# A COMPARATIVE STUDY BETWEEN TRANSUMBILICAL LAPAROSCOPIC ASSISTED APPENDICECTOMY VS CONVENTIONAL 3 PORTS LAPAROSCOPIC APPENDICECTOMY

**BY**

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**UNDER THE GUIDANCE OF**

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# ABBREVATIONS

1. DOA: DATE OF ADMISSIONS
2. DOD: DATE OF DISCHARGE
3. DOS: DATE OF SURGERY
4. PR: PULSE RATE
5. B.P: BLOOD PRESSURE
6. RR: RESPIRATORY RATE
7. TEMP: TEMPERATURE
8. HB: HEMOGLOBIN
9. TC: TOTAL COUNTS
10. DC: DIFFERENTIAL COUNT
11. ESR: ERYTHROCYTE SEDIMENTATION RATE
12. BT: BLEEDING TIME
13. CT: CLOTTING TIME
14. RBS: RANDOM BLOOD SUGAR
15. USG: ULTRA SONOGRAPHY
16. CT: COMPUTED TOMOGRAPHY
17. ECG: ELECTROCARDIOGRAPHY
18. VAS: VISUAL ANALOG SCALE
19. TULAA: TRANS UMBILICAL LAPAROSCOPIC ASSISTED APPENDECTOMY
20. CTPLA: CONVENTIONAL THREE PORT LAPAROSCOPIC APPENDECTOMY
21. CLA: CONVENTIONAL LAPAROSCOPIC APPENDECTOMY

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# INTRODUCTION

The abdomen is frequently termed a "Pandora's box" because of the multitude of organ systems and anatomical features it encompasses. Consequently, abdominal disorders frequently generate considerable clinical interest. A comprehensive assessment of the abdomen is an invaluable diagnostic instrument, especially for surgeons, as it facilitates the identification of the optimal treatment strategy. Acute appendicitis is the predominant cause of "acute abdomen" in paediatric patients, and the signs and symptoms thereof have become a central focus in clinical teaching.[1]

Acute appendicitis is a highly prevalent acute surgical condition impacting the abdomen[2]. A little over seven percent of individuals are likely to get appendicitis at some stage in their lives.[3] Although it can manifest at any age, it is predominantly noted in persons around their twenties and thirties.[4]

Despite innovations in technology, the diagnosis of appendicitis still mostly relies on the patient's history and physical examination. Rapid identification and quick surgical referral can mitigate the risk of perforation and avert repercussions.[5]

The rate of death for non-perforated appendicitis remains below 1%, although it may escalate to 5% or more in young and older individuals, when delayed diagnosis elevates the risk of perforation. Recognition of acute appendicitis is especially difficult in young women, children, and the elderly, despite advancements in medical care and the application of ultrasonography. Diagnostic scoring systems are valuable and straight forward instruments that facilitate decision-making.[6] Prolonged diagnostic delays might result in problems, elevating morbidity, whilst excessively conservative diagnoses may lead to unwarranted appendectomies.

An appendectomy is one of the most commonly executed procedures in general surgery, occurring in around 8% of cases.

Despite innovations in technology, operations, antibiotics, and hydration management, the morbidity associated with appendicitis remains between 5% and 8%, mostly due to wound infections and delays in diagnosis and treatment. Laparoscopy offers substantial advantages for the prompt evaluation and treatment of appendicitis, resulting in reduced morbidity and increasing acceptance as a substitute to conventional open surgery.[55]

Laparoscopic appendectomy is now considered as the best option to eliminate a sick appendix, irrespective of its anatomical or clinical characteristics. The major benefits of laparoscopic appendectomy are enhanced visualization, minimal blood loss, a less painful recovery, quicker recuperation and return to work, fewer risk of infection of the wound, and improved cosmetic outcomes.[49]

From its inception, laparoscopic appendectomy has been through various revisions, with novel methods being developed over time. The most recent innovation is single-port laparoscopy, designed as an enhanced method for executing appendectomy.[47] The fundamental advantage of this technique is the use of only one modest incision, in comparison to the three separate incisions necessary for the three ports in standard laparoscopic appendectomy, making it essentially a scar-less treatment. As this procedure is novel, additional research is needed to properly evaluate its safety and surgical outcomes.[49]

Semm in 1983 described the debut of laparoscopic appendectomy (LA) with a three-port technique. The drastically decreased surgical pain, enhanced cosmetic outcomes, and shorter hospital stay are the primary benefits associated with this technique.[57]

Esposito published his first experience with a one-trocar appendectomy on a child in 1998 [58] following M. A. Pelosi and M. A. Pelosi III presented a laparoscopic appendectomy employing a single umbilical puncture in 1992 .[59] One trocar implanted in the umbilical region and an operational laparoscope are used to conduct this method.

This method is known as trans-umbilical laparoscopic-assisted appendectomy (TULAA). The appendix is exteriorized through the umbilical wound and removed extracorporeally following intra-abdominal mobilizing of the Appendix.

TULAA is recognized as a minimally invasive surgery that combines convenience of usage, rapid recovery, affordable pricing, and lowest complication. For paediatric patients with uncomplicated appendicitis, single port appendectomy may be more favourable than standard laparoscopic appendectomy (CLA) from a cosmetic aspect.[60]

Unfortunately, the method has not become extensively employed because it is regarded to be a tough and tedious process. Trans umbilical laparoscopy-assisted appendectomy (TULAA) is being used with increasing frequency lately in paediatric patients with uncomplicated appendicitis.

The diminutive distance between the umbilicus and the appendix in children versus adults and the flexible nature of the abdominal wall make it feasible to remove the appendix through the umbilical wound. According to reviews, this surgery took a shorter period and had considerably fewer postoperative complications than the laparoscopic appendectomy with three standard ports. In the present study, the successful execution of trans umbilical laparoscopic-assisted appendectomy (TULAA) will be investigated, and its results will be juxtaposed with those of CLA.

# AIMS & OBJECTIVES

**AIMS:** By taking into account post-operative characteristics related to patient care and comfort, this study seeks to compare the results of two alternative surgical procedures for appendicitis, namely, trans umbilical laparoscopic assisted appendicectomy and traditional 3 Port Laparoscopic Appendicectomy.

**OBJECTIVE:** To compare the following parameters between trans umbilical laparoscopic assisted appendicectomy and conventional 3 port laparoscopic appendicectomy:

1. Operative time.

2. Postoperative pain.

3. Post-operative complications like haemorrhage, infection and wound related complications.

4. Duration of the Hospital stay, i.e., from the day of surgery to the day of discharge.

5. Conversion rate from trans-umbilical laparoscopic assisted appendicectomy to Conventional 3 port laparoscopic appendicectomy.

6. Cosmetic Acceptance.

# REVIEW OF LITERATURE

## HISTORICAL REVIEW [7-10]

It seems appropriate to enlighten one's mind with historic moments of medicine, which are fascinating. Credit must be given to those who have contributed for the benevolence of mankind. Their pioneer works are an inspiration to the new generations.

Tiberius Caesar allowed Celsus to dissect on the executed criminals and he might have felt the presence of appendix. Aryateus of Cappedocia in 3rd century A.D is reputed to have described accurately appendicular abscesses and cured the patients by incision & drainage of the abscess through the abdominal wall.

In 1492, Leonardo de Vinci clearly depicted the organ in his anatomical drawings. He called it "Orchid" literally an ear to denote the auricular appendage of the caecum.

In 1521, Berengario D A Carpi, first described the organ.

In1530, VidoVidius, first named the worm- like organ as the vermiformappendix.

In 1530, Great scholar, Erasmus, was the first to record case of appendicitiswith abscess formation.

In 1543, Andreas Vesalius, illustrated the normal appendix in his 'De Humani corporis Fabrica'.

In 1554, Zeanfernel, French physician described a case of perforated appendix after an autopsy on 7-year girl who had suffered from diarrhea and was given large quince to stop her bowels. In 1652, Hiden, a leading German surgeon gave detailed account of diseased inflamed appendix, after autopsy on a young man who died after several years of

progressive intestinal pain. The appendix was shrunken & drawn into a small bowel completely filling it, so that no contents could be forced into the colon, therefore such pain, appendix was inflamed & swollen throughout.

In 1710, Verneys was the first to coin the term appendix vermiformis, the first description of appendicitis.

In 1711, LorenzHiester gave the first good description of a case of acute appendicitis, postmortem on an executed criminal. Morganin (1719) illustrated beautifully in his 'Adversaria Anatomica'.

