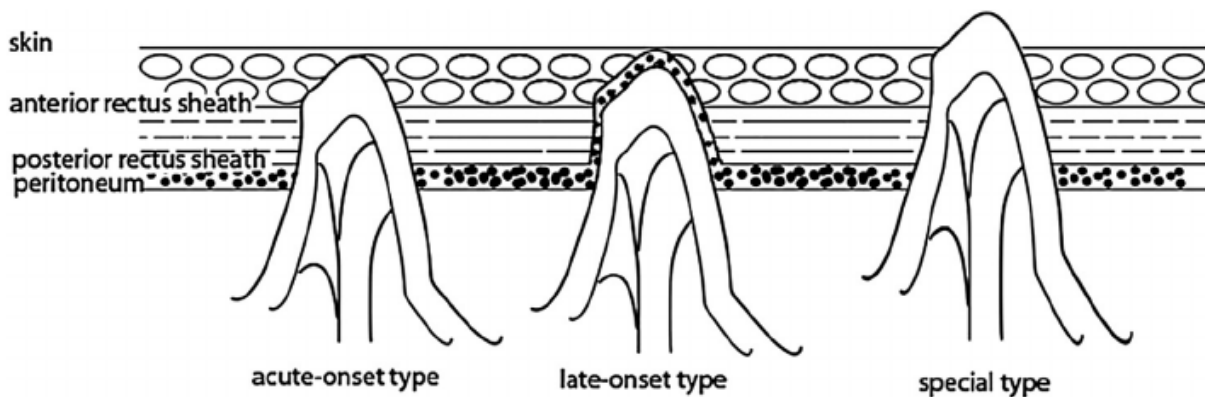


Figure 10: Different types of Trocar site hernias <sup>(47)</sup>

Predisposing factors for port site complications include obesity, which increases intra-abdominal pressure, and previous abdominal surgeries that result in altered tissue integrity. Other factors include the size of the port (larger ports have higher risk), inappropriate closure technique, prolonged operative time, and the use of non-sterile instruments. Poor patient positioning can also contribute to increased risk, as can insufficient post-operative care, leading to delayed healing or infection at the port site. Additionally, the surgeon's experience and skill level play a critical role in minimizing such complications. <sup>(46-48)</sup>

| Complication                                      | Definition  | Mechanism/Reason for Occurrence   |
|---|---|---|
| <b>Incisional Hernia/Trocar Site Hernia (TSH)</b> | Protrusion of abdominal contents through a weakness at the port site. | Improper fascial closure or large port size increases intra-abdominal pressure, causing herniation.                                       |
| <b>Port Site Infection (PSI)</b>                  | Infection at the site of port entry.                                  | Contamination during surgery, poor aseptic technique, or inadequate closure can lead to infection.  |
| <b>Seroma</b>                                     | Accumulation of serous fluid at the port site.                        | Inadequate fascial closure or excessive tissue trauma during port insertion can cause fluid buildup.                                      |
| <b>Hematoma</b>                                   | Accumulation of blood at the port site.                               | Vascular injury during port insertion or removal, particularly with larger ports, can cause bleeding into the tissues.                    |
| <b>Port site bleeding</b>                         | Continuous bleeding from the port site.                               | Inadequate hemostasis during port insertion or removal, injury to small vessels, or poor closure technique can cause persistent bleeding. |
| <b>Omentum-Related Complications</b>              | Involvement of omentum or bowel at the port site.                     | Sudden withdrawal of the last port without precaution may result in the suction of the omentum or bowel into the incision.                |
| <b>Port Site Metastasis (PSM)</b>                 | Spread of cancerous cells to the port site.                           | During surgery, cancerous cells may be displaced from the abdominal cavity and implant at the port site.                                  |
| <b>Nerve Trapping</b>                             | Compression or injury to nerves near the port site.                   | Poor port placement or excessive traction on the surrounding tissue during surgery can lead to nerve injury or entrapment.                |
| <b>Pain</b>                                       | Persistent discomfort or pain at the port site.                       | Nerve damage, poor closure technique, or inflammatory responses from inadequate wound healing may cause chronic pain.                     |
| <b>Port Site Hydatid Cyst (PSHC)</b>              | Cyst formation at the port site due to hydatid disease.               | Accidental spillage of cyst contents during laparoscopic procedures, causing infection and cyst formation at the port site.               |
| <b>Port Site Tuberculosis (PST)</b>               | Tuberculosis infection at the port site.                              | Mycobacterium tuberculosis spreads to the port site either through direct contamination or via hematogenous spread during surgery.        |
| <b>Port Site Endometriosis</b>                    | Presence of endometrial tissue at the port site.                      | Retrograde menstruation or implantation of endometrial cells at the port site due to surgical manipulation in women of reproductive age.  |
| <b>Port Site Abscess</b>                          | Collection of pus at the port site due to bacterial infection.        | Poor aseptic technique during surgery or delayed recognition of an infection can lead to abscess formation.                               |
| <b>Port Site Granuloma</b>                        | Chronic inflammation forms a mass of granulation tissue.              | Foreign body reaction to sutures, staples, or other materials used during surgery can cause granuloma formation.                          |
| <b>Port Site Fibrosis</b>                         | Thickening or scarring of tissue at the port site.                    | Chronic irritation or inflammation from repeated port use or improper closure can lead to fibrous tissue formation.                       |

Table 3: Port site complications associated with inefficient port closure <sup>(45-50)</sup>

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## **LITERATURE ARTICLE REVIEW:-**

### **Compare the outcomes of laparoscopic port closure using Cobbler Needle versus conventional hand suturing.**

Studies comparing the outcomes of laparoscopic port closure using the Cobbler Needle versus conventional hand suturing are limited. Therefore, our review of literature also includes comparisons with other needle-based closure techniques and devices to provide a broader perspective on their effectiveness and outcomes in port site closure. This approach aims to highlight advancements and alternatives to the traditional hand-suturing method, offering insights into their relative advantages and potential limitations. In a study conducted by **Elashry et al (1996)** various techniques for closing ports were evaluated. These comprise the Carter-Thomason Needle-Point Suture Passer, the Maciol suture needle set, the eXit Disposable Puncture Closure device, the Endoclose suture carrier, the Tahoe Surgical Instruments Ligature device, a 14 gauge angiocatheter with a looped polypropylene suture, the Lowsley retractor with hand sutured closure, and the traditional hand-sutured closure method. The researchers looked at factors like time efficiency, security, and whether extra tools were needed. The findings showed that the Carter-Thomason device was the quickest option, had fewer complications and ensured a leak-proof closure. As a result, it was determined that the Carter-Thomason device is the top choice for closing port sites after laparoscopic surgery. <sup>(51)</sup>

Similarly, In a study conducted by **Warren et al. (2017)**, it was found that out of 66,566 cholecystectomy cases, 472 (which is about 0.71%) developed surgical site infections (SSIs). Interestingly, the incidence was notably higher in open surgeries at 4.93%, compared to just 0.64% for laparoscopic procedures (with a P-value of less than .001). Several factors were identified that increased the risk of SSIs, including being male, having chronic anemia, diabetes, obesity, smoking, and experiencing acute cholecystitis or obstruction. The odds ratio for laparoscopic surgeries involving acute cholecystitis was 1.58, while for open surgeries, it was 4.29 and 4.04. In cases where conversions occurred, the odds ratios were even higher at 4.71 and 7.11. The study ultimately concluded that the existence of acute cholecystitis significantly raised the risk of SSIs in laparoscopic surgeries, with similar risks observed in both open and converted procedures. <sup>(52)</sup> According to a study conducted by **Abijit Shetty and colleagues (2014)**, researchers looked at 200 cases. The first half, 100 cases, were treated using the traditional hand closure method, while the next 100 were treated with the Carter-Thomason needle technique. All participants were healthy and free from any other medical conditions, which helped reduce complications that weren't related to the techniques being tested. The results showed that the Carter-Thomason

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method led to faster closure times and fewer complications associated with the wound and bowel compared to the hand suturing method. Ultimately, the study concluded that the Carter-Thomason technique was a more efficient option for closing port sites than the traditional hand closure method.<sup>(53)</sup>

In a research study conducted by **Majhi et al. (2021)** in Orissa, it was found that 9 out of 125 patients who underwent laparoscopic surgery—about 7.2%—experienced port-site complications after three months. The complications included port-site infections in 4 patients (3.2%), hemorrhage in 2 patients (1.6%), as well as cases of hernia, tuberculosis, umbilical hernia, and mild subcutaneous emphysema in 1 patient (0.8%). Additionally, 3 patients (2.4%) showed some scar abnormalities. The researchers concluded that while laparoscopic surgery typically has low complication rates, there are still rare issues that can impact patient outcomes. They emphasized that careful patient selection, meticulous surgical techniques, proper instrument sterilization, and the use of antibiotics can help minimize these complications.<sup>(54)</sup> In a study conducted by **Hellan et al. (2009)**, researchers looked back at 80 patients who had laparoscopic right hemicolectomy. They found that those in the intracorporeal group had shorter incisions compared to the extracorporeal group. Plus, the intracorporeal anastomosis led to fewer wound complications, which was especially helpful for obese patients with short or heavy mesenteries, as it prevented the need to pull large specimens through a small incision.<sup>(55)</sup>

In the research conducted by **Eid and colleagues (2005)**, it was discovered that obese and bariatric patients face a greater risk of trocar-site herniation. This is largely due to their larger preperitoneal spaces and increased intra-abdominal pressure, which makes simple fascial closure inadequate. To effectively prevent this complication, a full-thickness closure is essential. However, the study noted that hand suturing and certain devices posed challenges for these patients. It also emphasized the successful utilization of **Selvaraj and colleagues (2021)** of a specialized trocar closure system in a 34-year-old Caucasian woman who had laparoscopic Roux-en-Y gastric bypass surgery.<sup>(56)</sup> In a study conducted by **Lim et al. (2017)**, researchers sifted through MEDLINE, EMBASE, and BIOSIS databases from January 2010 to June 2016 and found 47 articles that were relevant to their investigation. They discovered that although laparoscopic suturing and intracorporeal knot tying can lead to longer surgery times and a higher risk of complications, these techniques also bring advantages such as better cosmetic results, improved diet tolerance, and enhanced bowel function. Even with the progress made in surgical methods and tools, the challenge of mastering laparoscopic suturing still hinders the broader use of minimally invasive surgery. The study highlighted the importance of improving skills in laparoscopic suturing to boost patient outcomes and lower healthcare expenses.<sup>(57)</sup> In a study conducted by

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**Bessoiff and colleagues (2021)**, it was found that using dilating trocars helped to lessen complications related to the abdominal wall and reduced the need for fascial closure. When closure was required, employing a suture passer or a similar tool yielded better results than the conventional hand-sewn methods. Specifically, the Carter-Thomason suture passer was associated with fewer perioperative complications for patients undergoing laparoscopic abdominal surgery compared to those who had hand-sewn port site closures. <sup>(58)</sup>

In a study conducted by **Samir et al. (2016)** researchers found that the Stony Brooke scar evaluation score was notably higher for the group using 2-octyl cyanoacrylate, scoring an average of  $4.2 \pm 1.03$ , compared to the suturing group, which had a score of  $3.12 \pm 1.04$  ( $p \leq 0.001$ ). Interestingly, in the adhesive group, 8% experienced adhesive film breakage, while the suturing and adhesive groups reported wound infections at rates of 8% and 4%, respectively ( $p = 0.65$ ). There were no hypersensitivity reactions noted. Overall, the study concluded that 2-octyl cyanoacrylate is a safe and effective method for closure, showing similar early complications to suturing but offering better cosmetic results in the short term. <sup>(59)</sup> Additionally, in a study conducted by **Andraos et al. (2022)**, the group using Cutanplast experienced significantly fewer early complications, reporting no infections compared to 9.8% in the control group ( $p = 0.055$ ). There were also no instances of bleeding or redness in the Cutanplast group. Over a two-year period, late complications were notably lower in the Cutanplast group, with zero cases of hernias compared to seven in the controls ( $p = 0.005$ ). Additionally, a higher percentage of patients in the Cutanplast group (78.6%) required 1–2 procedures, while only 58.5% of the control group did. The Cutanplast group also utilized fewer trocars (82 compared to 99) and had shorter operating times than those using the two-step suturing method. The study concluded that Cutanplast plug closure is an effective approach, leading to reduced operating times and complications, especially for obese patients. <sup>(60)</sup>

Meanwhile, **Selvaraj and colleagues (2021)** presented a simple yet effective method for closing fascial layers at port sites larger than 10 cm during laparoscopic and robotic urological surgeries, using a cobbler needle on 151 patients. This technique was applied before inserting the trocar sheath, allowing for clear depiction of the fascial closure. Remarkably, there were no significant intra-operative complications, no extra time was required, and no expensive tools were needed. Over an average follow-up period of 28 months, there were no reported bowel injuries or trocar site hernias. This approach has gained popularity for being straightforward, safe, and linked to fewer complications compared to traditional suturing techniques. <sup>(61)</sup> Similarly, **Shah et al. (2024)** found that laparoscopic appendectomy is the most commonly performed procedure, making up 70% of cases, and it also led to most of the complications. They reported that port site

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issues occurred in 33% of the cases (33 out of 100), with 14 patients experiencing discharge, 8 developing surgical site infections, 7 having bleeding issues, and 4 suffering from emphysema. These complications were more common when using the Hasson or open technique, with larger ports over 5 mm, and when specimen retrieval bags weren't used. Interestingly, the umbilical port was noted as the site where complications happened most frequently. Overall, while port site complications were not very common, they were managed effectively and had minimal impact on patient outcomes. <sup>(62)</sup>

Furthermore, **Jeon et al. (2020)** discovered that using EZ-Close™ significantly cut down closure time when compared to traditional hand suturing, clocking in at  $87.9 \pm 21.0$  seconds versus  $128.0 \pm 59.0$  seconds ( $p < 0.001$ ). They also noted fewer failures with EZ-Close™, reporting just 7 failures compared to 27 with hand suturing ( $p < 0.001$ ). For patients with a Body Mass Index between 25 and 27 kg/m<sup>2</sup>, the closure time was notably quicker with EZ-Close™, at  $85.9 \pm 19.8$  seconds compared to  $135.6 \pm 67.9$  seconds ( $p < 0.014$ ). Similarly, for those with a BMI of 27 kg/m<sup>2</sup> or more, the times were  $85.1 \pm 18.4$  seconds versus  $150.2 \pm 70.6$  seconds ( $p < 0.010$ ). When looking at AWT measurements, those between 20 and 26 mm also experienced faster closure with EZ-Close™, averaging  $81.1 \pm 11.5$  seconds compared to  $142.3 \pm 83.7$  seconds ( $p = 0.023$ ). Even for AWTs of 26 mm and above, the closure time was quicker with EZ-Close™, at  $85.6 \pm 22.6$  seconds versus  $160.2 \pm 55.5$  seconds ( $p < 0.001$ ). No infections or hernias were noted over a median follow-up of 20.4 months. EZ-Close™ proved efficient, especially for obese patients. <sup>(63)</sup>

Similarly, **Gad et al., (2020)** observed port site issues in 37 out of 400 cases, reflecting a 9.25% incidence rate. Vessel injuries were identified in 19 cases (4.75%), port site infections in 11 cases (2.75%), visceral injuries in 4 cases (1%), and port site hernias in 3 cases (0.75%). No cases of port site metastasis were reported. The study highlighted that port closure techniques play a critical role, with traditional suturing showing a higher complication rate. <sup>(64)</sup> Concurrently, in research by **Mudgal et al (2018)**, a higher proportion of female patients (77.34%) was noted, with the majority falling within the 41–50 years age range (31.7%). Most patients had a BMI between 18.5–25 kg/m<sup>2</sup> (53.33%). Pneumoperitoneum was established using the Veress needle in 54.66% and the Hasson's method in 45.33% of cases. Cholecystectomy was the main procedure for 80% of patients. Port site complications occurred in 8.67%, with early complications including bleeding (6 patients), surgical site infection (8 patients), emphysema (4 patients), and visceral injury (1 patient). Late complications involved hernia in 4 patients and hypertrophic scarring in 3 patients, especially in those with conventional suturing. The study found that advanced port closure methods resulted in fewer complications compared to traditional suturing, particularly in emergency surgeries. <sup>(65)</sup>

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# MATERIALS & METHODS



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## **MATERIALS AND METHODS**

### **Study Design**

Comparative Observational Study

### **Study Area**

The study was conducted in the Department of General Surgery at R.L Jalappa Hospital and Research Centre, Kolar, Karnataka affiliated with Sri Devaraj Urs Medical College , Kolar , Karnataka

### **Study Population**

Patients undergoing laparoscopic cholecystectomy or laparoscopic appendicectomy.

### **Study Period**

May 2023 to October 2024

### **Inclusion Criteria**

- Patients between age of 20 years and 70 years undergoing laparoscopic cholecystectomy or appendicectomy.

### **Exclusion Criteria**

- Immunocompromised patients
- Patients with history of abdominal radiotherapy

### **Sample Size**

A total of 60 patients were included in the study, with 30 patients in each group. Participants were divided equally into:

- **Group A:** Cobbler Needle port closure technique
- **Group B:** Conventional hand suturing technique

### **Ethical Considerations**

Approval for the study was obtained from the Institutional Human Ethics Committee. Written and informed consent was taken from all study participants prior to inclusion.

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## **Data Collection**

Demographic characteristics and clinical manifestation were documented using pre-structured proforma. Informed consent was obtained after which a detailed history and clinical examination was carried out by principal investigator.

Patients were randomly assigned to one of two groups via an even-odd allocation method, ensuring a similar distribution of cases:

- Patients with even number: Cobbler Needle group
- Odd-numbered patients: Hand suturing group (conventional)

## **Data Analysis**

Continuous variables (ie, age) were summarized using descriptive statistics (eg, mean, standard deviation [SD], and standard error [SE]). Data about categorical variables, such as the presence or absence of complications, were described using frequencies and percentages. For comparison of complication incidence between two groups, statistical tests such as the Chi-square test or Fisher's exact test were used based on feasibility and expected frequencies.

## **Procedure Details**

Standard clinical examination and relevant investigations were carried out on all patients. Closure of port at laparoscopic site was done by either Cobbler Needle technique or conventional suturing depending on group allocation.

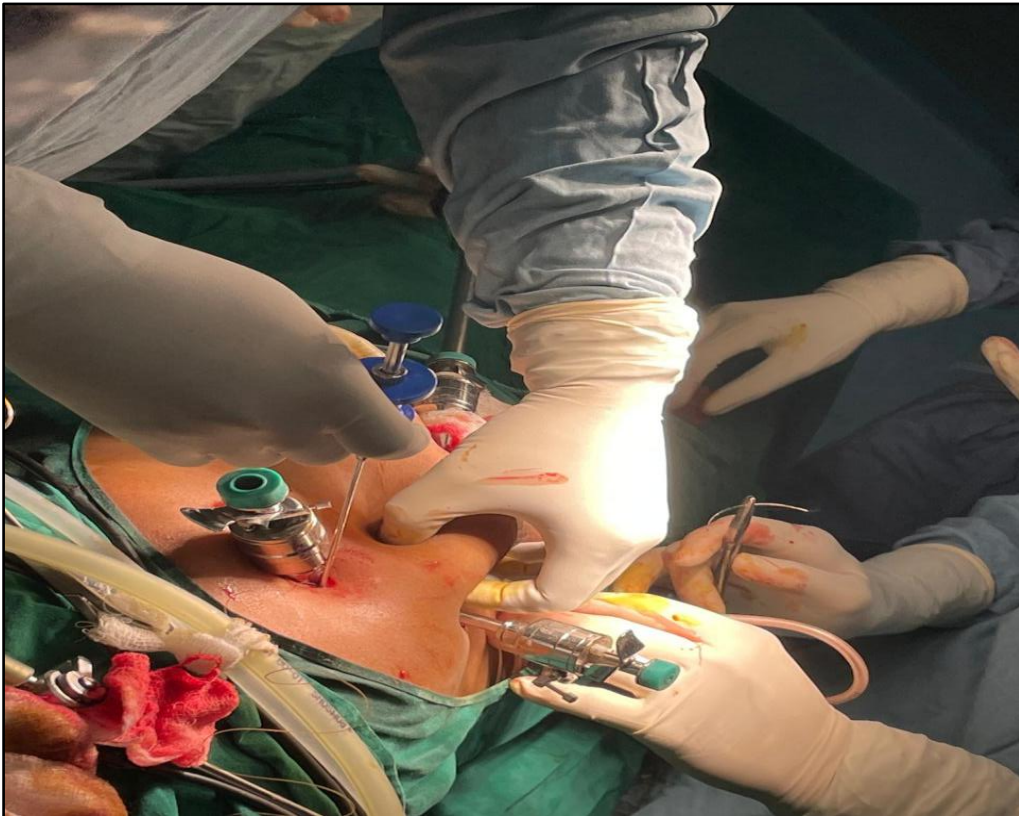
Follow-ups during the hospital stay and post operative days 3, 5, 7, 14 & 30 were done to rule out complications such as:

1. Seroma formation
2. Hematoma
3. Surgical site infection (SSI)

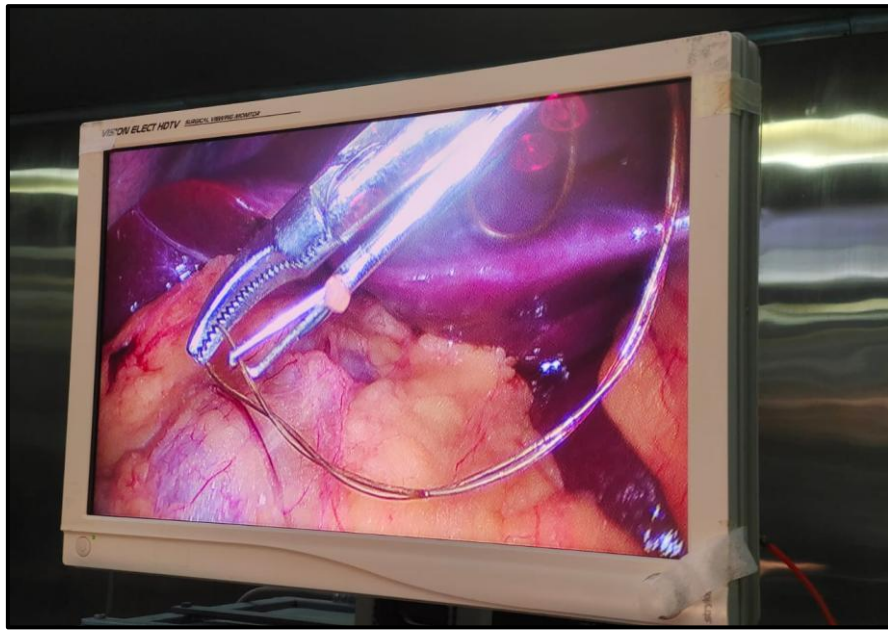
These were clinically assessed by the surgeon-in-charge.



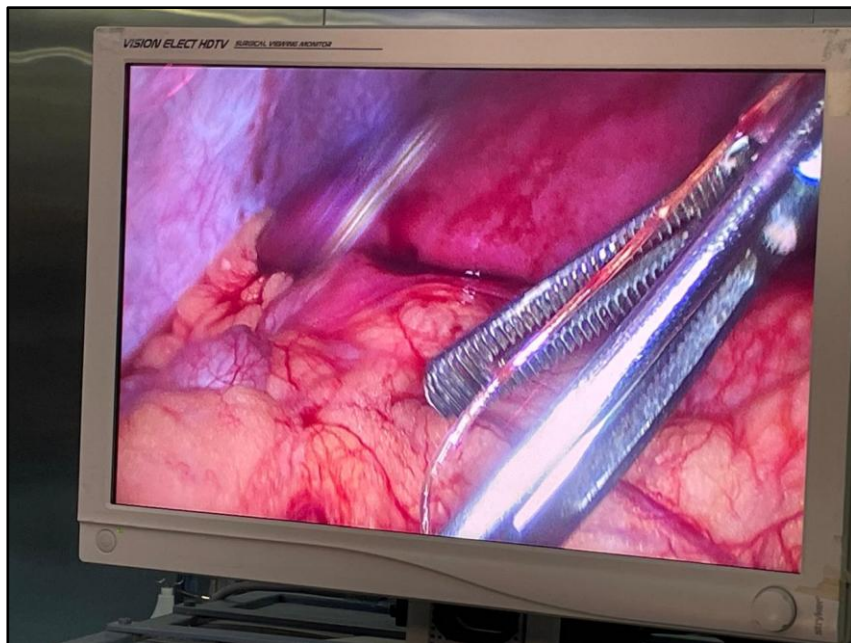
Picture 1 : Cobbler needle



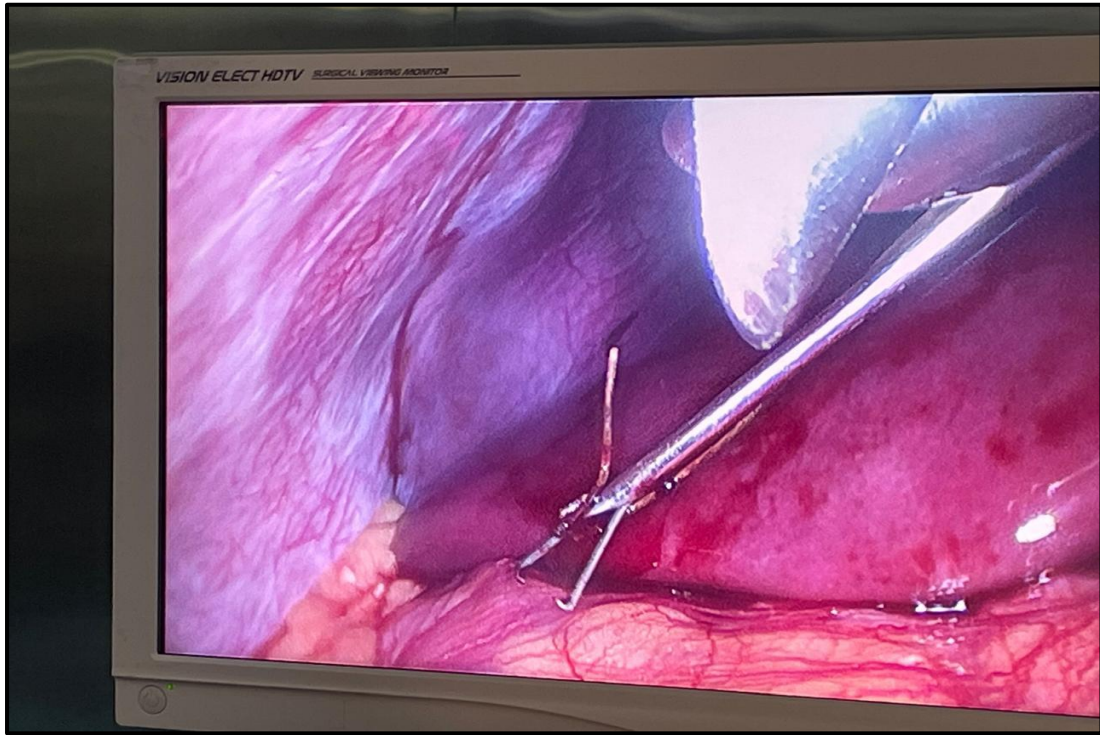
Picture 2 : The cobbler needle was used to pass the suture material.



Picture 3 : The suture and needle are placed into the peritoneal cavity under vision, creating a loop.



Picture 4 : The suture is pulled back using laparoscopic tools after a counter-coup puncture is done diametrically.



Picture 5 : The cobbler needle is used to draw the suture back.

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# RESULTS



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## RESULTS

### I. DEMOGRAPHIC AND CLINICAL PROFILE OF TOTAL STUDY POPULATION

Table 4: Average age of total study population (n=60)

| <b>Age</b> | <b>Range</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Mean</b> | <b>Std. Deviation</b> |
|------------|--------------|----------------|----------------|-------------|-----------------------|
|            | 45           | 22             | 67             | 40.02       | 11.60                 |

This table presents the age distribution of the complete study population. The ages documented varied from a minimum of 22 years to a maximum of 67 years, resulting in a mean age of 40.02 years and a standard deviation of 11.60. This information indicates a varied age spectrum among the participants.