In 1755, LorenzHiester, professor at Helmstedt recognized that appendix mightbe the site of acute primary inflammation.

The first reported appendectomy was by Claudius Amyand, surgeon at St. George's Hospital London in 1735. It was the first occasion on which the appendix was successfully removed from the living subject. He removed from a hernial sac an appendix that had been perforated by pin. By the end of the 18$^{th}$ century the appendix was recognized anatomically and that it could be become inflamed and cause serious, even fatal results. But symptoms were unrecognized and appropriate surgical treatment was a long way off.

John Parkinson in 1812, recorded a proven case of acute appendicitis. A 5-year-old boy died, 48 hours after the onset of acute abdominal pain and vomiting. At autopsy an actually inflamed appendix which contained a faecolith, was found. He stated that no disease was present in the caecum or proximal appendix but was in the appendiceal tip.

In 1824, French physician Louyer Villermay was the first to prove that the appendix could be the site of inflammation based on study of 2 young men who died

shortly after onset of abdominal pain. Each was found to have a gangrenous appendix & normal caecum. Melier in 1827 confirmed these findings.

Baron Gullaume Dupuytren & Goldbeck (1830), promoted the theory that inflammation arouses in the cellular tissue surrounding the caecum known as typhlitis & perityphlitis.

In 1884, Samuel Fenwick in London exhorted the surgical community to operate upon a perforated appendix as soon as the diagnosis was always certain.

In 1886, Fitz, professor of medicine at Harvard who gave a lucid and logical description of the clinical feature & described in detail the pathological changes of the disease; was also the first one to use the term appendicitis.

In 1880, Lawson Tait, a pioneer of abdominal surgery in Great Britain, performed first planned appendectomy on a girl with an appendiceal abscess. She had recurrent pain in right iliac fossa. This milestone in history of appendicitis was not reported by Tait till 1890. Later John Shepherd rediscovered Tait's important contribution. In 1887, Morton of Philadelphia successfully diagnosed & excised an acutely inflamed appendix within an abscess cavity.

In 1889, Charles McBurney described the pathological changes in appendicitis. In 1902, Albert Ochsner, surgeon from Chicago & Sherren at the London hospital recommended a conservative approach to patient with generalized peritonitis following perforated appendix, to allow the inflammatory process to localize before considering any operation. In 1905, Rockey described a transverse skin incision which, Elliot had done in 1896.

In 1905, Murphy clearly described the appropriate sequence of symptoms of pain followed by nausea and vomiting with fever and exaggerated local tenderness at the position occupied by the appendix.

In 1982, Semm is widely credited with performing the 1st successful laparoscopic appendectomy.[11]

Teicher I et al (1983), described problems related to the confusing diagnosis of acute appendicitis as evidenced by negative laparotomy rate. To assess the feasibility of decreasing the diagnostic error , scoring system was formed to aid in the diagnosis of acute appendicitis and concluded that the scoring system could have eliminated over 1/3rd of unnecessary laparotomies or appendectomies.[12]

Arnbjornsson E (1983), described the role of dietary fiber as the cause of acute appendicitis was evaluated. By means of food diaries, the average daily fiber consumption was determined in 31 patients with acute appendicitis & in 30 control patients, matched for age & sex. The average daily dietary fiber intake was 17.4 gms in the group with appendicitis and 21 gms in the control group, the difference is statistically significant the result which supports the hypothesis that diet in particular, lack of fiber may be an important factor in the pathogenesis of acute appendicitis.[13]

Alvarado A et al (1986), described practical scoring system which included localized tenderness in right lower quadrant, leukocytosis, migration of pain i.e. shifting of pain, temperature elevation, nausea, vomiting, anorexia & direct rebound tenderness and the score helped in interpreting the confusing picture of acute appendicitis[14].

Puyleart JBCM et al. (1986), used ultrasonography as a tool to diagnose appendix. Ultrasonography was performed with 5 MHz or 7.5 MHz transducer using

graded compression technique appendix was visualized & diameter thickness, free fluid, ileus, tenderness at McBurney's point[15].

Abu - Yousef MM et al. (1989), used high resolution 5 to7.5MHz transducer tocompress the bowels to displace the interfering gas in the right lower quadrant and directly visualized the inflamed appendix with the sensitivity that varies from 80 to 95%. A specificity of 95 to 100% & an accuracy of 91 to95%. It was also possible to differentiate acute appendicitis from the gangrenous & a perforated appendix. [16]

Addis et al. (1990) studied the lifetime rate of appendectomy and suggested as 21% for men & 25% for women, approximately 7% of all people undergoing appendectomy for acute appendicitis[3].

Fingerhut A et al. (1999), described diagnosis has been advocated as a potential tool to decide the number of negative appendicectomies performed. However, the morbidity associated with laparoscopic and general anesthesia is acceptable only if pathology requiring surgical treatment present, and is amenable to laparoscopic techniques. The question of leaving a normal appendix in situ is controversial one 17% to 27% of normal appendix at exploration had pathological and histological findings.[17]

Sudhir Kumar Mohanty et al. (2000), quoted that modified Alvarado's score combined with ultrasound can be used as a cheap inexpensive way of confirming acute appendicitis, thus reducing negative appendectomy rate[18].

Enochsson L et al (2001), quoted that laparoscopic appendectomy may be beneficial in obese patients in whom it may be difficult to gain adequate access through a small right lower quadrant incision. Additionally, there may be a decrease in risk of postoperative wound infection after laparoscopic appendectomy in obese patients[19].

Bhattarcharjee PK et al (2002), did a study on modified Alvarado score and concluded that score was found to be a dependable aid both in pre-operative diagnosisof acute appendicitis and in the reduction of negative appendectomy[20].

De U De Krishna K (2004), reported a case having right lower quadrant abdominal pain in a 26-year-old female who underwent appendectomy one year back. Recurrent appendicitis was noted in appendiceal stump. Although rare, stump appendicitis should be considered in the differential diagnosis of right lower quadrant abdominal pain.[21]

Nguyen NT et al. (2004), analyzed the outcomes of laparoscopic versus open appendectomy. He obtained data from the university health system consortium clinical data base for all patients who underwent appendectomy for acute and perforated appendicitis between 1999 and 2003(n=60236). Trends in utilization of laparoscopic appendectomy were examined over the 5-year period. Over all 41,085 patients underwent open appendectomy and 19,151 patients underwent laparoscopic appendectomy the percentage of appendectomy performed by a laparoscopy increased from 20% in 1999 to 43% in 2003. Compared with patients who underwent open appendectomy, patients who underwent laparoscopic appendectomy were more likely female, more likely white, had a lower severity of illness and were less likely to have perforated appendicitis. Laparoscopic appendectomy was associated with a shorter length of hospital stay (2.5 days vs. 3.4 days) lower rate of 30 days re- admission (1.0%vs 1.3%) and a lower rate of overall complication (6.1%vs.9.6).There was no significant difference in the observed to expected mortality ratio between laparoscopic and open appendectomy (0.5 vs. 0.6). The mean cost per case was similar between the two groups[22].

Parveen Bhatia et al. Institute of Minimal Access, Metabolic and Bariatric Surgery, Sir Ganga Ram Hospital and Bhatia Global Hospital & Endosurgery Institute, New Delhi, India presented their initial experience of 17 cases of SILS appendectomy which were completed using conventional laparoscopic instruments. They utilized a single-incision multi-port laparoscopic appendectomy (SIMPLA) technique. At the end of study results were a) operative time was 63 ± 20 min, b) blood loss 6.5 ± 5 mL,

c) Bowel movement (passing stool) occurred in 2.6 ± 0.6 days. d)Most patients were discharged on the first post-operative day on oral diet. e) The analgesic usage and pain scores were similar to multi-port laparoscopic appendectomy. No complications were noted at follow-up till 4 weeks and the surgical wound healed in all patients with an inconspicuous scar. They concluded that their initial experience with SILS appendectomy demonstrates its feasibility and supports the promise of minimizing further the access of laparoscopic surgery. The clear advantage is its cosmetic benefit. Jun Ho Park, et al.[49] compared the outcomes of laparoscopic appendectomy with trans umbilical single-port laparoscopic appendectomy (TUSPLA).This study was conducted in Hallym University of Medicine, Seoul, Korea between April 2009 to June 2009 and total of 40 patients were included in the study 20 in each group. They concluded that TUSPLA was technically feasible and safe in patients with non-complicated appendicitis and showed higher VAS score 24 hours postoperatively than the LA group.[53]

O Ates et al.[48] in 2005 conducted a comparative study between Laparoscopic appendectomy (LA) and Single-port intracorporeal laparoscopic appendectomy (SPI- LA) in children using transabdominal sling suture. Total of 38 patients were included in the study and 35 patients underwent SPI-LA and in 3 patients second port was inserted. Average duration of the procedure was 38+/- 5.6 min and no complications

were reported. This study concluded that SPI-LA is a safe, highly minimally invasive procedure with excellent cosmetic results.