Table 5: Distribution of study population based on age category (n=60)

| <b>Age category</b>       | <b>Frequency</b> | <b>Percent</b> |
|---------------------------|------------------|----------------|
| <b>Less than 30 years</b> | 12               | 20             |
| <b>30 – 45 years</b>      | 28               | 46.7           |
| <b>More than 45 years</b> | 20               | 33.3           |
| <b>Total</b>              | 60               | 100            |

## Age Category Frequency

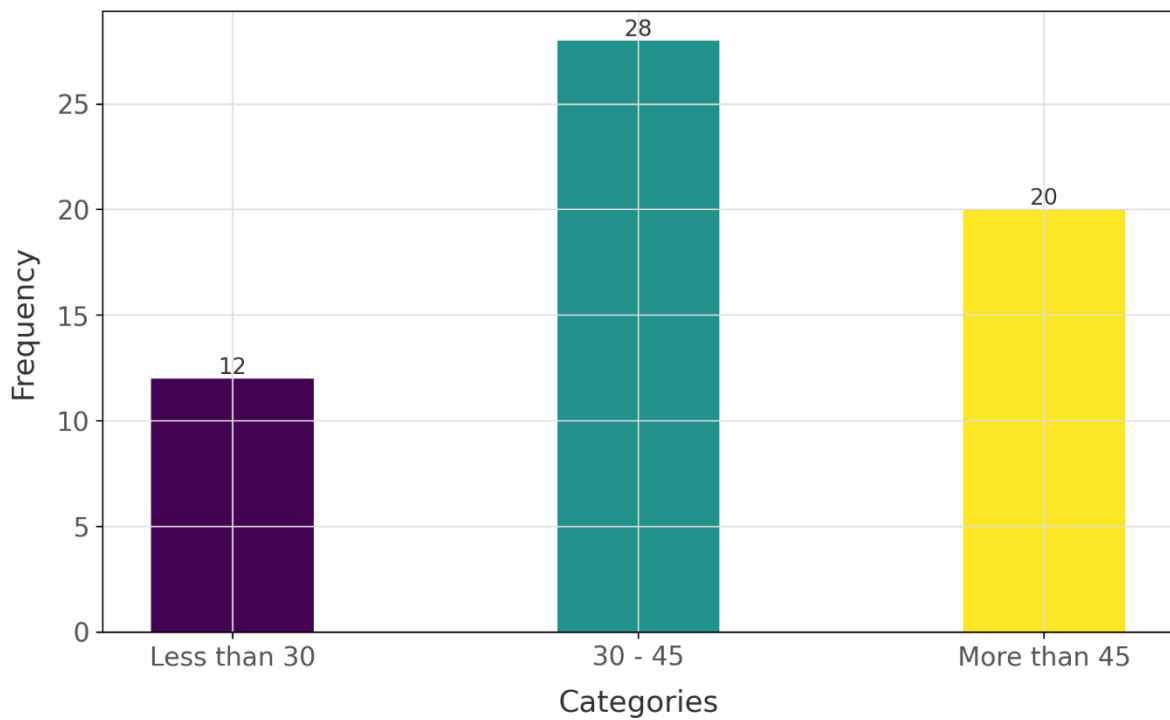


Figure 11 : Bar Chart for distribution of study population based on age category (n=60)

The study population was categorized into three age groups. The majority (46.7%) of participants were in the 30–45 years category, followed by those above 45 years (33.3%), and the least representation was from individuals under 30 years (20%)

Table 6: Distribution of study population based on procedure (n=60)

| Procedure                             | Frequency | Percent    |
|---------------------------------------|-----------|------------|
| Laparoscopic Appendicectomy under GA  | 6         | 10         |
| Laparoscopic Cholecystectomy under GA | 54        | 90         |
| <b>Total</b>                          | <b>60</b> | <b>100</b> |

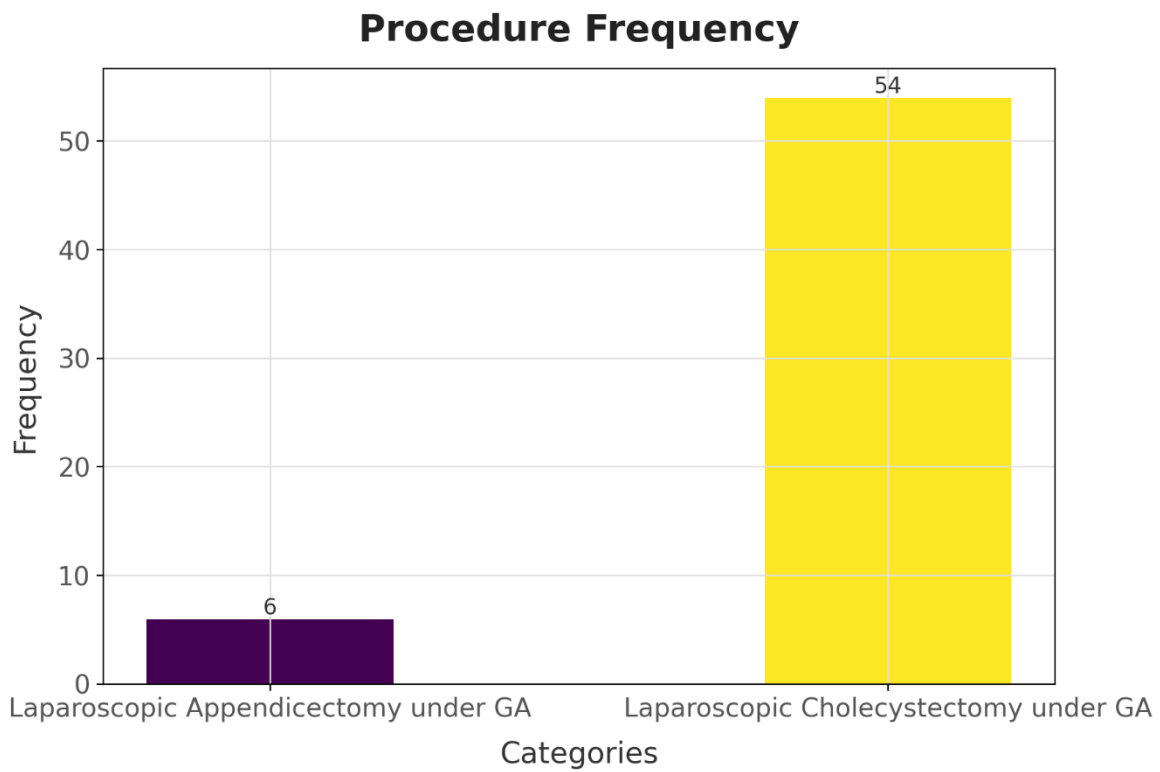


Figure 12 : Bar Chart for distribution of study population based on procedure (n=60)

Among the study population, 90% underwent laparoscopic cholecystectomy under general anesthesia, while only 10% underwent laparoscopic appendicectomy under general anesthesia, indicating a predominance of cholecystectomy cases.

Table 7: Distribution of study population based on method of closure (n=60)

| Method of closure       | Frequency | Percent    |
|-------------------------|-----------|------------|
| Cobbler Needle Suturing | 30        | 50         |
| Conventional Suturing   | 30        | 50         |
| <b>Total</b>            | <b>60</b> | <b>100</b> |

The study population was evenly divided between the two closure methods, with 50% undergoing Cobbler Needle Suturing and 50% undergoing Conventional Suturing, ensuring balanced comparison groups.

**II. DEMOGRAPHIC AND CLINICAL PROFILE OF STUDY POPULATION BASED ON METHOD OF CLOSURE**

Table 8: Average age of study population based on method of closure (n=60)

| <b>Method Of Closure</b>       | <b>Mean</b> | <b>Std. Deviation</b> |
|--------------------------------|-------------|-----------------------|
| <b>Cobbler Needle Suturing</b> | 39.30       | 12.30                 |
| <b>Conventional Suturing</b>   | 40.73       | 11.01                 |
| <b>Total</b>                   | 40.02       | 11.60                 |

The mean age of patients undergoing Cobbler Needle Suturing was 39.30 years with a standard deviation of 12.30, while for those undergoing Conventional Suturing, it was 40.73 years with a standard deviation of 11.01. The overall mean age remained at 40.02 years.

Table 9: Age distribution of study population based on method of closure (n=60)

| <b>Age category</b> | <b>Method Of Closure</b>       |                              | <b>Total</b> |
|---------------------|--------------------------------|------------------------------|--------------|
|                     | <b>Cobbler Needle Suturing</b> | <b>Conventional Suturing</b> |              |
| <b>Less than 30</b> | 7                              | 5                            | 12           |
| <b>30 - 45</b>      | 13                             | 15                           | 28           |
| <b>More than 45</b> | 10                             | 10                           | 20           |
| <b>Total</b>        | 30                             | 30                           | 60           |

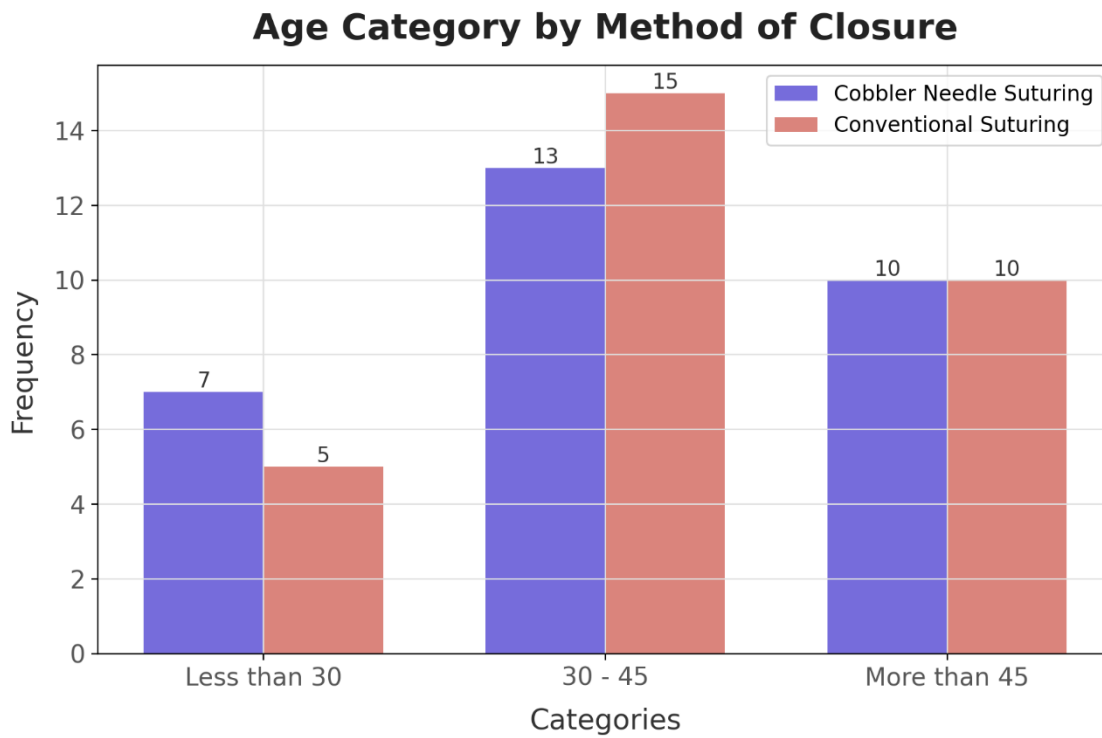


Figure 13: Stacked Bar Chart for age distribution of study population based on method of closure (n=60)

The distribution across age groups was fairly even, with a slight predominance of the 30–45 age group in both closure methods. The least representation was seen in the <30 age category.

Table 10: Gender distribution of study population based on method of closure (n=60)

| Gender       | Method Of Closure      |                       | Total |
|--------------|------------------------|-----------------------|-------|
|              | Cobble Needle Suturing | Conventional Suturing |       |
| Female       | 22                     | 24                    | 46    |
| Male         | 8                      | 6                     | 14    |
| <b>Total</b> | 30                     | 30                    | 60    |

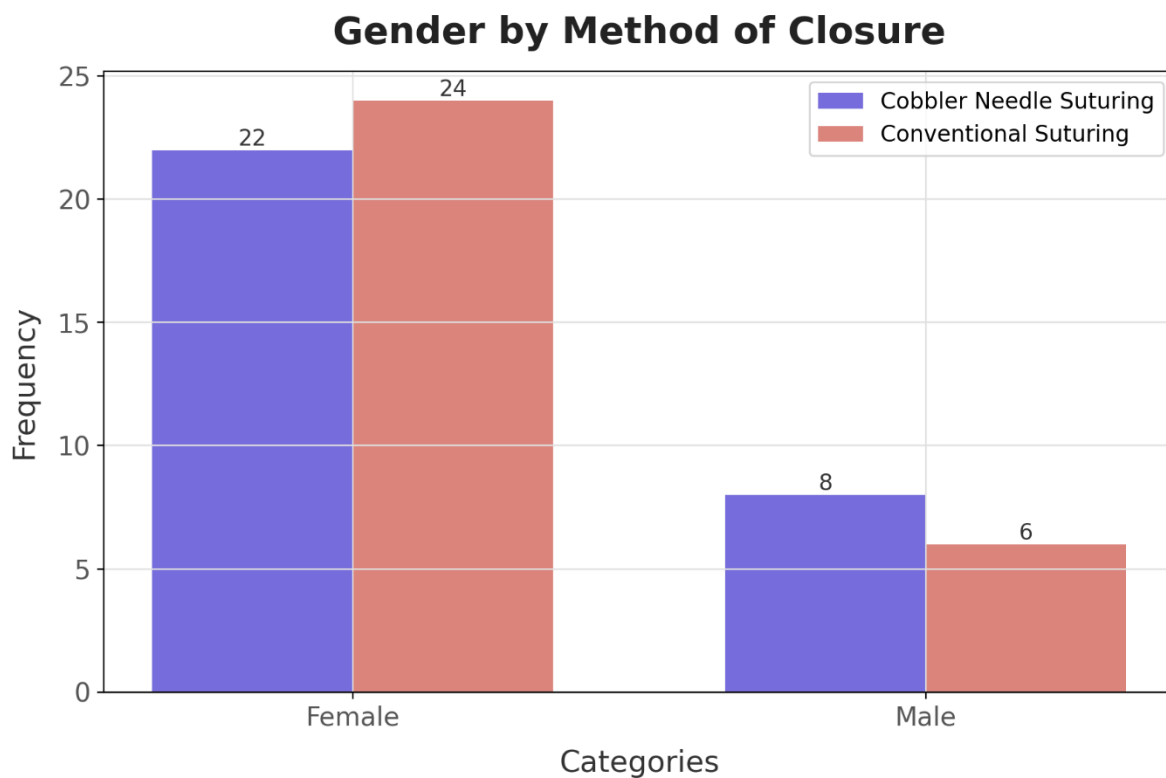


Figure 14: Stacked bar chart for gender distribution of study population based on method of closure (n=60)

Female participants (76.7%) constituted the majority in both closure methods. The gender distribution was fairly similar across both techniques.

Table 11: Procedure done for the study population based on method of closure (n=60)

| Procedure                             | Method Of Closure      |                       | Total |
|---------------------------------------|------------------------|-----------------------|-------|
|                                       | Cobble Needle Suturing | Conventional Suturing |       |
| Laparoscopic Appendicectomy under GA  | 4                      | 2                     | 6     |
| Laparoscopic Cholecystectomy under GA | 26                     | 28                    | 54    |
| <b>Total</b>                          | 30                     | 30                    | 60    |

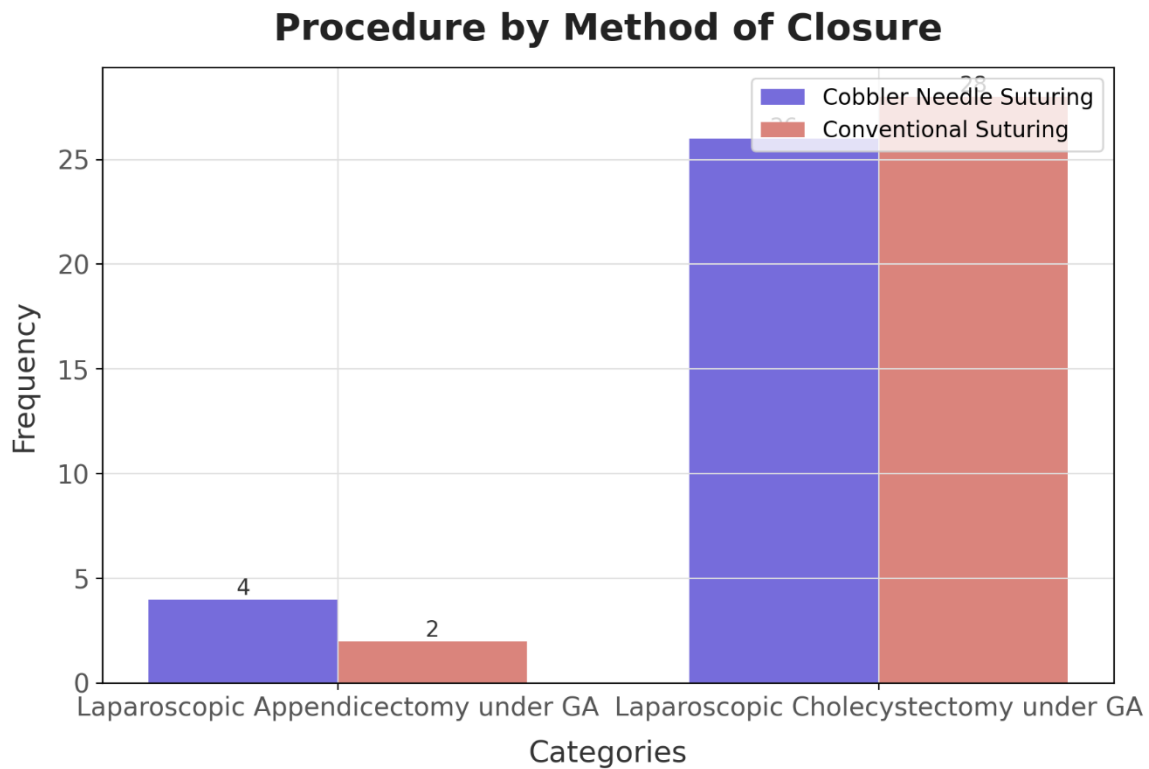


Figure 15 : Stacked bar chart for procedure done for the study population based on method of closure (n=60)

Laparoscopic cholecystectomy was the predominant procedure in both closure methods, with 26 patients in the Cobble Needle group and 28 in the Conventional Suturing group. Laparoscopic appendicectomy was less common in both groups.

### **III. DISTRIBUTION OF OUTCOME BASED ON METHOD OF CLOSURE**

Table 12: Distribution of seroma formation during follow up based on method of closure (n=60)

| <b>Follow up day</b> | <b>Seroma Status</b> | <b>Cobbler Needle Suturing</b> | <b>Conventional Suturing</b> | <b>Total</b> | <b>P value</b> |
|----------------------|----------------------|--------------------------------|------------------------------|--------------|----------------|
| <b>Day - 3</b>       | Absent               | 28 (93.3%)                     | 20 (66.7%)                   | 48 (80%)     | <b>0.01*</b>   |
|                      | Present              | 2 (6.7%)                       | 10 (33.3%)                   | 12 (20%)     |                |
|                      | <b>Total</b>         | <b>30</b>                      | <b>30</b>                    | <b>60</b>    |                |
| <b>Day - 5</b>       | Absent               | 28 (93.3%)                     | 21 (70%)                     | 49 (81.7%)   | <b>0.02*</b>   |
|                      | Present              | 2 (6.7%)                       | 9 (30%)                      | 11 (18.3%)   |                |
|                      | <b>Total</b>         | <b>30</b>                      | <b>30</b>                    | <b>60</b>    |                |
| <b>Day - 7</b>       | Absent               | 29 (96.7%)                     | 30                           | 59 (98.3%)   | 0.31           |
|                      | Present              | 1 (3.3%)                       | 0                            | 1 (1.7%)     |                |
|                      | <b>Total</b>         | <b>30</b>                      | <b>30</b>                    | <b>60</b>    |                |
| <b>Day - 14</b>      | Absent               | 30                             | 30                           | 60           | —              |
|                      | <b>Total</b>         | <b>30</b>                      | <b>30</b>                    | <b>60</b>    |                |
| <b>Day - 30</b>      | Absent               | 30                             | 30                           | 60           | —              |
|                      | <b>Total</b>         | <b>30</b>                      | <b>30</b>                    | <b>60</b>    |                |

Table 9 illustrates the distribution of seroma formation at various postoperative follow-up intervals in patients who underwent laparoscopic port closure using either the Cobbler Needle suturing method or Conventional Hand Suturing. Seroma presence or absence was assessed on postoperative days 3, 5, 7, 14, and 30.

- Day 3: Seroma was detected in 6.7% (2/30) of patients in the Cobbler Needle group, while 33.3% (10/30) of those in the Conventional Suturing group developed the condition. This difference was statistically significant (P = 0.01), indicating a lower likelihood of early seroma formation with the Cobbler Needle technique.
- Day 5: A similar pattern was observed, with seroma persisting in 6.7% (2/30) of patients in the Cobbler Needle group, compared to 30% (9/30) in the Conventional Suturing group.

The difference remained statistically significant ( $P = 0.02$ ), reinforcing the suggestion that the Cobbler Needle technique may be associated with a lower risk of seroma formation.

- Day 7: By this time, seroma had resolved in the majority of patients, with only one case (3.3%) persisting in the Cobbler Needle group, while no cases remained in the Conventional Suturing group. The difference between the groups was not statistically significant ( $P = 0.31$ ).
- Days 14 and 30: No seroma was observed in either group, indicating complete resolution in all patients. As there was no difference between groups,  $P$  values were not applicable.

Overall, these findings suggest that seroma formation is more prevalent in the early postoperative phase with Conventional Hand Suturing but diminishes over time. The Cobbler Needle technique appears to be associated with a significantly lower incidence of seroma in the initial postoperative period.

Table 13: Distribution of haematoma formation during follow up based on method of closure (n=60)

| Follow up day | Haematoma Status | Cobbler Needle Suturing | Conventional Suturing | Total      | P value |
|---------------|------------------|-------------------------|-----------------------|------------|---------|
| Day 3         | Absent           | 29 (96.7%)              | 21 (70%)              | 50 (83.3%) | 0.006*  |
|               | Present          | 1 (3.3%)                | 9 (30%)               | 10 (16.7%) |         |
| Day 5         | Absent           | 29 (96.7%)              | 28 (93.3%)            | 57 (95%)   | 0.55    |
|               | Present          | 1 (3.3%)                | 2 (6.7%)              | 3 (5%)     |         |
| Day 7         | Absent           | 30                      | 30                    | 60         | —       |
| Day 14        | Absent           | 30                      | 30                    | 60         | —       |
| Day 30        | Absent           | 30                      | 30                    | 60         | —       |

Table 13 presents the occurrence of hematoma at different postoperative follow-up intervals in patients who underwent laparoscopic port closure using either the Cobbler Needle suturing technique or Conventional Hand Suturing. Hematoma presence or absence was recorded on postoperative days 3, 5, 7, 14, and 30.

- Day 3: Hematoma formation was observed in 3.3% (1/30) of patients in the Cobbler Needle group, whereas 30% (9/30) of those in the Conventional Suturing group developed hematoma. This difference was statistically significant ( $P = 0.006$ ), indicating a lower incidence of early hematoma formation with the Cobbler Needle technique.
- Day 5: Hematoma persisted in 3.3% (1/30) of patients in the Cobbler Needle group and 6.7% (2/30) in the Conventional Suturing group. However, the difference between the groups was not statistically significant ( $P = 0.55$ ), suggesting similar resolution rates.
- Days 7, 14, and 30: No hematoma was observed in either group from day 7 onward, indicating complete resolution of the condition in all patients. Since there were no differences between groups, P values were not applicable.

Overall, these findings suggest that hematoma formation is more frequent in the early postoperative period with Conventional Hand Suturing.

Table 14: Distribution of surgical site infection during follow up based on method of closure (n=60)

| Follow up day | SSI Status   | Cobbler Needle Suturing | Conventional Suturing | Total      | P value       |
|---------------|--------------|-------------------------|-----------------------|------------|---------------|
| Day 3         | Absent       | 30                      | 21 (70%)              | 51 (85%)   | <b>0.001*</b> |
|               | Present      | 0                       | 9 (30%)               | 9 (15%)    |               |
|               | <b>Total</b> | <b>30</b>               | <b>30</b>             | <b>60</b>  |               |
| Day 5         | Absent       | 28 (93.3%)              | 27 (90%)              | 55 (91.7%) | 0.64          |
|               | Present      | 2 (6.7%)                | 3 (10%)               | 5 (8.3%)   |               |
|               | <b>Total</b> | <b>30</b>               | <b>30</b>             | <b>60</b>  |               |

|               |              |            |           |            |      |
|---------------|--------------|------------|-----------|------------|------|
| <b>Day 7</b>  | Absent       | 28 (93.3%) | 27 (90%)  | 55 (91.7%) | 0.64 |
|               | Present      | 2 (6.7%)   | 3 (10%)   | 5 (8.3%)   |      |
|               | <b>Total</b> | <b>30</b>  | <b>30</b> | <b>60</b>  |      |
| <b>Day 14</b> | Absent       | 30         | 30        | 60         | —    |
| <b>Day 30</b> | Absent       | 30         | 30        | 60         | —    |

Table 11 details the incidence of surgical site infection (SSI) at various postoperative follow-up intervals in patients who underwent laparoscopic port closure using either the Cobbler Needle suturing technique or Conventional Hand Suturing. The presence or absence of SSI was recorded on postoperative days 3, 5, 7, 14, and 30.

- Day 3: SSI was observed in 30% (9/30) of patients in the Conventional Suturing group, while no cases were reported in the Cobbler Needle group. This difference was statistically significant ( $P = 0.001$ ), indicating a higher risk of early postoperative infection with Conventional Hand Suturing.
- Day 5: The incidence of SSI decreased in both groups, with 6.7% (2/30) of patients in the Cobbler Needle group and 10% (3/30) in the Conventional Suturing group showing infection. However, the difference was not statistically significant ( $P = 0.64$ ), suggesting similar infection resolution trends.
- Day 7: The SSI incidence remained unchanged from day 5, with 6.7% (2/30) of patients in the Cobbler Needle group and 10% (3/30) in the Conventional Suturing group. Again, the difference between groups was not statistically significant ( $P = 0.64$ ).
- Days 14 and 30: No cases of SSI were observed in either group, indicating complete resolution of infections. Since there were no differences between groups, P values were not applicable.

The Cobbler Needle technique appears to be associated with a significantly lower risk of SSI in the immediate postoperative period, suggesting a potential advantage in reducing early surgical site infections.

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# DISCUSSION



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## **Discussion**

The study included a total of 60 participants with an age range of 22 to 67 years (Mean: 40.02 ± 11.60 years). The majority (46.7%) belonged to the 30–45 years category, followed by those over 45 years (33.3%), with the lowest proportion being under 30 years (20%). Regarding the surgical procedure, 90% of patients underwent laparoscopic cholecystectomy, while 10% underwent laparoscopic appendectomy. The population was evenly divided between Cobbler Needle Suturing and Conventional Suturing (50% each), ensuring a balanced comparison. The mean age was similar between the two groups (39.30 years for Cobbler Needle Suturing and 40.73 years for Conventional Suturing). The age distribution showed a predominance of the 30–45 age category in both techniques. Females constituted the majority in both groups (76.7%). Laparoscopic cholecystectomy was the predominant procedure in both groups, with 26 cases in the Cobbler Needle group and 28 in the Conventional Suturing group.

Seroma formation was significantly lower in the Cobbler Needle group during the early postoperative period. On Day 3, only 6.7% of patients in the Cobbler Needle group developed seroma compared to 33.3% in the Conventional Suturing group ( $P = 0.01$ ). This trend persisted on Day 5 (6.7% vs. 30%,  $P = 0.02$ ). By Day 7, seroma had mostly resolved, with only one case (3.3%) in the Cobbler Needle group. No seroma was observed in either group by Days 14 and 30. Hematoma formation was significantly higher in the Conventional Suturing group in the early postoperative period. On Day 3, only 3.3% of patients in the Cobbler Needle group developed hematoma compared to 30% in the Conventional Suturing group ( $P = 0.006$ ). By Day 5, hematoma persisted in 3.3% of Cobbler Needle cases and 6.7% of Conventional Suturing cases ( $P = 0.55$ ). From Day 7 onward, no hematoma was observed in either group. During the early post-operative period too, SSI was significantly more common in the Conventional Suturing group. On Day 3, 30% of Conventional Suturing patients developed SSI, with none in the Cobbler Needle arm ( $P = 0.001$ ). Infection rates were lower by Day 5 (6.7% with Cobbler Needle vs. 10% with Conventional Suturing,  $P = 0.64$ ). Day 7 showed a trend similar to the pattern in Day 6. From Day 14 onwards, no case of SSI was entered.

The findings show that Early Post Operative Seroma, Hematoma and SSIs were significantly lower in Cobbler Needle Suturing as compared to Conventional Hand Suturing. Such findings have led to suggest that the Cobbler Needle technique may provide an advantage when it comes to improving early postoperative complications in laparoscopic port closure. Therefore, based on

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these observations, the Cobbler Needle technique could be proposed as a better procedure in laparoscopic surgery in order to enhance patient results and reduce post-surgical complications.

Other studies on this topic are limited, making it difficult to compare the findings directly. We had very little research to work with in this area, so our analysis was made up of the limited evidence that is available. We will compare our findings with the available data to frame an overarching understanding of the subject with the caveat that the subject lacks a significant body of knowledge as of October 2023. This highlights the need for more well-designed studies to better inform existing evidence and bring to light other aspects of the question.

Comparisons of port closure techniques during laparoscopic procedures have demonstrated variability in closure efficiency, postoperative complications, and clinical outcomes. Elashry et al. (1996) performed a comparison of various port closure systems including Carter-Thomason Needle-Point Suture Passer, Maciol suture needle set, eXit Disposable Puncture Closure device, Endoclose suture carrier, and others. Their results showed that the Carter-Thomason device was the most efficient method of closure, being the fastest technique leading to fewer complications, and was therefore ultimately considered the preferred method of port-site closure after laparoscopic surgery (51). Similarly, Shetty et al. (2014) evaluated the performance of the strategy of Carter and Thomason and compared to traditional hand suturing in a series of 200 patients. Their study showed that the Carter-Thomason technique significantly shortened closure time and there was less wound-related complications (53). These observations concord with the findings of our study that showed a significantly reduced incidence of early postoperative complications, such as seroma, hematoma, or surgical site infection, in patients who underwent Cobbler Needle port closure. This is in addition to the increasing evidence suggesting that specific closure methods improve the outcomes of surgery through providing better wound integrity and lower post-surgical complications.