E Khiangte et al. from Sept. 2009 to June 2010 at International Hospital Assam, India conducted 40 single-port surgeries using Glove port, 27 cholecystectomies,11appendectomies and 02 ovarian cystectomies. Study concluded that Glove port is simple, reusable, cost-effective and a reliable Gadget for single-port surgery, may be alternative to the costly commercially available single-port system.[47]

## REGIONAL ANATOMY

**GENERAL CONSIDERATION** -The abdomen is partitioned into nine parts by means of two vertical and two horizontal lines. The vertical lines traverse via the midclavicular line and the mid inguinal points, while the horizontal lines are the transpyloric and trans tubercular lines. The transpyloric line is a horizontal line that crosses across the tip of the 9th costal cartilage on both sides. The trans tubercular line is a horizontal line connecting the two tubercles of the iliac crest. The right iliac fossa constitutes the lower-right quadrant of the abdomen. Its anterior wall is composed of the external oblique, internal oblique, transverse abdominal muscles, and the transversalis fascia. The posterior wall is formed by the psoas and quadratus lumborum muscles together with the thoracolumbar fascia, while the inferior boundary is defined by the posterior half of the ileum and the iliacus muscles. The lateral wall is made up of the external oblique, internal oblique, transverse abdominal muscles, and fascia transversalis, with the iliac bone covered by the iliacus muscles creating the lower margin.

**APPENDIX** [26-29] The vermiform appendix can be found primarily in humans, certain arthropods, apes, and wombats. It is positioned at the very beginning of the large intestine, in the right iliac fossa.

**EMBRYOLOGY OF APPENDIX:** The caecal bud is a pouch which originates within the posterior part of the midgut loop. The caecum and appendix arise from the expansion of this bud. The proximal section of the bud expands swiftly to transform into the caecum, whereas the distal part stays narrow and matures into the appendix. The appendix originally forms as a tiny diverticulum in the 6th week of intrauterine life and is initially positioned at the tip of the caecum. The appendix arises on the medial side due to the abnormal development of the right wall of the caecum.

The exact location of the appendix base is determined by the placement of the caecum. It connects to the posterior medial surface of the caecum, about 2.5 centimetres below the ileo-caecal junction, at the site where the three-tinea coli intersect. The rest of the appendix is free. The base of the appendix is placed about one-third of the way down the path from the right anterior superior iliac spine to the umbilicus (McBurney's point) in regard to the anterior abdominal wall. In cases of inadequate bowel rotation, the caecum could be a located higher behind the liver, near the duodenum and gall bladder, resulting in acute appendicitis symptoms to appear like those of acute cholecystitis. If the caecum is lengthy and movable, the appendix may be placed in the pelvis, with discomfort being most obvious during pelvic examination in situations of acute appendicitis. In a few instances, the caecum and appendix may be located in the left iliac fossa, where acute appendicitis could imitate acute diverticulitis of the sigmoid colon. The position of the appendix tip relative to the caecum might vary.

The many anatomical locations of the appendix include:

1. Retrocaecal-74%
2. Para caecal -2%
3. Pre ileal -1% ,
4. Post ileal -5%
5. Pelvic -21%
6. Sub caecal - 1.5%

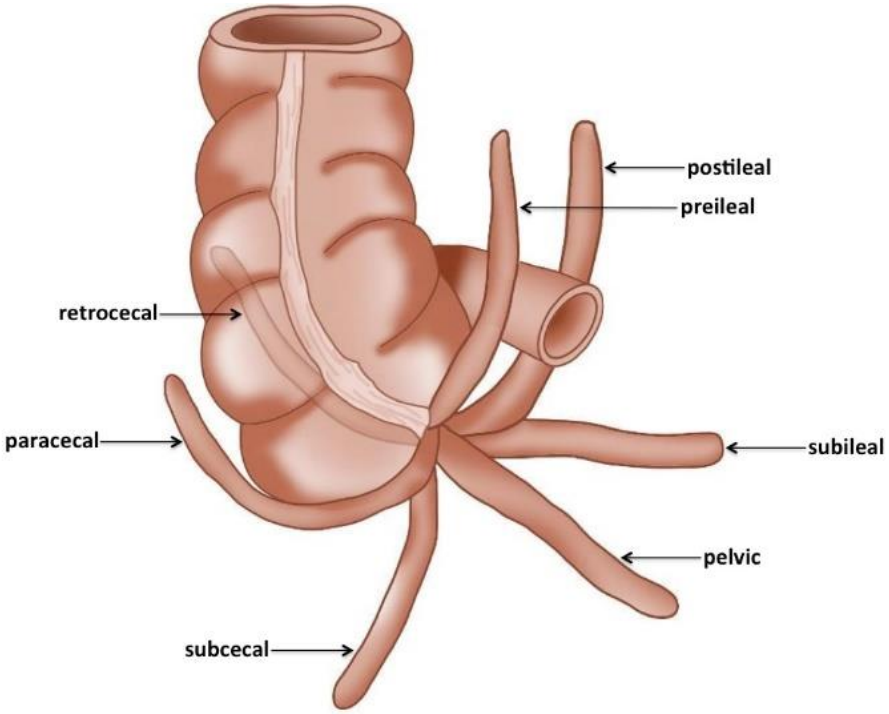



**FIGURE 1:** The appendix exhibits considerable diversity with regard to length and circumference. On average, its length varies between 7.5 to 10 cm, while exceptional specimens have been recorded to reach as long as 30 cm. In males, the appendix can frequently be approximately 0.5 cm longer than in females.

**FIGURE 2:** Mesoappendix displaying the appendicular artery

The lumen of the appendix, that is supposed to be broad enough to fit a matchstick, is uneven due to the many longitudinal folds of the mucous membrane which impinge onto it. The appendix has a short mesentery of its own, and the mesoappendix, which develops from the bottom portion of the mesentery, can vary substantially. In certain situations, the distal portion of the appendix may be totally detached from the mesoappendix. In youngsters, the mesoappendix is frequently so slender that the contained blood vessels are discernible, however in numerous adults, it gets engorged with adipose tissue, burying the arteries.

**BLOOD SUPPLY OF APPENDIX:** The appendicular artery, which is a branch of the lower division of the ileocolic artery, travels beneath the terminal ileum until it leaves the mesoappendix near the base of the appendix. It then moves along the bare border of the mesoappendix, with the exception of the variable distance near the tip, where the mesoappendix is absent. In this region, the artery rests directly on the muscle wall beneath the peritoneal lining. An accessory appendicular artery, known to be a branch of the posterior caecal artery, called "Artery of Seshachalam" might be present. Nevertheless, in the majority of individuals, when the appendicular artery penetrates the wall of the appendix, it changes into an end artery.

Thrombosis of this artery associated with appendicitis could result to necrosis of the appendix. The appendicular vein, which follows the appendicular artery throughout the free border of the mesoappendix, empties into the caecal veins, generating the ileocolic vein. This vein serves as a feeder to the superior mesenteric vein. In situations of gangrenous appendicitis, an inflammatory thrombus can develop to suppurative pyelophlebitis.

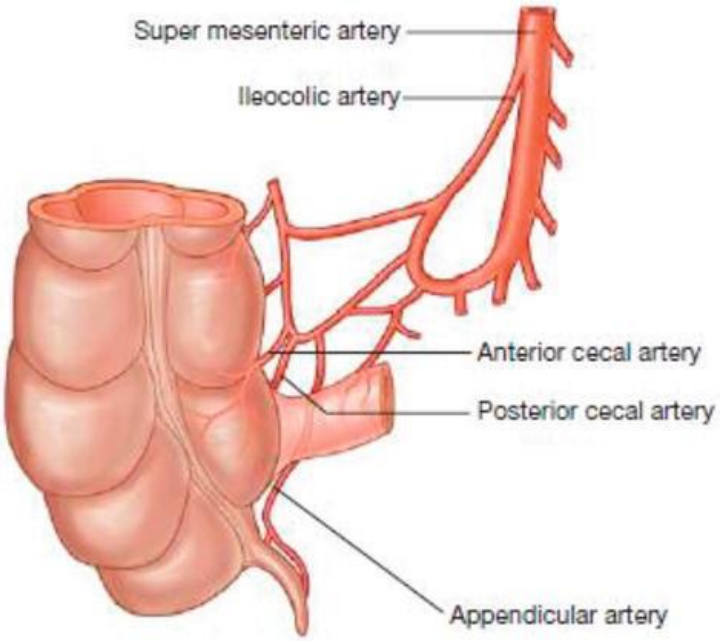



**FIGURE 3**: Blood supply of appendix

**LYMPHATIC SUPPLY-**

Lymphatic veins flow via the mesoappendix and empty into the ileocecal lymph nodes via multiple mesenteric nodes, eventually connecting to the superior mesenteric nodes.