Surgical site infections are still a major concern facing both laparoscopic and open procedures. Warren et al. In a large-scale study of 66,566 cases of cholecystectomy, they found that SSIs were noted in 0.64% of laparoscopic surgeries versus 4.93% of open procedures (2017), suggesting that minimally invasive approaches are associated with fewer infections. Other risk factors include the male sex, the presence of diabetes, obesity and smoking, as well as acute cholecystitis, and all of them were associated with the increased risk of SSIs (52). Although the effect of patient comorbidities as a predictor of risk is beyond the scope of this current study, we did observe a significantly decreased reported incidence of SSI in our analysis of Cobbler Needle versus standard suturing in our patients, which continues to support previously reported outcomes for the

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benefits of Cobbler Needle in infection rates. The reports of Majhi et al. (2021) that demonstrated the incidence of port-site complications (infections, hematomas, port-site hernias, etc.) in 7.2% of the patients — laparoscopic surgery within the range of 3 months, indicating the importance of the closure technique to reduce postoperative morbidity (54). Shah et al. (2024) also document a serious occurrence of the port-site issues were more frequent if higher caliber trocars had been used, and specimen retrieval sacks were not used. Additionally, Bessoff et al. (58) that the wound outcomes with suture passer were more favorable than the hand-sewed closures regarding perioperative complications hematoma and wound dehiscence complications. These results are consistent with these studies, suggesting that closure with Cobbler Needle may result in better outcomes compared with conventional hand suturing in terms of early postoperative complications.

Moreover, port closure techniques in obese patients have gained attention as well. Eid et al. reported that TSH was markedly increased in obese and bariatric surgery patients due to greater intraabdominal pressure and expanded preperitoneal space, another risk factor for TSPH and, accordingly, with concern in minimally invasive procedures, full-thickness meticulous closure to prevent fascial defects is required. They pointed out that adequate closure using conventional hand suturing was frequently unachievable in these patients and advocated for changes in practice to incorporate methods of secure and efficient wound closure (56). Similarly, Jeon et al. Indicated that closure time and failure rates were greatly reduced using the EZ-Close™ device, especially in patients with high body mass index (BMI); these specialized devices are proposed to have a positive effect on high-risk populations.(63) Our study did not stratify according to BMI but the reduced rates of seroma, hematoma, and SSI observed for the Cobbler Needle group may indicate that this technique could be advantageous in obese and high-risk patients. Additionally, Selvaraj et al. described good results of closure with the Cobbler Needle after laparoscopic and robotic urological surgery in 151 patients. They demonstrated that their Cobbler Needle technique, performed anterior to the insertion of the trocar sheath permitting direct visualization of the fascial repair, resulted in no trocar-site hernias on average 28 months of follow-up, reaffirming the safety and efficacy of their technique (61). These outcomes are consistent with our study's conclusion that Cobbler Needle suturing is a safe and effective alternative to standard hand suturing with a trend towards reduced early postoperative morbidity and potentially decreasing late complication rates.

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# SUMMARY



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## **Summary**

Laparoscopic surgery is widely favored due to its minimally invasive nature, but effective port site closure remains critical to avoid postoperative complications such as seroma, hematoma, and surgical site infections (SSI). The Cobbler Needle Suturing technique has been proposed as an alternative to Conventional Hand Suturing in port site closure, potentially offering improved clinical outcomes. However, limited comparative studies have evaluated the efficacy of these two techniques in clinical settings.

This comparative observational study was conducted at R.L. Jalappa Hospital and Research Centre, Karnataka, between May 2023 and October 2024. It aimed to assess and compare the outcomes of port site closure using the Cobbler Needle and Conventional Hand Suturing techniques in patients undergoing laparoscopic cholecystectomy or appendicectomy. A total of 60 patients were enrolled and allocated evenly into two groups (n=30 each) using an even-odd allocation method. Group A underwent closure with the Cobbler Needle Suturing technique, while Group B received closure via Conventional Hand Suturing.

Postoperative outcomes—specifically the incidence of seroma, hematoma, and SSI—were assessed through physical examination on postoperative days 3, 5, and 7. Microsoft Excel was used for data entry, and statistical analysis was performed using SPSS version 26.0.

The results indicated a clear benefit of the Cobbler Needle technique over the conventional method. Seroma formation was significantly lower in the Cobbler Needle group, with only 6.7% incidence on Day 3 compared to 33.3% in the Conventional group ( $P = 0.01$ ). This trend continued on Day 5 (6.7% vs. 30%,  $P = 0.02$ ), and by Day 7, only one case remained in the Cobbler group. Both groups showed complete resolution by Day 14.

Hematoma occurrence was also significantly lower in the Cobbler group, with only one case (3.3%) reported on Day 3, compared to 30% in the Conventional group ( $P = 0.006$ ). No hematomas were noted in either group beyond Day 7.

SSI showed a similar pattern. None of the patients in the Cobbler group developed an SSI on Day 3, while 30% of patients in the Conventional group were affected ( $P = 0.001$ ). By Day 5, the infection rate had decreased, and by Day 14, no SSIs were reported in either group.

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# LIMITATIONS



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## **Limitations**

There are a few limitations in this study that need to be addressed while interpreting the findings. First, it was performed in a single center, which limits the external validity of the results. Outcomes observed in this study may not fully translate to other settings given differences in patient demographics, healthcare infrastructure, and surgical practices between institutions; however, the groups do share certain sociodemographic factors.

Second, the number of subjects studied was a limited sample of only 60 subjects. Numbers this small might not have enough statistical power to reveal differences between the two suturing techniques. The small cohort size also limits the ability to control or compensate for confounders in the outcome data. Another limitation is that the study only explored three main postoperative complications such as seroma, hematoma, and surgical site infections. The current study did not consider few other possible factors such as postoperative pain, healing time, and patient satisfaction that are significant for evaluating the efficacy and surgical outcomes.

Due to the lack of imaging or laboratory testing, the potential for assessment bias exists as all complications were examined using only physical examination. This approach may not be well sensitive and may not be objective especially during the assessment of conditions such as seroma and hematoma, which is more appropriately evaluated using imaging modalities. Moreover, the exclusion criteria for high-risk patients, such as the immunocompromised or those with previous abdominal radiotherapy, restrict the generalizability of the findings to more heterogeneous, complex surgical populations. Thus, the study's findings may not generalise to patients with higher baseline complications.

These limitations underscore the importance of larger, multicenter, and probabilistic studies with longer follow-up. Such studies would help validate the present findings and provide a better overall picture of postoperative outcomes in a variety of patient populations and clinical contexts.

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# CONCLUSION



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## **Conclusion**

This study showed that Cobbler Needle Suturing was associated with a statistically significant decrease in early postoperative complications such as seroma, hematoma and surgical site infection (SSI), as compared to Conventional Hand Suturing technique for laparoscopic port closure. Although there was an equal distribution of subjects between the 2 groups, the Cobbler Needle technique was consistently found to have a lower complication rate, especially in the early postoperative days. On Day 14, resolution of seroma, hematoma, and SSI was complete in both techniques, indicating that the main advantage of Cobbler Needle Suturing is limiting early postoperative morbidity.

These outcomes suggest that Cobbler Needle Suturing might be superior to Conventional Hand Suturing in laparoscopic procedures by improving patient outcomes through a decrease in early complications. These results suggest that it may help to enhance postoperative recovery and overall surgical safety. More studies on larger cohorts with long-term follow-up are needed to validate these findings and investigate their potential clinical implications.

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# RECOMMENDATIONS



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## **Recommendations**

The Cobbler Needle Suturing must be preferred technique over other techniques for laparoscopic port closure, as it is reported to be associated with lower rates of seroma, hematoma, and surgical site infection (SSI). Its utilization may result in better patient outcomes and shorter recovery time after surgery. With these benefits, surgeons need to utilize Cobbler Needle Suturing in patients with increased risk for wound infections. Overall, this method has the capacity to provide a safer and more reliable alternative to traditional hand suturing methods among high-risk populations.

Training programs might adopt Cobbler Needle Suturing to aid in establishing widespread use. This effort will help train new generations of practitioners with the when and how to use techniques like these – a skill set future surgeons will need. Additional studies are crucial for confirming the present outcomes. Additional large-scale studies are needed to determine the long-term outcomes of this technique and to assess its cost-effectiveness when compared to traditional methods.

Finally, hospitals must improve the use of Cobbler Needle Suturing by standardization in surgical protocols and guidelines. Taking this step can ensure standardization of practice and lead to improved and reproducible postoperative results between institutions.

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# REFERENCES



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## References

1. Shenoy RK. Manipal Manual of Surgery. New Delhi, India: CBS Publishers & Distributors; 2010.
2. Townsend. Sabiston textbook of surgery: The biological basis of modern surgical practice. 21st ed. Townsend CM, editor. Philadelphia, PA: Elsevier - Health Sciences Division; 2021.
3. Minimally invasive surgery [Internet]. Cleveland Clinic. [cited 2025 Jan 3]. Available from: <https://my.clevelandclinic.org/health/procedures/minimally-invasive-surgery>
4. Garry R. Laparoscopic surgery. Best Pract Res Clin Obstet Gynaecol. 2006 Feb;20(1):89-104. doi: 10.1016/j.bpobgyn.2005.10.003. Epub 2005 Dec 20. PMID: 16373090.
5. Buia A, Stockhausen F, Hanisch E. Laparoscopic surgery: A qualified systematic review. World J Methodol. 2015 Dec 26;5(4):238-54. doi: 10.5662/wjm.v5.i4.238. PMID: 26713285; PMCID: PMC4686422.
6. Donohue JH. Laparoscopic surgical procedures. Mayo Clin Proc. 1994 Aug;69(8):758-62. doi: 10.1016/s0025-6196(12)61095-7. PMID: 8035632.
7. Palanivelu C. Art of laparoscopic surgery – textbook and atlas. New Delhi, India: Jaypee Brothers Medical; 2019.
8. Aziz HH. A simple technique of laparoscopic port closure. JSLS. 2013 Oct-Dec;17(4):672-4. doi: 10.4293/108680813X13794522666482. PMID: 24398217; PMCID: PMC3866079.
9. Shah PR, Naguib N, Thippeswammy K, Masoud AG. Port site closure after laparoscopic surgery. J Minim Access Surg. 2010 Jan-Mar; 6(1):22-23.
10. Botea F, Torzilli G, Sarbu V. A simple, effective technique for port-site closure after laparoscopy. JSLS: Journal of the Society of Laparoendoscopic Surgeons. 2011 Jan;15(1):77.
11. Shaher Z. Port closure techniques. Surg Endosc. Epub 2007 Feb 7. Aug;21(8):1264-1274.
12. Chatzipapas IK, Hart RJ, Magos A. Simple technique for rectus sheath closure after laparoscopic surgery using straight needles, with review of the literature. J Laparoendosc Adv Surg Tech A 1999 Apr;9(2):205-209.
13. Del Junco M, Okhunov Z, Juncal S, Yoon R, Landman J. Evaluation of a novel trocar-site closure and comparison with a standard Carter-Thomason closure device. J Endourol. 2014 Jul;28(7):814-818.

- 
14. Sasmal PK, Mishra TS, Rath S, Meher S, Mohapatra D. Port site infection in laparoscopic surgery: A review of its management. *World J Clin Cases*. 2015 Oct 16;3(10):864-71. doi: 10.12998/wjcc.v3.i10.864. PMID: 26488021; PMCID: PMC4607803.
  15. Hamood MA, Mishra RK. Different port closure techniques in laparoscopy surgery. *World J Laparosc Surg* 2009 SepDec;2(3):29-38.
  16. Sriram BM. *SRB's manual of surgery*. 6th ed. New Delhi, India: Jaypee Brothers Medical; 2023.
  17. Minimally invasive surgery [Internet]. Yale Medicine. 2022 [cited 2025 Jan 2]. Available from: <https://www.yalemedicine.org/conditions/minimally-invasive-surgery>
  18. Ochsner JL. Minimally invasive surgical procedures. *Ochsner J*. 2000 Jul;2(3):135-6. PMID: 21765681; PMCID: PMC3117518.
  19. Chang J, Rattner DW. History of Minimally Invasive Surgical Oncology. *Surg Oncol Clin N Am*. 2019 Jan;28(1):1-9. doi: 10.1016/j.soc.2018.07.001. Epub 2018 Oct 23. PMID: 30414674.
  20. Yu X, Elliott SP, Wilt TJ, McBean AM. Practice patterns in benign prostatic hyperplasia surgical therapy: the dramatic increase in minimally invasive technologies. *J Urol*. 2008 Jul;180(1):241-5; discussion 245. doi: 10.1016/j.juro.2008.03.039. Epub 2008 May 21. PMID: 18499180.
  21. Stephen W, Eubanks S, Lee L, Swanstrom LL, Soper NJ, eds. (2004). *Mastery of Endoscopic and Laparoscopic Surgery* (2nd ed.). Lippincott Williams & Wilkins. ISBN 978-0781744454
  22. Srivastava, Arati; Niranjana, Ashutosh (2010). "Secrets of safe laparoscopic surgery: Anaesthetic and surgical considerations". *Journal of Minimal Access Surgery*. 6 (4). Medknow: 91–4. doi:10.4103/0972-9941.72593. ISSN 0972-9941. PMC 2992667. PMID 21120064
  23. Kaban GK, Czerniach DR, Litwin DE, Litwin DE (2003). "Hand-assisted laparoscopic surgery". *Surgical Technology International*. 11: 63–70. PMID 12931285
  24. Hassler KR, Collins JT, Philip K, Jones MW. Laparoscopic Cholecystectomy. 2023 Jan 23. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 28846328.
  25. What is Cholecystectomy? [Internet]. North Texas Medical Center | Your Health. Your Hospital. Your Choice. North Texas Medical Center; 2020 [cited 2025 Jan 2]. Available from: <https://ntmconline.net/services/surgery/cholecystectomy/>

- 
26. St Peter SD, Keckler SJ, Nair A, Andrews WS, Sharp RJ, Snyder CL, Ostlie DJ, Holcomb GW. Laparoscopic cholecystectomy in the pediatric population. *J Laparoendosc Adv Surg Tech A*. 2008 Feb;18(1):127-30. doi: 10.1089/lap.2007.0150. PMID: 18266591.
  27. Sief S. Laparoscopic cholecystectomy illustration, Surgical views of a step-by-step cholecystectomy [Internet]. Science photo library. 2022 [cited 2025 Jan 2]. Available from: <https://www.sciencephoto.com/media/1366791/view/laparoscopic-cholecystectomy-illustration>
  28. Laparoscopic appendectomy [Internet]. Msurgery.ie. [cited 2025 Jan 2]. Available from: <https://msurgery.ie/home/operative-procedures/major-procedures/general-surgery/laparoscopic-appendectomy/>
  29. Hori T, Machimoto T, Kadokawa Y, Hata T, Ito T, Kato S, Yasukawa D, Aisu Y, Kimura Y, Sasaki M, Takamatsu Y, Kitano T, Hisamori S, Yoshimura T. Laparoscopic appendectomy for acute appendicitis: How to discourage surgeons using inadequate therapy. *World J Gastroenterol*. 2017 Aug 28;23(32):5849-5859. doi: 10.3748/wjg.v23.i32.5849. PMID: 28932077; PMCID: PMC5583570.
  30. Laparoscopic appendix removal (appendectomy) surgery patient information [Internet]. SAGES. SAGES - Society of American Gastrointestinal and Endoscopic Surgeons; 2020 [cited 2025 Jan 2]. Available from: <https://www.sages.org/publications/patient-information/patient-information-for-laparoscopic-appendectomy-from-sages/>
  31. Mishra RK. Laparoscopic port closure technique [Internet]. Laparoscopyhospital.com. [cited 2025 Jan 3]. Available from: <https://www.laparoscopyhospital.com/introduction.htm>
  32. Guruswamy R, Studley JGN. A simple, safe and cost-effective technique for closure of difficult laparoscopic port sites. *Ann R Coll Surg Engl* [Internet]. 2007;89(2):176–7. Available from: <http://dx.doi.org/10.1308/rcsann.2007.89.2.176>
  33. Arifuzaman M, Samreen A. Laparoscopic port closure techniques and incidence of port-site hernias: A review and recommendations. *World J Laparosc Surg DVD* [Internet]. 2018;11(2):90–102. Available from: <http://dx.doi.org/10.5005/jp-journals-10033-1342>
  34. Cobbler needle [Internet]. Medpick - Online Medical Supply Store. Medpick; 2023 [cited 2025 Jan 3]. Available from: [https://medpick.in/product/cobbler-needle/?srsltid=AfmBOoqpqxq56AfQQcmnMNf59RfjwNj25Nm\\_3v322gMDasL2XFXWNShqE](https://medpick.in/product/cobbler-needle/?srsltid=AfmBOoqpqxq56AfQQcmnMNf59RfjwNj25Nm_3v322gMDasL2XFXWNShqE)