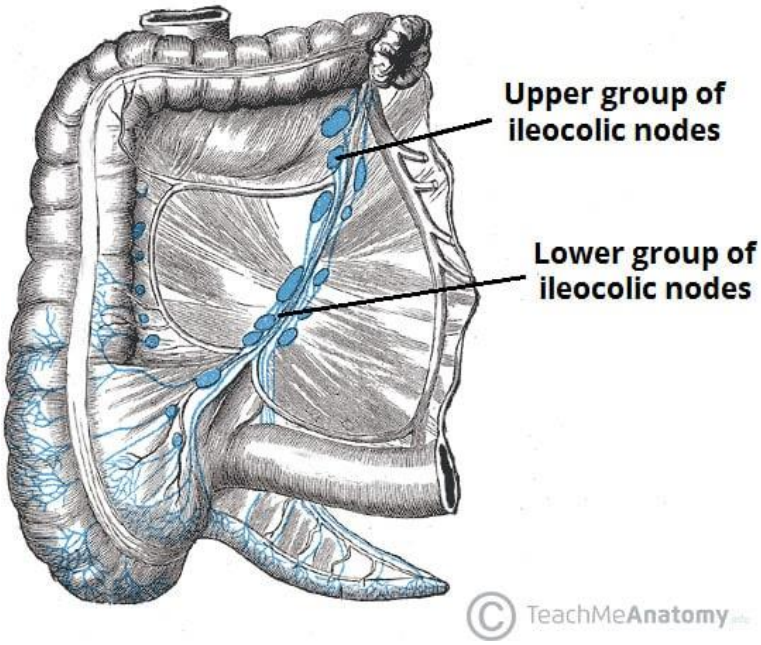



**FIGURE 4:** Lymphatic drainage of Appendix

**NERVE SUPPLY:** The afferent nerve fibres that are accountable for communicating visceral pain from the appendix are assumed to run alongside the sympathetic nerves, originating from the superior mesenteric plexus. These nerve fibres reach the spinal cord at the level of the 10th thoracic segment.

## MICROSCOPIC APPEARANCE[30-31]

The appendix is completely covered by columnar intestinal mucosa of colonic origin, and while crypts exist, their quantity is very limited. At the foundation of these crypts are Kulchitzky cells, which may lead to carcinoid tumours and possibly induce appendicitis. The submucosa comprises many lymphatic follicles, that may also play a role in appendicitis. The muscular layer comprises two entire smooth muscle layers: an inner circular layer and an outer longitudinal layer. The outer longitudinal layer is composed by the convergence of the taenia coli at the appendix's base. The appendix is entirely enveloped by the visceral layer of the peritoneum, with the exception at the slender attachment point of the mesoappendix

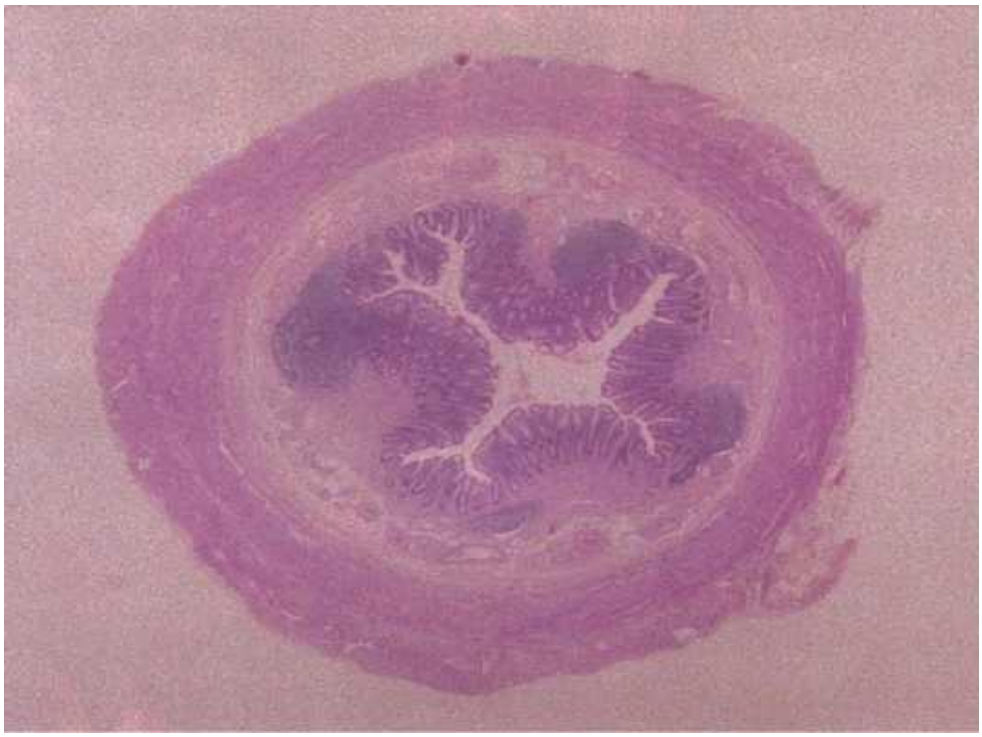


**FIGURE 5:** MICROSCOPIC APPEARANCE OF APPENDIX.

## CONGENITAL ANOMALIES OF APPENDIX [4]

1. The incidence of agenesis is 1 in 100,000 individuals.

2. A limited number of instances of double appendix have been documented.

3.Left-sided appendix in situs inversus viscerum, characterized by full transposition of thoracic and abdominal viscera. Occurs in 1 in 35,000 individuals.[4]

## FUNCTIONS OF APPENDIX [32-35]

1. Embryological
2. Physiological
3. Microbiological
4. Biochemical
5. Immunological

**EMBRYOLOGY:** In the 5th week of pregnancy, the appendix forms as a bud at the intersection of the small and large bowel, rapidly developing into a pouch. By the 6th week, a transient nubbin emerges at the top of the pouch, signifying its function in the pouch's rapid development. It is not until the 5th month of pregnancy that the closer portion of this pouch begins to expand at a distinct rate, finally producing the actual cecum, which proceeds to develop into infancy.

**PHYSIOLOGY:** The goblet cells covering the appendix, as well as the adjacent cecum and colon, create a special sort of secretions that acts as an antimicrobial barrier, helping regulate the proliferation of germs in the intestine. This mucus has a substantial quantity of IgA immunoglobulin, which are secretory antibodies produced to promote mucosal surface immunity and contribute to the bowel's blood barrier.

**MICROBIOLOGY:** The cells both inside and enclosing the lymphoid follicles in the appendix manufacture secretory and humoral antibodies, serving a function in limiting bacterial development in the cecum and colon during neonatal life. Furthermore, the appendix contributes in the acquisition of systemic tolerance to particular antigens in the digestive tract, whether these are generated from bacteria, food, or even the body's own proteolytic enzymes.

**BIOCHEMICAL:** Roughly one in every three hundred appendectomy specimens contains a carcinoid tumour, composed of a specific cell type abundant in serotonin. Although the exact function of serotonin in the entire gastrointestinal tract remains under investigation, it is evident that the majority of these tumours arise in the appendix.

**IMMUNOLOGICAL:** That region, where the appendix appears to have its primary function, is attributed to its content of lymphoid follicles. It was believed that the appendix would serve as the locus for the induction of B lymphocytes. The appendix continues to play a role in this crucial function, albeit not independently, and its lymphoid tissue is recognized for its involvement in antibody synthesis. There are two types of these antibodies:

i) IgA immunoglobulin - confers secretory or mucosal surface immunity.

ii) IgM and IgG immunoglobulins - humoral or systemic immunity.

The aforementioned type function has demonstrated that the appendix is an integral component of the G.A.L.T (Gut Associated Lymphatic Tissue).