- 
35. Stainless steel laparoscopic Port Closure / Suture Passer Needle [Internet]. indiamart.com. [cited 2025 Jan 3]. Available from: <https://www.indiamart.com/proddetail/laparoscopic-port-closure-suture-passer-needle-24756808362.html>
  36. Selvaraj N, Dholakia K, Ramani S, Ragavan N. The Chennai port closure method: A novel simple technique for laparoscopic port closure. *Surg Open Sci.* 2021 Feb 17;4:37-40. doi: 10.1016/j.sopen.2021.02.001. PMID: 33778460; PMCID: PMC7985694.
  37. Laparoscopic Port Closure Cobbler Suture Passer Needle surgical instru [Internet]. Tannu Surgical Works. [cited 2025 Jan 3]. Available from: [https://tannusurgicalworks.com/products/laparoscopic-port-closure-cobbler-suture-passer-needle-surgical-instrument?srsltid=AfmBOor\\_5X0JWqqna7dZGLX6-Rg0cnSpEFfycLUsfqsPx1FMgpFBeipk](https://tannusurgicalworks.com/products/laparoscopic-port-closure-cobbler-suture-passer-needle-surgical-instrument?srsltid=AfmBOor_5X0JWqqna7dZGLX6-Rg0cnSpEFfycLUsfqsPx1FMgpFBeipk)
  38. Ethicon-port-closure-needle-suture-coated-vicryl-violet-braided-box-of-12-model-j00jg [Internet]. OOO MediNOVA. 2015 [cited 2025 Jan 3]. Available from: <https://www.medinova.com.ua/ethicon-port-closure-needle-suture-coated-vicryl-violet-braided-box-of-12-model-j00jg/>
  39. Mishra RK. *Textbook of laparoscopy for surgeons and gynecologists.* 4th ed. New Delhi, India: Jaypee Brothers Medical; 2021.
  40. Hulka JF, Reich H. *Textbook of Laparoscopy.* 3rd ed. London, England: W B Saunders; 1998.
  41. Dhamotharan SR. *Through the ports: A textbook of laparoscopy for postgraduates.* Mountain View, CA: Notion Press; 2019.
  42. A novel method of laparoscopic port site closure to significantly decrease postoperative surgical site pain [Internet]. SAGES. SAGES - Society of American Gastrointestinal and Endoscopic Surgeons; 2014 [cited 2025 Jan 3]. Available from: <https://www.sages.org/meetings/annual-meeting/abstracts-archive/a-novel-method-of-laparoscopic-port-site-closure-to-significantly-decrease-postoperative-surgical-site-pain/>
  43. Suturing techniques technique [Internet]. Medscape.com. 2020 [cited 2025 Jan 3]. Available from: <https://emedicine.medscape.com/article/1824895-technique?form=fpf>
  44. Li P, Chung RS. Closure of trocar wounds using a suture carrier. *Surg Laparosc Endosc.* 1996;6:469-71.
  45. Chandra J N, Manivasagam SS, Choudhary S, Manocha P, Reddy BH. Insights Into Laparoscopic Port Site Complications: A Comprehensive Review. *Cureus.* 2024 Jun 28;16(6):e63431. doi: 10.7759/cureus.63431. PMID: 39077265; PMCID: PMC11284342
-

- 
46. Karthik S, Augustine AJ, Shibumon MM, Pai MV. Analysis of laparoscopic port site complications: A descriptive study. *J Minim Access Surg.* 2013 Apr;9(2):59-64. doi: 10.4103/0972-9941.110964. PMID: 23741110; PMCID: PMC3673575.
47. Pulle, Mohan & Siddhartha, Rahul & Dey, Ashish & Mittal, Tarun & Malik, Vinod. (2015). Port site hernia in laparoscopic surgery: Mechanism, prevention and management. *Current Medicine Research and Practice.* 5. 10.1016/j.cmrp.2015.05.008.
48. Martinez J, Targarona EM, Balagué C, Pera M, Trias M. Port site metastasis. An unresolved problem in laparoscopic surgery. A review. *Int Surg.* 1995 Oct-Dec;80(4):315-21. PMID: 8740676.
49. Ki HJ, Park JB, Sul JY. Umbilical Port Site Hernia and Diastasis Recti. *J Minim Invasive Surg.* 2020 Jun 15;23(2):80-85. doi: 10.7602/jmis.2020.23.2.80. PMID: 35600062; PMCID: PMC8985617.
50. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. *Indian J Med Microbiol.* 2005 Oct;23(4):249-52. PMID: 16327121.
51. Elashry OM, Nakada SY, Wolf JS Jr, Figenshau RS, McDougall EM, Clayman RV. Comparative clinical study of port-closure techniques following laparoscopic surgery. *J Am Coll Surg.* 1996 Oct;183(4):335-44. PMID: 8843262.
52. Warren DK, Nickel KB, Wallace AE, Mines D, Tian F, Symons WJ, Fraser VJ, Olsen MA. Risk Factors for Surgical Site Infection After Cholecystectomy. *Open Forum Infect Dis.* 2017 Feb 22;4(2):ofx036. doi: 10.1093/ofid/ofx036. PMID: 28491887; PMCID: PMC5419069.
53. Shetty A, Adiyat KT. Comparison between hand suture and Carter-Thomason needle closure of port sites in laparoscopy. *Urol J.* 2014 Sep 2;11(4):1768-71. PMID: 25194073.
54. Majhi H, Nayak TK, Raghav SS, Tirkey AS. Assessment of Port Site Complications in laparoscopic surgery – A prospective descriptive study from western odisha. *J Evid Based Med Healthc* [Internet]. 2021;8(24):2106–11. Available from: <http://dx.doi.org/10.18410/jebmh/2021/394>
55. Hellan M, Anderson C, Pigazzi A. Extracorporeal versus intracorporeal anastomosis for laparoscopic right hemicolectomy. *JLS.* 2009;13:312–317.
56. Eid GM, Collins J. Application of a trocar wound closure system designed for laparoscopic procedures in morbidly obese patients. *Obes Surg.* 2005 Jun-Jul;15(6):871-3. doi: 10.1381/0960892054222623. PMID: 15978161.

- 
57. Lim S, Ghosh S, Niklewski P, Roy S. Laparoscopic Suturing as a Barrier to Broader Adoption of Laparoscopic Surgery. *JLS*. 2017 Jul-Sep;21(3):e2017.00021. doi: 10.4293/JLS.2017.00021. PMID: 28694682; PMCID: PMC5491803.
58. Bessoiff KE, Choi J, Wolff CJ, Kashikar A, Carlos GM, Caddell L, et al. Evidence-based surgery for laparoscopic appendectomy: A stepwise systematic review. *Surg Open Sci* [Internet]. 2021;6:29–39. Available from: <http://dx.doi.org/10.1016/j.sopen.2021.08.001>
59. Deolekar, S., Thakur, B. A., & Bairolia, K. (2016). Comparison of conventional suturing and tissue adhesive (2-octyl cyanoacrylate) for port site skin closure in laparoscopic surgeries. *International Surgery Journal*, 4(1), 204–208. <https://doi.org/10.18203/2349-2902.isj20164440>
60. Andraos, Y. Safety and Efficacy of Trocar Port-Site Closure Using a Biological Plug Closure in Laparoscopic Bariatric Surgery: a Prospective Study. *OBES SURG* 32, 3796–3806 (2022). <https://doi.org/10.1007/s11695-022-06238-y>
61. Selvaraj N, Dholakia K, Ramani S, Ragavan N. The Chennai port closure method: A novel simple technique for laparoscopic port closure. *Surg Open Sci*. 2021 Feb 17;4:37-40. doi: 10.1016/j.sopen.2021.02.001. PMID: 33778460; PMCID: PMC7985694.
62. Shah KK, Galani KJ, Nathwani MT. A study of laparoscopic port site complications – A descriptive study in a tertiary care hospital. *Natl J Physiol Pharm Pharmacol* 2024;14(03):413-417.
63. Jeon Y, Song S, Han KW, Lee DH, Baek JH. Evaluation of a Novel Trocar-Site Closure Device in Laparoscopic Surgery. *JLS*. 2020 Jul-Sep;24(3):e2020.00033. doi: 10.4293/JLS.2020.00033. PMID: 32714001; PMCID: PMC7343404.
64. K H Gad, A M M Elhefny, W B Gerges, M S A Sebaie, Assessment of Port Site Complication in Laparoscopic Abdominal Surgery, *QJM: An International Journal of Medicine*, Volume 113, Issue Supplement\_1, March 2020, hcaa050.019, <https://doi.org/10.1093/qjmed/hcaa050.019>
65. Mudgal, M. M., Kothiya, P. K., Kushwah, N., & Singh, R. (2018). Port site complications following laparoscopic surgeries: a prospective study. *International Surgery Journal*, 5(2), 598–601. <https://doi.org/10.18203/2349-2902.isj20180360>

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# ANNEXURES



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**Annexure 1**

**PROFORMA**

**COMPARATIVE STUDY OF COBBLER NEEDLE SUTURING VERSUS  
CONVENTIONAL SUTURING IN PORT CLOSURE IN  
LAPAROSCOPIC SURGERIES**

Investigator : Dr. Akhil Vincent , Junior Resident , Dept. Of General Surgery

**Particulars of the patients:**

- NAME : \* Date of admission
- AGE : \* Date of discharge:
- Gender : \* UHID NO :
- Occupation :
- Group : Conventional Suturing / Cobbler Needle Suturing

**HISTORY**

- Chief Presenting complaints:
- History Of Presenting Complaints :
- Past History:
- Obstetric / Menstrual History :
- Personal History :
- Family History:

**GENERAL PHYSICAL EXAMINATION:**

- General Condition:
- Built and nutrition:

|        |  |         |  |          |  |          |  |                 |  |       |  |
|--------|--|---------|--|----------|--|----------|--|-----------------|--|-------|--|
| Pallor |  | Icterus |  | Clubbing |  | Cyanosis |  | Lymphadenopathy |  | Edema |  |
|--------|--|---------|--|----------|--|----------|--|-----------------|--|-------|--|

Height : Cms                      Weight: Kgs                      BMI : Kg/m<sup>2</sup>

VITALS

- Pulse rate :
- Blood pressure :
- Respiratory Rate:
- Temperature :

SYSTEMIC EXAMINATION

- Cardio Vascular System :
- Respiratory System:
- Central Nervous System:
- Per Abdomen:

INVESTIGATIONS

Hb : gm/dl  
RBC: Millions / Cu mm  
PCV : %  
WBC : Thousands/Cumm  
PLT: Thousands/Cumm  
Blood Group :

Blood Urea : mg/dL                      Serum Creatinine : mg/dL

Serum sodium : mEq/L                      Serum potassium : mEq/L

HIV-                                      HCV -                                      HBsAg -

RBS- mg/dL                                      ECG -

USG -                                      Chest X Ray -

- **DIAGNOSIS:**
  
- **PREOPERATIVE ORDERS:**
  
- **SURGERY PERFORMED:**
  
- **POSTOPERATIVE ORDERS AND PROGRESS:**

Post Operative Monitoring Of Seroma , Haematoma , Surgical Site Infection

| Day                   | Seroma | Haematoma | Surgical Site Infection |
|-----------------------|--------|-----------|-------------------------|
| Post Operative Day 3  |        |           |                         |
| Post Operative Day 5  |        |           |                         |
| Post Operative Day 7  |        |           |                         |
| Post Operative Day 14 |        |           |                         |
| Post Operative Day 30 |        |           |                         |

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## Annexure 2

### **PATIENT INFORMATION SHEET**

**Study title:**

**COMPARATIVE STUDY OF COBBLER NEEDLE SUTURING VERSUS CONVENTIONAL SUTURING IN PORT CLOSURE IN LAPAROSCOPIC SURGERIES**

Laparoscopy is a type of surgical procedure that allows a surgeon to access the inside of the abdomen (tummy) and pelvis without having to make large incisions in the skin. This procedure is also known as keyhole surgery or minimally invasive surgery. Large incisions can be avoided during laparoscopy because the surgeon uses an instrument called a laparoscope. This is a small tube that has a light source and a camera, which relays images of the inside of the abdomen or pelvis to a television monitor.

After completing the surgery, the skin ports used for the surgery to be closed. Conventional method is using hand technique to close the camera ports. Another novel method is using a specialised instrument called cobbler needle. The both methods are used for skin closure techniques and accepted. This study is intended to document the results of port closure using Cobbler Needle and Conventional Suturing techniques and compare the both.

This is a comparative study between Cobbler Needle and Conventional Hand Suturing in the port closure of laparoscopic surgery. Patient satisfying the inclusion criteria will be divided into two groups as per the even-odd method. Patients in group A will be managed with Cobbler Needle and Group B with conventional hand suturing. Patients will be followed up throughout the course in hospital stay for complications like seroma formation, hematoma formation and surgical site infection on post operative days 3, 5, 7.

Patients in this study will have to undergo appropriate blood investigations and Ultrasound Scan of Abdomen and Pelvis will be taken pre operatively. Patients will be subjected to laparoscopy surgery and after correlation with clinical assessment and those results will be compiled and documented.

Patient will be explained about the importance of undergoing the above-mentioned investigations and treatment procedures, alternative methods of treatment and complications of not undergoing the treatment.

Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in the study, we will collect information from you or the person responsible for you, or both. Relevant history will be taken. This information collected will be used only for dissertation and publication.

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All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the members of the same. There is no compulsion to agree to this study. The care you will get will not change if you do not wish to participate in this study. You will have no financial benefit by being a part of this study, nor will you incur any risk. You are required to sign/provide thumb impression only if you voluntarily agree to participate in this study.