**ETIOLOGY:** The enigma of appendicitis—its actual aetiology and its swift progression from a trivial ailment to the predominant serious intra-abdominal inflammatory disorder in Western societies—has been extensively discussed. No definitive explanation has been offered to date. The subsequent etiological elements are noteworthy; however, they are only contributory.

**AGE INCIDENCE:** During second decade of life the incidences of appendicitis is common.

**SEX:** Males are more commonly affected than females

**RACE AND DIET:** Appendicitis is widespread in more developed nations, such those in the United States, Europe, and Australia, but rare among Asians, Africans, and Polynesians. Rendle Short shown that when individuals from these populations go to nations with a higher prevalence of appendicitis, they rapidly acquire the same vulnerability to the condition. This is believed to be associated with a diet rich in meat and deficient in cellulose.

**ECONOMIC STATUS**: Acute appendicitis occurs more prevalently in the upper and middle classes than in the working class. The utilization of water closets, rather than squatting for faeces, has been posited as a potential factor in the increased prevalence of appendicitis.

**FAMILY VULNERABILITY:** This can be attributed to a hereditary anomaly in the organ's positioning, which predisposes individuals to infection. Consequently, the entire family may possess a lengthy retrocecal appendix with relatively inadequate blood flow.

**OBSTRUCTION OF LUMEN OF APPENDIX:** In 80% of instances, a type of obstruction to the lumen of an acutely inflamed appendix may be discerned post-excision. The impediments consist of:

1. **Within the lumen:** This encompasses fecaliths and hyperplasia of submucosal lymphoid tissue. Fecaliths are stratified aggregates composed of solidified faecal matter, calcium, magnesium phosphates, carbonates, bacteria, and epithelium detritus. In infrequent cases, foreign objects may be lodged within these aggregates. The existence of fecaliths indicates a type of appendicular stasis, potentially associated with the early hypertrophy of lymphoid tissue, resulting in partial lumen occlusion. The radiographic detection of a stone is an unequivocal indication for surgical intervention, irrespective of symptomatology. Moreover, parasites like roundworms, threadworms, and pinworms may obstruct the lumen, as can foreign objects such as pins or residual barium from prior examinations.

2. **In the wall:** Strictures induced by fibrosis due to prior inflammation or neoplasms, with carcinoid tumours as the predominant aetiology.

3. **External to the Wall:** Adhesions and kinking may arise, resulting in blockage beyond the appendix.

**DISTAL COLON OBSTRUCTION**: Acute appendicitis may arise from obstructive colon cancer, mainly located in the right colon, and is more frequently observed in elderly patients.

**PURGATIVE ABUSE:** The ingestion of purgatives, especially castor oil, by patients with abdominal discomfort can result in heightened peristaltic activity, potentially leading to the puncture of an inflamed appendix. The adage "Purgation signifies Perforation" effectively encapsulates this notion.

**SEASONAL FACTORS**: In paediatric populations, an intriguing association may exist between respiratory tract infections and acute appendicitis. The tonsils and appendix might simultaneously be impacted by lymphoid tissue involvement. A bloodborne infection may also be present in such instances.

**BACTERIAL FACTORS:** Appendicitis is significantly associated with bacterial proliferation in the appendix; yet, no singular microbe is the exclusive causative agent. An amalgamation of aerobic and anaerobic microorganisms is accountable. The predominant species identified are E. coli (85%), enterococci (30%), non-haemolytic streptococci, anaerobic streptococci, Clostridium welchii (30%), and Bacteroides.

**VIRAL INFECTIONS:** An acute viral infection occurring concurrently with or quickly preceding appendicitis may induce lymphoid hyperplasia, and the subsequent healing process can result in scarring or kinking, potentially leading to acute blockage. This is an effect, but not its root cause. Cytomegalovirus (CMV) appendicitis has recently been recognized in individuals with HIV. Tucker and associates were the inaugural researchers to document a case of a ruptured appendix accompanied with a peri-appendicular abscess attributable to E. coli. In this instance, intranuclear inclusions, indicative of CMV infection, were seen all through the mucosa and submucosa of the appendix. Davidson and associates have documented two supplementary examples.

**TUBERCULOSIS OF APPENDIX** [36] Appendiceal tuberculosis has been infrequently documented since the advent of antitubercular medications. Borrow and Friedman (1952) examined 265 instances, the majority of which were identified during post-mortem evaluations of verified tuberculosis cases. Two forms of appendiceal tuberculosis have been identified: ulcerative and hyperplastic (Koster & Kosman, 1934).[36] TB of the appendix may manifest as a tumour in the right iliac fossa, potentially resembling ileo-caecal TB.

**OTHER RARE CAUSES:**

1. Appendicitis occurring in conjunction with regional ileitis (Crohn's disease)
2. Carcinoid tumour of the appendix
3. Primary adenocarcinoma of the appendix

These conditions can only be diagnosed through histological examination.

**PATHOLOGY** [29,37] The peril of acute appendicitis is in the significant probability of infection disseminating to the peritoneal cavity from the origin, either via:

1. Perforation.

2. Bacteria traversing the appendicular wall.

During the interval between the development of acute appendicitis and bursting, the body's innate defensive mechanism can confine the inflammation in approximately 95% of instances, restricting its dissemination to the peri-appendiceal area. The greater omentum functions to restrict the dissemination of infection, but intense peristalsis induced by consumed laxatives may aggravate it. If the inflamed appendix is freely suspended, the likelihood of peritonitis escalates, resulting in early perforation and unavoidable extensive peritonitis. Upon effective completion of the walling-off process, an inflammatory conglomerate of entangled intestines and omentum, characterized by minimal or absent pus, develops. In certain instances, a persistent suppurative process results in the formation of an enlarging pus-filled accumulation, creating a peri-appendicular abscess.

Two distinct forms of appendicitis are acknowledged:

**NON-OBSTRUCTIVE ACUTE APPENDICITS:** Inflammation, predominantly induced by bacterial invasion, generally initiates in the mucosal membrane and, more seldom, in the lymph follicles. It may culminate in one of the subsequent outcomes:

1. Resolution
2. Ulceration
3. Suppuration
4. Fibrosis
5. Gangrene

Upon dissemination of the infection to the lax submucosal tissue, it advances rapidly. The appendix becomes engorged, dark red, and exhibits haemorrhaging in the mucous membrane. The circulatory supply to the farthest segment of the appendix is frequently impaired, as the artery is intramural and susceptible to obstruction from inflammation or thrombosis, potentially resulting in gangrene of the tip. In certain cases, hypertrophy of the lymphoid tissue in the appendix may occlude the lumen, leading to obstructive appendicitis. Non-obstructive appendicitis can advance gradually, allowing for the formation of protective barriers that result in localized peritonitis. In numerous instances, the infection remains confined to the mucosal lining (catarrhal inflammation), and while the symptoms may diminish, it is improbable that the appendix will revert to its pre-inflammation condition. Due to the tip of the appendix being predominantly damaged, fibrosis frequently develops at that site following the recovery of the infection, and a reduced tip is a characteristic observation in recurrent appendicitis.

**OBSTRUCTIVE ACUTE APPENDICITIS:** The obstruction of the appendix initiates with the accumulation of normal mucus discharge, subsequently resulting in bacterial multiplication. This leads to pressure-induced atrophy of the mucosa, permitting germs to penetrate into the underlying tissue layers. The walls of the appendix become inflamed, followed by thrombosis of the vessels. The appendix's end-artery system consequently results in gangrene and ultimately perforation of the necrotic appendix wall. Typically, within 12 to 18 hours of obstruction, the segment of the appendix distally to the blockage becomes gangrene. Upon meticulous analysis of excised gangrenous appendices, it is evident that they predominantly fall within the obstructive classification.[30]

Perforation typically transpires in the location of an obstructed faecolith, prior to the establishment of protective adhesions. The purulent and gaseous materials, when subjected to elevated pressure, may result in early extensive peritonitis. Should the patient endure the initial peritonitis, subphrenic and pelvic abscesses frequently arise as future sequelae. A more lethal kind of peritonitis may result from the subsequent rupture of an intra-abdominal abscess induced by a burst appendix.

A rare yet fatal outcome of gangrenous appendicitis is ascending septic thrombophlebitis of the portal venous system, also known as pyelothrombophlebitis. In this instance, septic clots from the compromised mesenteric arteries may embolize the liver, resulting in many pyogenic abscesses. Following the resolution of acute inflammation, adhesions may develop, resulting in the kinking of the appendix and subsequent obstructive appendicitis. Fibrosis resulting from prior appendicitis episodes may constrict the lumen, facilitating faecolith impaction. Appendicitis may infrequently occur alongside ileocecal Crohn's disease.
A "mucocele of the appendix" may develop when blockage is partial and uncomplicated by infection.