For further information contact,

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Name , left thumb impression/signature of the patient

Name , left thumb impression/signature of the witness

## ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆ

**ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ:** ಲ್ಯಾಪರೋಸ್ಕೋಪಿಕ್ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಗಳಲ್ಲಿ ಪೋರ್ಟ್ ಮುಚ್ಚುವಿಕೆಯನ್ನು ಸಾಂಪ್ರದಾಯಿಕ ಸೂತ್ರೀಕರಣದ ವಿರುದ್ಧ ಕೂಬ್ಲರ್ ಸೂಜಿಗಳ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ

ಲ್ಯಾಪರೋಸ್ಕೋಪಿ ಒಂದು ರೀತಿಯ ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ವಿಧಾನವಾಗಿದ್ದು, ಇದು ಚರ್ಮದಲ್ಲಿ ದೊಡ್ಡ ಬದಲಾವಣೆಗಳನ್ನು ಮಾಡದೆ ಕಿಬ್ಬೊಟ್ಟೆಯ (ತಿಮಯ) ಮತ್ತು ಪೆಲ್ವಿಸ್ ನ ಒಳಭಾಗವನ್ನು ಪ್ರವೇಶಿಸಲು ಅನುಮತಿಸುತ್ತದೆ. ಈ ಪ್ರಕ್ರಿಯೆಯನ್ನು ಕೀಹೋಲ್ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆ ಅಥವಾ ಕನಿಷ್ಠ ಆಕ್ರಮಣಕಾರಿ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆ ಎಂದೂ ಕರೆಯಲಾಗುತ್ತದೆ. ಲ್ಯಾಪರೋಸ್ಕೋಪಿ ಎಂದು ಕರೆಯಲ್ಪಡುವ ಒಂದು ಉಪಕರಣವನ್ನು ಶಸ್ತ್ರಚಿಕಿತ್ಸಕ ಲ್ಯಾಪರೋಸ್ಕೋಪಿ ಸಮಯದಲ್ಲಿ ದೊಡ್ಡದಾದ ಇಂಚ್ ಗಳನ್ನು ತಪ್ಪಿಸಬಹುದು. ಇದು ಒಂದು ಸಣ್ಣ ಕೊಳವೆಯಾಗಿದೆ, ಇದು ಒಂದು ಬೆಳಕಿನ ಮೂಲ ಮತ್ತು ಕ್ಯಾಮರಾವನ್ನು ಹೊಂದಿರುತ್ತದೆ, ಇದು ಕಿಬ್ಬೊಟ್ಟೆಯ ಒಳಗಿನ ಚಿತ್ರಗಳನ್ನು ಅಥವಾ ದೂರದರ್ಶನ ಮಾನಿಟರ್ ಪ್ರಸಾರ ಮಾಡುತ್ತದೆ.

ಶಸ್ತ್ರಚಿಕಿತ್ಸೆ ಮುಗಿದ ನಂತರ, ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಗಾಗಿ ಬಳಸಲಾಗಿರುವ ಚರ್ಮದ ಪೋರ್ಟ್‌ಗಳನ್ನು ಮುಚ್ಚಲಾಗುವುದು. ಸಾಂಪ್ರದಾಯಿಕ ವಿಧಾನವು ಕ್ಯಾಮೆರಾ ಬಂದರುಗಳನ್ನು ಮುಚ್ಚಲು ಹ್ಯಾಂಡ್ ತಂತ್ರವನ್ನು ಬಳಸುತ್ತಿದೆ. ಮತ್ತೊಂದು ಹೊಸ ವಿಧಾನವೆಂದರೆ ಕಾಬ್ಲರ್ ಸೂಜಿ ಎಂಬ ವಿಶೇಷ ಸಾಧನವನ್ನು ಬಳಸುತ್ತದೆ. ಎರಡೂ ವಿಧಾನಗಳನ್ನು ಚರ್ಮದ ಮುಚ್ಚುವ ತಂತ್ರಗಳಿಗೆ ಬಳಸಲಾಗುತ್ತದೆ ಮತ್ತು ಅಂಗೀಕರಿಸಲಾಗಿದೆ. ಈ ಅಧ್ಯಯನವು ಕೊಬ್ಲರ್ ಸೂಜಿ ಮತ್ತು ಸಾಂಪ್ರದಾಯಿಕ ಸುಕ್ಕುಗಟ್ಟಿಸುವ ತಂತ್ರಗಳನ್ನು ಬಳಸಿಕೊಂಡು ಬಂದರು ಮುಚ್ಚುವ ಫಲಿತಾಂಶಗಳನ್ನು ದಾಖಲಿಸುವ ಉದ್ದೇಶವನ್ನು ಹೊಂದಿದೆ.

ಇದು ಲ್ಯಾಪರೋಸ್ಕೋಪಿಕ್ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ಬಂದರು ಮುಚ್ಚುವಿಕೆಯಲ್ಲಿ ಕಾಬ್ಲರ್ ಸೂಜಿ ಮತ್ತು ಸಾಂಪ್ರದಾಯಿಕ ಕೈ ಸೂತ್ರೀಕರಣದ ನಡುವಿನ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನವಾಗಿದೆ. ಸೇರ್ಪಡೆ ಮಾನದಂಡಗಳನ್ನು ಪೂರೈಸುವ ರೋಗಿಯನ್ನು ಸಹ-ಬೆಸ ವಿಧಾನಕ್ಕೆ ಅನುಗುಣವಾಗಿ ಎರಡು ಗುಂಪುಗಳಾಗಿ ವಿಂಗಡಿಸಲಾಗಿದೆ. 'ಎ' ಗುಂಪಿನ ರೋಗಿಗಳನ್ನು ಕಾಬ್ಲರ್ ಸೂಜಿ ಮತ್ತು 'ಬಿ' ಗುಂಪಿನೊಂದಿಗೆ ಸಾಂಪ್ರದಾಯಿಕ ಕೈ ಸೂಜಿಗಳೊಂದಿಗೆ ನಿರ್ವಹಿಸಲಾಗುತ್ತದೆ. ಸರ್ಮಾ ರಚನೆ, ಹೆಮಟೋಮಾ ರಚನೆ ಮತ್ತು ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ಸೈಟ್ ಸೋಂಕಿನ ನಂತರದ ದಿನಗಳಲ್ಲಿ 3, 5, 7 ಮುಂತಾದ ತೊಂದರೆಗಳಿಗೆ ಆಸ್ಪತ್ರೆಯಲ್ಲಿ ರೋಗಿಗಳು ಚಿಕಿತ್ಸೆ ಪಡೆಯುತ್ತಿದ್ದಾರೆ.

ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಬರುವ ರೋಗಿಗಳು ಸರಿಯಾದ ರಕ್ತ ಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಬೇಕಾಗುತ್ತದೆ ಮತ್ತು ಕಿಬ್ಬೊಟ್ಟೆಯ ಮತ್ತು ಶ್ರೋಣಿಗಳನ್ನು ಮೊದಲೇ ಪ್ರಾಯೋಗಿಕವಾಗಿ ತೆಗೆದುಕೊಳ್ಳಲಾಗುವುದು. ರೋಗಿಗಳನ್ನು ಲ್ಯಾಪರೋಸ್ಕೋಪಿ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಗೆ ಒಳಪಡಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಕ್ಲಿನಿಕಲ್ ಮೌಲ್ಯಮಾಪನದೊಂದಿಗೆ ಪರಸ್ಪರ ಸಂಬಂಧದ ನಂತರ ಮತ್ತು ಆ ಫಲಿತಾಂಶಗಳನ್ನು ಸಂಕಲನ ಮತ್ತು ದಾಖಲಿಸಲಾಗುತ್ತದೆ.

ರೋಗಿಗಳಿಗೆ ಮೇಲೆ ತಿಳಿಸಿದ ತನಿಖೆಗಳು ಮತ್ತು ಚಿಕಿತ್ಸಾ ಕಾರ್ಯವಿಧಾನಗಳು, ಚಿಕಿತ್ಸೆಯ ಪರ್ಯಾಯ ವಿಧಾನಗಳು ಮತ್ತು ತೊಡಕುಗಳಿಗೆ ಒಳಗಾಗುವ ಪ್ರಾಮುಖ್ಯತೆಯ ಬಗ್ಗೆ ವಿವರಿಸಲಾಗುವುದು.

ದಯವಿಟ್ಟು ಈ ಕೆಳಗಿನ ಮಾಹಿತಿಯನ್ನು ಓದಿ ಮತ್ತು ಕುಟುಂಬ ಸದಸ್ಯರೊಂದಿಗೆ ಮಾತನಾಡಿ. ಅಧ್ಯಯನದ ಬಗ್ಗೆ ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಬಹುದು. ನೀವು ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಒಪ್ಪುವುದಾದರೆ, ನಾವು ನಿಮ್ಮಿಂದ ಅಥವಾ ನಿಮ್ಮ ಜವಾಬ್ದಾರಿಯುತ ವ್ಯಕ್ತಿಯಿಂದ ಮಾಹಿತಿಯನ್ನು ಸಂಗ್ರಹಿಸುತ್ತೇವೆ. ಅದಕ್ಕೆ ಸಂಬಂಧಿಸಿದ ಇತಿಹಾಸವನ್ನು ಮಾಡಲಾಗುವುದು. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಪ್ರಕಟಣೆ ಮತ್ತು ಪ್ರಕಟಣೆಗಾಗಿ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ.

ನಿಮ್ಮಿಂದ ಸಂಗ್ರಹಿಸಿದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಗೌಪ್ಯವಾಗಿ ಇಡಲಾಗುವುದು ಮತ್ತು ಅದನ್ನು ಹೊರಗಿನವರಿಗೆ ಬಹಿರಂಗಪಡಿಸಲಾಗುವುದಿಲ್ಲ. ನಿಮ್ಮ ಗುರುತು ಬಹಿರಂಗವಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನವನ್ನು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿ ಪರಿಶೀಲಿಸಿದೆ ಮತ್ತು ನೀವು ಅದರ ಸದಸ್ಯರ ಸಂಪರ್ಕಕ್ಕೆ ಸ್ವತಂತ್ರರು. ಈ ಅಧ್ಯಯನಕ್ಕೆ ಯಾವುದೇ ಷರತ್ತು ಇಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸದಿರಲು ನೀವು ಬಯಸುವಲ್ಲಿ, ನಿಮ್ಮ ಕಾಳಜಿ ಬದಲಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದ ಭಾಗವಾಗಿರುವುದರಿಂದ ನಿಮಗೆ ಯಾವುದೇ ಹಣಕಾಸಿನ ಲಾಭವಿಲ್ಲ, ಅಥವಾ ನೀವು ಯಾವುದೇ ಅಪಾಯವನ್ನು ಎದುರಿಸುವುದಿಲ್ಲ. ನೀವು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಸ್ವ ಇಚ್ಛೆಯಿಂದ ಒಪ್ಪಿದರೆ ಮಾತ್ರ ನೀವು ಹೆಬ್ಬರಳನ್ನು ಗುರುತು ಹಾಕಬೇಕಾಗುತ್ತದೆ.

ಹೆಚ್ಚಿನ ಮಾಹಿತಿಗಾಗಿ ಸಂಪರ್ಕಿಸಿ,

ಡಾ. ಅಖಿಲ್ ವಿನ್ಸೆಂಟ್ (ಜೂನಿಯರ್ ರೆಸಿಡೆಂಟ್)

ಸಾಮಾನ್ಯ ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ವಿಭಾಗ

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ಹೆಸರು , ರೋಗಿಯ ಎಡ ಹೆಬ್ಬರಳಿನ ಗುರುತು/ಸಹಿ

ಹೆಸರು , ಎಡ ಹೆಬ್ಬರಳಿನ ಗುರುತು/ಸಾಕ್ಷಿಯ ಸಹಿ

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### Annexure 3

#### INFORMED CONSENT FORM

I, \_\_\_\_\_ aged \_\_\_\_\_ have been explained in my own understandable language, that I will be included in a comparative study of Cobbler Needle suturing versus Conventional hand Suturing in port closure in laparoscopic surgeries being conducted in R L Jalappa Hospital & Research Centre , Tamaka, Kolar. I have or have been read to me and understand the purpose of study, type of study, risks and benefits associated with my involvement. I have been explained that my clinical findings, investigations, intra-operative findings, post-operative course, will be assessed and documented for study purpose. I will have the opportunity to ask questions regarding various aspects of the study.

I hereby give my valid written informed consent without any force or prejudice for or any other procedure deemed fit, which is a diagnostic & / or therapeutic procedure / biopsy / transfusion / operation to be performed on me under any anesthesia deemed fit. The nature and risks involved in the procedure (surgical and anaesthetical) have been explained to me to my satisfaction.

I have been explained in detail about the Clinical Research on “COMPARATIVE STUDY OF COBBLER NEEDLE SUTURING VERSUS CONVENTIONAL SUTURING IN PORT CLOSURE IN LAPAROSCOPIC SURGERIES” I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, has been answered to my satisfaction. I consent voluntarily to participate as a participant in this research. I hereby give consent to provide my history, undergo physical examination, undergo required investigations and surgical procedure deemed fit and provide its results and documents etc to the doctor / institute etc. For academic and scientific purpose the operation / procedure, etc may be video graphed or photographed. All the data may be published or used for any academic purpose. I will not hold the doctors / institute etc responsible for any untoward consequences during the procedure / study.

I have been given opportunity to ask any question regarding the study and all my doubts are cleared. I give consent to participate in the study and will collect information from me or the person responsible for me, or both. I have been informed that consent can be withdrawn at any point of time . This information collected will be used only for dissertation and publication.

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I have been informed that collected from me will be kept confidential and will not be disclosed to any outsider. My identity will not be revealed. This study has been reviewed by the Institutional Ethics Committee and you are free to contact the members of the same. There is no compulsion to agree to this study. The care you will get will not change if you do not wish to participate in this study. You will have no financial benefit by being a part of this study, nor will you incur any risk. You are required to sign/provide thumb impression only if you voluntarily agree to participate in this study.

A copy of this Informed Consent Form and Patient Information Sheet has been provided to the participant.

Name And Signature/Thumb impression of patient :

Name And Signature/Thumb impression of patient attendant :

Relation with patient: \_\_\_\_\_

Signature & Name Witness: \_\_\_\_\_

Principal Investigator's Name: Dr Akhil Vincent

Mobile Number:9495988178 Email Id : [akhil.kakkassery@gmail.com](mailto:akhil.kakkassery@gmail.com)

## ಮಾಹಿತಿಯ ಒಪ್ಪಿಗೆ ನಮೂನೆ

ನಾನು , \_\_\_\_\_ ವಯಸ್ಸಿನ \_\_\_\_\_ ನನ್ನ ಸ್ವಂತ ಅರ್ಥವಾಗುವ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಿದ್ದೇನೆ, ಕೋಲಾರದ ಟಮಕಾದ ಆರ್ ಎಲ್ ಜಾಲಪ್ಪ ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರದಲ್ಲಿ ನಡೆಸಲಾಗುತ್ತಿರುವ ಲ್ಯಾಪರೋಸ್ಕೋಪಿಕ್ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಗಳಲ್ಲಿ ಪೋರ್ಟ್ ಮುಚ್ಚುವ ಸಾಂಪ್ರದಾಯಿಕ ಕೈ ಹೊಲಿಗೆ ವಿರುದ್ಧ ಕಾಬ್ಲರ್ ಸೂಜಿ ಹೊಲಿಗೆಯ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನನ್ನು ಸೇರಿಸಲಾಗುವುದು. ನಾನು ಓದಿದ್ದೇನೆ ಅಥವಾ ನನಗೆ ಓದಿದ್ದೇನೆ ಮತ್ತು ಅಧ್ಯಯನದ ಉದ್ದೇಶ, ಅಧ್ಯಯನದ ಪ್ರಕಾರ, ಅಪಾಯಗಳು ಮತ್ತು ನನ್ನ ಒಳಗೊಳ್ಳುವಿಕೆಗೆ ಸಂಬಂಧಿಸಿದ ಪ್ರಯೋಜನಗಳನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡಿದ್ದೇನೆ. ನನ್ನ ಕ್ಲಿನಿಕಲ್ ಸಂಶೋಧನೆಗಳು, ತನಿಖೆಗಳು, ಇಂಟ್ರಾ-ಆಪರೇಟಿವ್ ಸಂಶೋಧನೆಗಳು, ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ನಂತರದ ಕೋರ್ಸ್ ಅನ್ನು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುತ್ತದೆ ಮತ್ತು ಅಧ್ಯಯನ ಉದ್ದೇಶಕ್ಕಾಗಿ ದಾಖಲಿಸಲಾಗುತ್ತದೆ ಎಂದು ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ. ಅಧ್ಯಯನದ ವಿವಿಧ ಅಂಶಗಳ ಬಗ್ಗೆ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ.

ನಾನು ಈ ಮೂಲಕ ನನ್ನ ಮಾನ್ಯ ಲಿಖಿತ ತಿಳುವಳಿಕೆಯುಳ್ಳ ಸಮ್ಮತಿಯನ್ನು ಯಾವುದೇ ಬಲ ಅಥವಾ ಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೆ ನೀಡುತ್ತೇನೆ ಅಥವಾ ಯಾವುದೇ ಇತರ ಕಾರ್ಯವಿಧಾನಕ್ಕೆ ಸರಿಹೊಂದುತ್ತದೆ, ಇದು ರೋಗನಿರ್ಣಯ ಮತ್ತು / ಅಥವಾ ಚಿಕಿತ್ಸಕ ವಿಧಾನ / ಬಯಾಪ್ಸಿ / ವರ್ಗಾವಣೆ / ಕಾರ್ಯಾಚರಣೆಯನ್ನು ಯಾವುದೇ ಅರಿವಳಿಕೆ ಅಡಿಯಲ್ಲಿ ನನಗೆ ನಡೆಸಲಾಗುವುದು. ಕಾರ್ಯವಿಧಾನದಲ್ಲಿ ಒಳಗೊಂಡಿರುವ ಸ್ವಭಾವ ಮತ್ತು ಅಪಾಯಗಳು (ಶಸ್ತ್ರಚಿಕಿತ್ಸೆ ಮತ್ತು ಅರಿವಳಿಕೆ) ನನ್ನ ತೃಪ್ತಿಗೆ ನನಗೆ ವಿವರಿಸಲಾಗಿದೆ.

ಲ್ಯಾಪರೋಸ್ಕೋಪಿಕ್ ಸರ್ಜರಿಗಳಲ್ಲಿ ಪೋರ್ಟ್ ಕ್ಲೋಷರ್‌ನಲ್ಲಿ ಸಾಂಪ್ರದಾಯಿಕ ಹೊಲಿಗೆಯ ವಿರುದ್ಧ “ಕಾಬ್ಲರ್ ಸೂಜಿ ಹೊಲಿಗೆಯ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ” ಕುರಿತು ಕ್ಲಿನಿಕಲ್ ಸಂಶೋಧನೆಯ ಕುರಿತು ನಾನು ವಿವರವಾಗಿ ವಿವರಿಸಿದ್ದೇನೆ ಮತ್ತು ನಾನು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಓದಿದ್ದೇನೆ ಮತ್ತು ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ. ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಗೆ ನನ್ನ ತೃಪ್ತಿಗೆ ಉತ್ತರಿಸಲಾಗಿದೆ. ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವವನಾಗಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಸುತ್ತೇನೆ. ನನಗೆ ಇತಿಹಾಸವನ್ನು ಒದಗಿಸಲು, ದೈಹಿಕ ಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಲು, ಅಗತ್ಯವಿರುವ ತನಿಖೆಗಳು ಮತ್ತು ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ವಿಧಾನಗಳಿಗೆ ಒಳಗಾಗಲು ನಾನು ಈ ಮೂಲಕ ಒಪ್ಪಿಗೆ ನೀಡುತ್ತೇನೆ ಮತ್ತು ಅದರ ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳು ಇತ್ಯಾದಿಗಳನ್ನು ವೈದ್ಯರು / ಸಂಸ್ಥೆ ಇತ್ಯಾದಿಗಳಿಗೆ ಒದಗಿಸುತ್ತೇನೆ. ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಕಾರ್ಯಾಚರಣೆ / ಕಾರ್ಯವಿಧಾನ, ಇತ್ಯಾದಿಗಳನ್ನು ವೀಡಿಯೋ ಗ್ರಾಫ್ ಮಾಡಬಹುದು ಅಥವಾ ಛಾಯಾಚಿತ್ರ. ಎಲ್ಲಾ ಡೇಟಾವನ್ನು ಪ್ರಕಟಿಸಬಹುದು ಅಥವಾ ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಬಳಸಬಹುದು. ಕಾರ್ಯವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ ಅಹಿತಕರ ಪರಿಣಾಮಗಳಿಗೆ ನಾನು ವೈದ್ಯರು / ಸಂಸ್ಥೆ ಇತ್ಯಾದಿಗಳನ್ನು ಹೊಣೆಗಾರರನ್ನಾಗಿ ಮಾಡುವುದಿಲ್ಲ..

ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಲು ನನಗೆ ಅವಕಾಶವನ್ನು ನೀಡಲಾಗಿದೆ ಮತ್ತು ನನ್ನ ಎಲ್ಲಾ ಅನುಮಾನಗಳನ್ನು ನಿವಾರಿಸಲಾಗಿದೆ. ನಾನು ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಒಪ್ಪಿಗೆ ನೀಡುತ್ತೇನೆ ಮತ್ತು ನನ್ನಿಂದ ಅಥವಾ ನನಗೆ ಜವಾಬ್ದಾರಿಯುತ ವ್ಯಕ್ತಿಯಿಂದ ಅಥವಾ ಇಬ್ಬರಿಂದಲೂ ಮಾಹಿತಿಯನ್ನು ಸಂಗ್ರಹಿಸುತ್ತೇನೆ. ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಒಪ್ಪಿಗೆಯನ್ನು ಹಿಂಪಡೆಯಬಹುದು ಎಂದು ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಪ್ರಬಂಧ ಮತ್ತು ಪ್ರಕಟಣೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ.

ನನ್ನಿಂದ ಸಂಗ್ರಹಿಸಿದ ಮಾಹಿತಿಯನ್ನು ಗೌಪ್ಯವಾಗಿ ಇಡಲಾಗುವುದು ಮತ್ತು ಯಾವುದೇ ಹೊರಗಿನವರಿಗೆ ಬಹಿರಂಗಪಡಿಸುವುದಿಲ್ಲ ಎಂದು ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ. ನನ್ನ ಗುರುತು ಬಹಿರಂಗಪಡಿಸುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನವನ್ನು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯು ಪರಿಶೀಲಿಸಿದೆ ಮತ್ತು ನೀವು ಅದರ ಸದಸ್ಯರನ್ನು ಸಂಪರ್ಕಿಸಲು ಮುಕ್ತರಾಗಿದ್ದೀರಿ. ಈ ಅಧ್ಯಯನವನ್ನು ಒಪ್ಪಿಕೊಳ್ಳಲು ಯಾವುದೇ ಒತ್ತಾಯವಿಲ್ಲ. ನೀವು ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ಬಯಸದಿದ್ದರೆ ನೀವು ಪಡೆಯುವ ಕಾಳಜಿಯು ಬದಲಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದ ಭಾಗವಾಗುವುದರಿಂದ ನಿಮಗೆ ಯಾವುದೇ ಆರ್ಥಿಕ ಪ್ರಯೋಜನವಾಗುವುದಿಲ್ಲ. ಅಥವಾ ನೀವು ಯಾವುದೇ ಅಪಾಯಕ್ಕೆ ಒಳಗಾಗುವುದಿಲ್ಲ. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಸಿದರೆ ಮಾತ್ರ ನೀವು ಸಹಿ/ಹೆಚ್ಚರಳಿನ ಗುರುತನ್ನು ಒದಗಿಸಬೇಕಾಗುತ್ತದೆ.

ಈ ತಿಳುವಳಿಕೆಯುಳ್ಳ ಒಪ್ಪಿಗೆ ನಮೂನೆಯ ಪ್ರತಿಯನ್ನು ಮತ್ತು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಭಾಗವಹಿಸುವವರಿಗೆ ಒದಗಿಸಲಾಗಿದೆ.

ರೋಗಿಯ ಸಹಿ ಮತ್ತು ಹೆಸರು.

ಅಟೆಂಡೆಂಟ್ ಸಹಿ/ಹೆಚ್ಚರಳಿನ ಗುರುತು ಮತ್ತು

ರೋಗಿಯ ಹೆಸರು

ರೋಗಿಯೊಂದಿಗೆ ಸಂಬಂಧ: \_\_\_\_\_

ಸಹಿ ಮತ್ತು ಹೆಸರು ಸಾಕ್ಷಿ: \_\_\_\_\_

ಪ್ರಧಾನ ತನಿಖಾಧಿಕಾರಿಯ ಹೆಸರು: ಡಾ ಅಖಿಲ್ ವಿನ್ನೆಂಟ್

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# MASTER CHART



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## KEY TO MASTER CHART

Age\_ Cat: Age Category

Age Category 1: Less Than 30 Years

Age Category 2: 30 To 45 Years

Age category 3: More than 45 Years

GA: General Anaesthesia

D3\_ Seroma : Post Operative Day 3 \_ Seroma

D5\_ Seroma : Post Operative Day 5 \_ Seroma

D7\_ Seroma : Post Operative Day 7 \_ Seroma

D14\_ Seroma : Post Operative Day 14 \_ Seroma

D30\_ Seroma : Post Operative Day 30 \_ Seroma

D3\_ Hematoma : Post Operative Day 3 \_ Hematoma

D5\_ Hematoma : Post Operative Day 5 \_ Hematoma

D7\_ Hematoma : Post Operative Day 7 \_ Hematoma

D14\_ Hematoma : Post Operative Day 14 \_ Hematoma

D30\_ Hematoma : Post Operative Day 30 \_ Hematoma

D3\_ SSI : Post Operative Day 3 \_ Surgical Site Infection

D5\_ SSI : Post Operative Day 5 \_ Surgical Site Infection

D7\_ SSI : Post Operative Day 7 \_ Surgical Site Infection

D14\_ SSI: Post Operative Day 14 \_ Surgical Site Infection

D30\_ SSI : Post Operative Day 30 \_ Surgical Site Infection

| Sl. No. | Age | Age_cat | Sex    | Procedure                             | Method Of Closure       | D3_Sero<br>ma | D5_Sero<br>ma | D7_Sero<br>ma | D14_Sero<br>ma | D30_Sero<br>ma | D3_Haem<br>atoma | D5_Haem<br>atoma | D7_Haem<br>atoma | D14_Hae<br>matoma | D30_Hae<br>matoma | D3_SSI | D5_SSI | D7_SSI | D14_SSI | D30_SSI |
|---------|-----|---------|--------|---------------------------------------|-------------------------|---------------|---------------|---------------|----------------|----------------|------------------|------------------|------------------|-------------------|-------------------|--------|--------|--------|---------|---------|
| 1       | 38  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 2       | 52  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 3       | 38  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 4       | 27  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 5       | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 1      | 1      | 0      | 0       | 0       |
| 6       | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 7       | 39  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 1      | 0       | 0       |
| 8       | 28  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 9       | 52  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 10      | 38  | 2       | Male   | Laparoscopic Appendicectomy under GA  | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 11      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 1      | 1      | 0      | 0       | 0       |
| 12      | 40  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 1             | 1             | 1             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 1      | 1      | 0       | 0       |
| 13      | 62  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 14      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 15      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 16      | 36  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 17      | 22  | 1       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 18      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 19      | 40  | 2       | Male   | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 20      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 21      | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 22      | 49  | 3       | Female | Laparoscopic Appendicectomy under GA  | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 23      | 35  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 1             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 24      | 26  | 1       | Male   | Laparoscopic Appendicectomy under GA  | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 1                | 1                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 25      | 43  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 26      | 51  | 3       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 27      | 54  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 28      | 55  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 29      | 24  | 1       | Female | Laparoscopic Appendicectomy under GA  | Conventional Suturing   | 0             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 30      | 34  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 1      | 1      | 0       | 0       |
| 31      | 37  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 32      | 59  | 3       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 33      | 45  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 0             | 0             | 0              | 0              | 1                | 1                | 0                | 0                 | 0                 | 0      | 0      | 1      | 0       | 0       |
| 34      | 31  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 35      | 49  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 1                | 1                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 36      | 30  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 37      | 34  | 2       | Male   | Laparoscopic Appendicectomy under GA  | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 38      | 29  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 39      | 37  | 2       | Male   | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 40      | 63  | 3       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |

| Sl. No. | Age | Age_cat | Sex    | Procedure                             | Method Of Closure       | D3_Sero<br>ma | D5_Sero<br>ma | D7_Sero<br>ma | D14_Sero<br>ma | D30_Sero<br>ma | D3_Haem<br>atoma | D5_Haem<br>atoma | D7_Haem<br>atoma | D14_Hae<br>matoma | D30_Hae<br>matoma | D3_SSI | D5_SSI | D7_SSI | D14_SSI | D30_SSI |
|---------|-----|---------|--------|---------------------------------------|-------------------------|---------------|---------------|---------------|----------------|----------------|------------------|------------------|------------------|-------------------|-------------------|--------|--------|--------|---------|---------|
| 41      | 38  | 2       | Male   | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 42      | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 43      | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 44      | 57  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 45      | 63  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 46      | 49  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 47      | 62  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 48      | 31  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 49      | 49  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 50      | 45  | 3       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 51      | 47  | 3       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 52      | 25  | 1       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 53      | 42  | 2       | Male   | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 1             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 1      | 0       | 0       |
| 54      | 67  | 3       | Male   | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 55      | 40  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 1      | 1      | 0      | 0       | 0       |
| 56      | 36  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 57      | 40  | 2       | Female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 1             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 1      | 0      | 0      | 0       | 0       |
| 58      | 35  | 2       | Male   | Laparoscopic Appendicectomy under GA  | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 59      | 47  | 3       | female | Laparoscopic Cholecystectomy under GA | Conventional Suturing   | 0             | 0             | 0             | 0              | 0              | 1                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |
| 60      | 31  | 2       | Female | Laparoscopic Cholecystectomy under GA | Cobbler Needle Suturing | 0             | 0             | 0             | 0              | 0              | 0                | 0                | 0                | 0                 | 0                 | 0      | 0      | 0      | 0       | 0       |