Additional infrequent pathological diseases of the appendix encompass:

1. Mucocele of the appendix
2. Diverticula of the appendix
3. Intussusception of the appendix
4. Endometriosis of the appendix
5. Primary Crohn’s disease of the appendix

## CLINICAL FEATURES & DIAGNOSIS:

**AGE INCIDENCE[25]** Acute appendicitis is rare among children under two years old but increases in prevalence during the early years of life. The peak incidence transpires between the ages of 20 and 30, thereafter diminishing progressively, yet it can impact persons of any age. In babies, the appendix possesses a wider lumen in comparison to the intestine, and its orifice into the cecum is broad. In elderly individuals, the appendix experiences involution.[25]

## CLINICAL FEATURES[26,29,37]

**NON-OBSTRUCTIVE ACUTE APPENDICITS**: There are typically 5 types of clinical features

**SHIFTING ABDOMINAL PAIN:** The primary symptom usually manifests as pain localized adjacent to the umbilicus, in the epigastric region, or it may present as more diffuse discomfort. This is visceral discomfort, characterized by its ambiguity and resulting from the distension of the appendix. The discomfort persists unabated. After several hours, the pain migrates to the region where the inflamed appendix causes irritation to the delicate parietal peritoneum. **PYREXIA:** An associated elevation in pulse rate, often ranging from 80 to 90 beats per minute, is common. In particularly serious instances, both the temperature and pulse rate may escalate higher.

Gastric function is frequently impaired, characterized by protective pyloro-spasm, resulting in symptoms including anorexia, nausea, infrequent vomiting, a brown-coated tongue, and malodorous breath. Vomiting is typically transient and concludes immediately when the stomach is evacuated. The majority of individuals encounter constipation; nevertheless, diarrhoea may sometimes arise, especially in young children or when the appendix is situated in the post-ileal or pelvic position.[37]

**LOCALIZED TENDERNESS IN THE RIGHT ILIAC FOSSA:** Upon the migration of pain, isolated tenderness may be detected at McBurney's point or an alternative site, contingent upon the appendix's position. This aids in ascertaining the surgical method.

McBurney (1889) indicated that the locus of maximum pain, identified by the application of a solitary finger, is situated 1.5 to 2 inches from the anterior superior iliac spine along a direct line extending from the iliac spine to the umbilicus (Shephard, 1960)[38]. Currently, it is widely acknowledged as the intersection of the lateral third and medial two-thirds of a line extending from the umbilicus to the right anterior superior iliac spine, thought to correspond to the base of the appendix.

Sir Z. Cope (1959)[39] observed that tenderness at McBurney's point is not consistently present. The discomfort typically emanates straight from the appendix and is contingent upon its position, occurring when the appendix is not adhered to adjacent structures. The soreness may also result from irritation of the neighbouring peritoneum. Gentle percussion may help identify the point of highest tenderness, which might sometimes be situated in the flank.

**RIGHT ILIAC FOSSA RIGIDITY:** Over time, precise identification of the ache becomes increasingly difficult due to the onset of muscular rigidity that follows the soreness. This is a consequence of irritation to the parietal peritoneum.

**OBSTRUCTIVE APPENDICITS**: The progression of clinical events in this illness occurs at an accelerated rate. The onset is abrupt, accompanied by severe widespread abdominal colic from the outset. The temperature may remain within normal limits, and vomiting is prevalent, perhaps causing the clinical appearance to mimic severe intestinal obstruction. Upon identification, immediate surgical surgery is required, as the disease rapidly advances to perforation. An attack may commence at any moment; however, it frequently initiates during the early morning hours, rousing the patient from slumber. The traditional symptoms of pain, anorexia, nausea, vomiting, and pyrexia may be present, but it is not always comprehensive. In many instances, the sole notable symptoms may be discomfort or soreness in the right iliac fossa.

**SPECIAL CLINICAL FEATURES:**

1. **Cutaneous Hyperesthesia:** Hyperesthesia in Sherren's triangle, delineated by lines linking the umbilicus, right anterior superior iliac spine, and pubic symphysis, serves as a valuable indicator for detecting gangrenous appendicitis. It can be elicited by gently stimulating the abdomen wall with one of the fingers.
2. **Rebound Tenderness:** The suspicious region is palpated during each exhalation. The hand is abruptly retracted, prompting the abdominal muscles to swiftly revert to their initial posture. This elicits acute pain, prompting the sufferer to cry out or flinch. This reaction transpires due to the inflamed parietal peritoneum, which, irritated by the underlying inflammatory organ, also responds with the abdominal muscles.
3. **Auscultation Findings**: Intestinal function may persist properly even in severe cases of acute inflammation; nonetheless, paralytic ileus ultimately ensues, signifying widespread peritonitis. Overemphasized bowel sounds may occasionally indicate obstruction at the terminal ileum, thereby misleading the surgeon in achieving an accurate diagnosis. Ultimately, a silent abdomen may present with a protracted history of pain, acute toxaemia, and abdominal distension.

**STANDARD TECHNIQUES OF APPENDICECTOMY[40]**

**GRIDIRON INCISION:** This muscle-disrupting incision is frequently employed during appendectomy. Its primary benefit is that it does not harm any nerves, and because of its muscle-splitting nature, it facilitates rapid healing. While there exists an exceedingly remote danger of damaging the subcostal nerve, potentially resulting in inguinal hernias, such occurrences are uncommon. The incision is oblique and oriented perpendicular to the right Spino-umbilical line, which extends from the right anterior superior iliac spine to the umbilicus. It traverses McBurney's point, the intersection of the lateral third and medial two-thirds, and generally measures 3 to 4 inches in length, with one-third situated above the Spino-umbilical line and two-thirds below it.

**TECHNIQUE:** The caecum may be discernible immediately upon opening the peritoneum, or it may require localization by putting two fingers into the peritoneal cavity and manoeuvring them along the lateral wall. It can be readily differentiated from the small intestine by the existence of taenia coli. The caecum is held with a damp pack by the left hand and softly retracted toward its inferior end, resulting in the appendix being drawn into the incision. The right index finger may be employed to aid in the delivery of the appendix by being placed deeply into the lower section of the wound beneath the caecum. If the appendix is not readily apparent, the operator should follow one of the taenia coli to locate its base. The appendix is meticulously liberated by moving a finger along its length towards the tip, delicately severing any robust adhesions. In instances of thick adhesions, they must be separated or divided under direct vision. Occasionally, as a result of prior inflammation, the appendix may become abruptly bent and adherent to the right iliac fossa or pelvic brim by fibrous bands.

The bands can be carefully separated without inducing much haemorrhage if the dissection occurs on the lateral aspect of the appendix.
The segment of the caecum to which the appendix is affixed remains external to the incision, while the remainder is reintroduced into the peritoneal cavity. The appendix is elevated and secured using Babcock's forceps near its apex. The mesoappendix is secured with artery forceps, thereafter divided and ligated. A forceps is momentarily positioned at the junction of the appendix and the caecum, and a ligature is secured around this compressed region. The ligature ends must be elongated and held in forceps to facilitate control of the stump. A purse-string Lambert suture is applied to the caecal wall encircling the base of the appendix. Forceps are positioned 5 to 6 mm from the ligature, following the evacuation of the lumen through the pressure exerted by the blades. A swab is positioned beneath to absorb any extruding material, and the appendix is severed near the forceps. The stump is subsequently invaginated using lean forceps as the purse-string suture is tightened. The pathogenic appendix, knife, swab, and forceps are extracted from the surgical field and dropped into a bowl.
Prior to abdominal closure, the ligated mesoappendix is examined for haemorrhage. Accessible regions are assessed or palpated, specifically the distal ileum for Meckel's diverticulum and the ileo-caecal lymph nodes. In females, the uterus, right ovary, and fallopian tubes are examined by introducing two fingers into the pelvic cavity. The procedure concludes with the layered stitching of the incision.

**RETROGRADE REMOVAL OF APPENDIX:** The bottom of the appendix is frequently more accessible than the tip, especially when the appendix is situated in a retrocaecal location. The inflamed distal portion may be affixed to the posterior wall of the caecum or even entrenched within the serosa. In such circumstances, employing a retrograde technique for appendectomy helps streamline the operation. Two sets of artery forceps are introduced via the mesoappendix and positioned at the base of the appendix, 5-6 mm apart. The proximal forceps are removed, and the appendix is ligated in the compressed groove. The tissue is subsequently excised around the distal forceps, and the proximal stump is invaginated. The appendix, with its severed end retained by the forceps, is meticulously dissected away. The mesentery is systematically clamped and trimmed from base to apex, followed by the excision of the appendix.

**LANZ TRANSVERSE INCISION**: This incision is executed approximately 2-3 cm inferior to the umbilicus, aligned along the axis from the mid-clavicular to the mid-inguinal point. The incision aligns with the skin's natural Langer's lines, penetrating the underlying structures, therefore rendering it an aesthetically advantageous option. The sole disadvantage is that the rectus sheath is incised at the centre of the wound.

**PARAMEDIAN INCISION:** The primary benefit of this incision is the robust scar it generates. It is positioned parallel to the midline, approximately 2-3 cm from it. The anterior rectus sheath is incised along the incision line. Forceps are positioned on the medial cut edges and retracted to expose the medial border of the rectus muscle. The rectus muscle is subsequently displaced laterally to reveal the posterior sheath, which is incised alongside the transversalis fascia and peritoneum.

**RUTHERFORD MORRISON:** This incision is advantageous when the appendix is positioned para- or retro caecally and adherent. The incision is predominantly an oblique muscle-cutting kind, commencing at McBurney's point and extending obliquely upward and laterally as required.

**BATTLES PARARECTAL INCISION:** This incision is generally executed in the lower abdomen, adjacent to the lateral aspect of the rectus muscle. The skin and subcutaneous tissue are incised in tandem to the incision line, and the anterior rectus sheath is similarly separated along this line. The rectus muscle is retracted medially to reveal the posterior rectus sheath in the upper section of the incision and the transversalis fascia in the lower section, where the posterior rectus sheath is lacking under the arcuate line. Nerves must be retracted to get access to the abdomen; nevertheless, it may be occasionally necessary to sacrifice one or two nerves, potentially leading to weakening in the section of the rectus muscle innervated by those nerves. This incision was once prevalent for appendectomies and unilateral gynaecological surgeries. Nonetheless, its application has diminished as it fails to offer good access to the pertinent organs and cannot be readily extended due to the existence of intercostal nerves. The closure is performed in the same manner as with the paramedian incision.

**LATERAL TRANSVERSE COSMETIC INCISION OPEN APPENDECTOMY** [26,40,41,42]

A little transverse incision, measuring 2.5 to 3 cm, is executed in the right lower abdomen, commencing at the lateral border of the rectus muscle and extending laterally along the McBurney's point line. The sole muscle engaged in the process is the rectus, which is retracted medially, with no additional muscles being incised or divided. The primary advantages of this tiny incision appendectomy are its enhanced aesthetic result and the minimal visibility of the resultant scar.

**CONVENTIONAL 3 PORT LAPAROSCOPIC APPENDICECTOMY** [43] The principal advantage of laparoscopic surgery for suspected appendicitis is its diagnostic capability, particularly in women of reproductive age.

**SINGLE INCISION LAPAROSCOPIC SURGERY (SILS)**[51]

SILS aims at minimizing the number of abdominal wall incisions. The fundamental idea is to allow all of the laparoscopic instruments to enter through one skin incision. When compared with standard laparoscopy, the benefits of single-port laparoscopy seem similar to NOTES. SILS avoids the potential risk of intraperitoneal sepsis from internal organ perforation. SILS instruments are adapted from standard laparoscopic instruments.

First clinical use of a single incision laparoscopy was performed in humans as early as1969 by Wheeless who successfully performed single-puncture tubal ligation. First single-port appendectomy was done in 1992.With surgeons overcoming the learning of laparoscopy and advent of improved instrumentation, the concept of single-port laparoscopic surgery is gaining acceptance. Nowadays various procedures are done through single-incision such as cholecystectomy, colectomy, splenectomy, adrenalectomy, inguinal hernia repair, bariatric surgeries, prostatectomy, nephrectomy, pyeloplasty, hysterectomy & salpingectomy.

## ESSTENTIAL REQUIREMENTS OF LAPAROSCOPIC APPENDICECTOMY:

Instruments for visualization:

i) Light source

ii) Telescope

iii) Video camera system

iv) Beam splitter

v) Monitor

vi) Video recorder

vii) Video printer

viii) Instruments for exposure & manipulation

ix) Insufflator

x) Puncture instruments

xi) Grasping & dissecting instrument

xii) Occlusion & ligation instruments

xiii) Electro surgical unit. Laser equipment is unnecessary

xiv) Irrigation & suction instruments

xv) Wound closure instruments

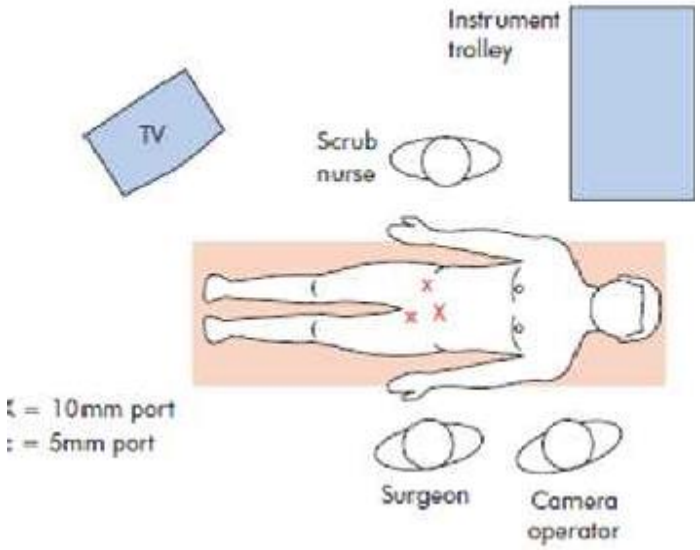



**FIGURE 6:** Position of surgeon, assistants and equipment for laparoscopic appendectomy

**PREPARATION OF PATIENT FOR LAPAROSCOPIC APPENDICECTOMY:**

In light of the circumstances, it is imperative that the patient is thoroughly prepared both psychologically and physically for the treatment. The stages of the laparoscopic process are comprehensively elucidated to the patient. The patient's safety is always prioritized, and the treatment may be terminated at any point and transitioned to open surgery if required. It is specified that if open surgery is necessary, it shall be conducted under the same anaesthesia. Explicit informed consent must be acquired. The patient's comprehensive understanding, confidence, acceptance, and participation are essential for the seamless execution of the process. The preoperative assessment of the patient is identical to that for an open appendectomy. The surgery takes place under general anaesthesia, necessitating a standard evaluation of the patient's eligibility for anaesthesia.

**THE PNEUMO-PERITONEUM**: The primary stage in guaranteeing the safe and efficient accomplishment of any laparoscopic procedure, whether diagnostic or surgical, is the development of sufficient universal pneumoperitoneum. The pneumoperitoneum is established via a spring-loaded Veress needle. A minor incision is created in the infraumbilical area, and the Veress needle is grasped between the thumb and index finger, while the little finger is positioned on the abdomen wall to serve as a safeguard against excessive or abrupt penetration. The left hand elevates the abdominal wall to its maximum height, and with gradual, moderate pressure from wrist dorsiflexion, the tip of the Veress needle is pushed through the abdominal wall layers.

It is imperative to verify that the needle tip is positioned within the free peritoneal cavity, accomplished by:

1. Injecting saline
2. Performing the hanging drop test
3. Checking for free movement of the needle tip

Upon confirmation that the needle tip is situated in the free peritoneal cavity, the needle is attached to the electronic pneumo-insufflator, and carbon dioxide insufflation commences at a flow rate of one litre per minute. The pressure measurements on the insufflator, the needle tip, and the intra-abdominal cavity are meticulously observed. Percussion of the abdomen wall generates a resonant sound and eliminates liver dullness.

**OPEN TECHNIQUE:** A little incision is created at the inferior margin of the umbilicus, which is then expanded until the rectus sheath is accessed. Upon identification of the rectus sheath, it is meticulously incised, and the incision is made deeper under direct visualization to access the peritoneum. A 10 mm port is placed with a blunt trocar when the bowels are readily apparent and pneumoperitoneum is established by introducing CO2. Pneumoperitoneum is established by the absence of liver dullness during percussion. Subsequently, two additional ports are introduced into the peritoneal cavity under direct visualization, either as two 5 mm ports or one 10 mm port and one 5 mm port, utilizing suitable incisions on the abdominal wall.

**TRANSUMBILICAL LAPAROSCOPIC-ASSISTED APPENDECTOMY:** The trans-umbilical single incision laparoscopic appendectomy employs the minimal number of laparoscopic instruments for exposure, with the appendectomy conducted extracorporeally, akin to the open approach.

**TECHNIQUE:** All patients were directed to void their bladders prior to operation. The individual was positioned supine with the left arm secured. The surgery was conducted under general anaesthesia. Subsequent to meticulously washing the umbilicus, it was retracted outward utilizing two Allis forceps. A vertical trans-umbilical incision was performed, and the subcutaneous adipose tissue and fascia were incised to facilitate direct access and view of the peritoneal cavity. The incision was sufficiently widened to allow the insertion of the surgeon's little finger.

**FIGURE 7:** Umbilicus being pulled with 2 Allis forces & Trans umbilical incision being made.

A solitary 10 mm umbilical port was established, and a 10 mm 0-degree operative telescope featuring a 6 mm working channel was utilized. The patient was placed in the Trendelenburg position, with the table inclined to the left side.

**FIGURE 8:** 10mm Trocar introduced through the Trans-umbilical Incision

A grasper was employed to bluntly liberate the appendix and cecum. The peritoneal connections of the cecum and appendix were meticulously detached. When these attachments seemed dense, they were coagulated utilizing a monopolar power source connected to the grasper. Only minor dissection was necessary.

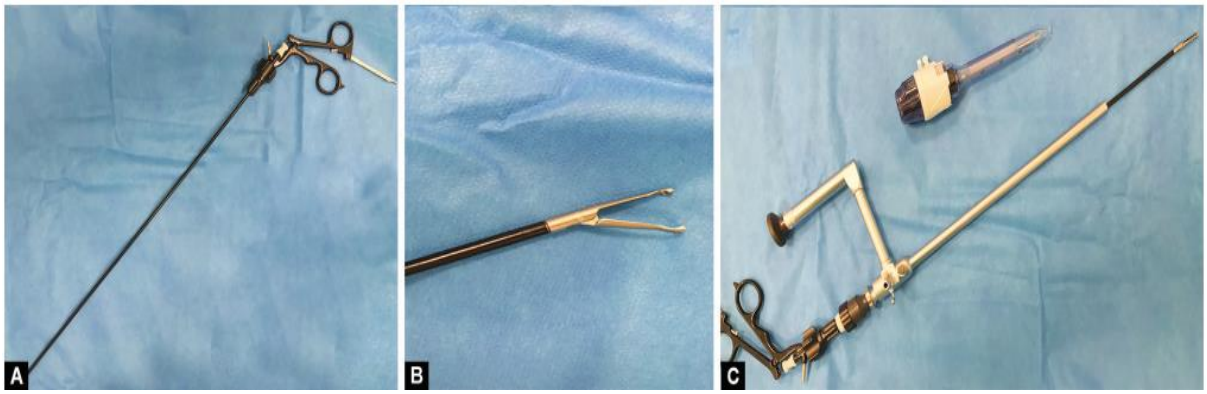



**FIGURE 9:** (A) The grasper; (B) The tip of the grasper; and (C) The grasper in the telescope with the 10 mm port

The procedure was deemed adequate when the appendix tip arrived the umbilical port, notwithstanding the presence of pneumoperitoneum. The appendix was thereafter grabbed at its tip and exteriorized with the cecum through the umbilical incision following the deflation of the pneumoperitoneum. Enhanced precautions were implemented during the exteriorization of a ruptured or gangrenous appendix.

**FIGURE 10:** Appendix exteriorised through the umbilical incision

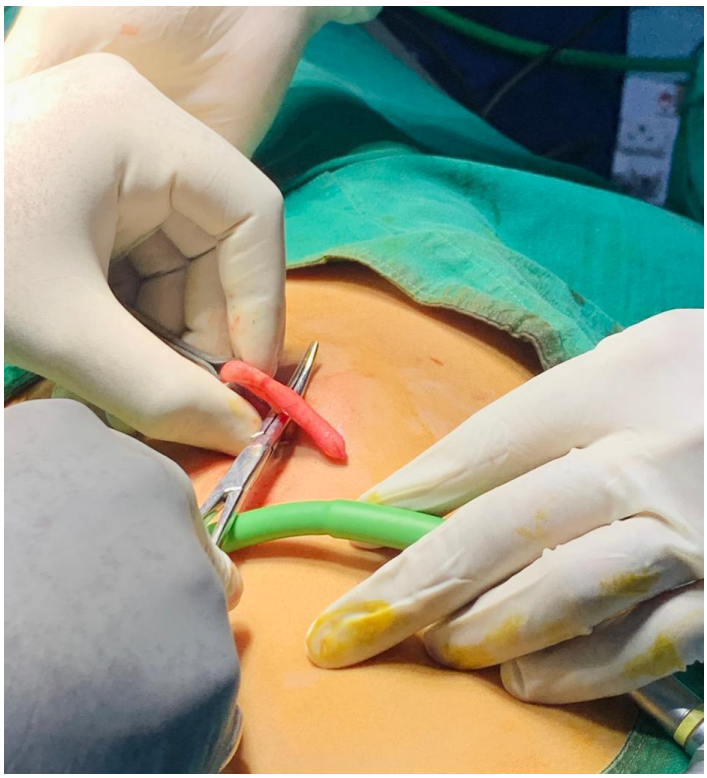


**FIGURE 11:** Extracorporeal dissection of mesoappendix

At the skin level, the mesoappendix was ligated with a 2-0 Polyglactin absorbable suture. The base was ligated using a 2-0 Polyglactin absorbable suture.

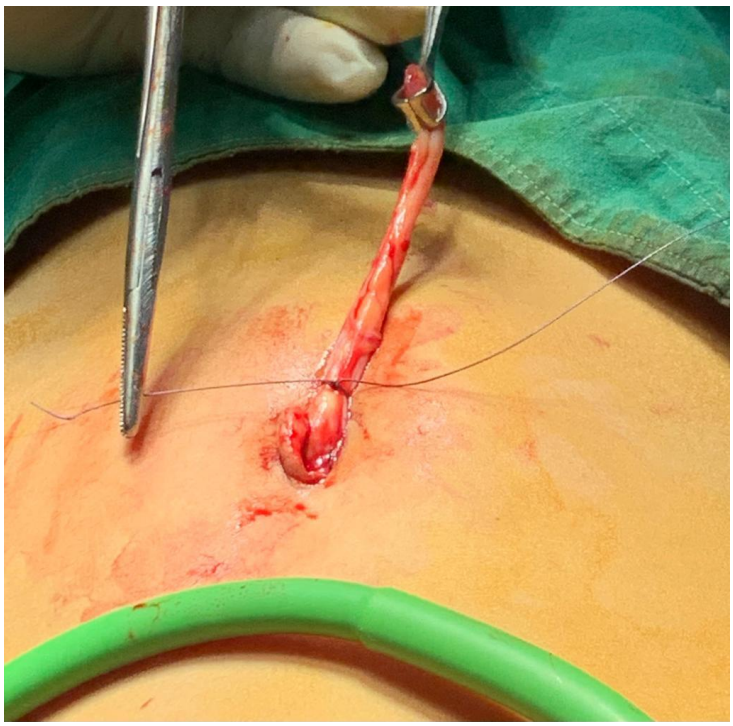


**FIGURE 12**: Extracorporeal ligation of base of Appendix

The appendectomy was then completed extracorporeally. The stump was subsequently coagulated. Thorough cleansing of the incision was performed before closing. For every procedure using the TULAA approach, the operating room was prepared for the potential conversion to the traditional 3-port technique.

**FIGURE 13:** Specimen after completing extracorporeal appendicectomy

After performing extracorporeal appendicectomy the port site was closed with No 1 Polyglactin and skin with No 3-0 Synthetic Non absorbable monofilament Nylon suture

**FIGURE 14:** Immediate Post Operative image

**POST-OPERATIVE COMPLICATION** [44] Post-operative complications following an appendectomy are typically uncommon and are affected by the degree of peritonitis at the time of surgery and any pre-existing conditions that may elevate the risk of problems. These encompass:

Wound infection

ii) Intra-abdominal abscess

iii) Paralytic ileus

iv) Respiratory issues

v) Venous thrombosis and embolism

vi) Portal pyaemia

vii) Faecal fistula

viii) Adhesive intestinal obstruction

ix) Right inguinal hernia

**PROGNOSIS:** Recent improvements in outcomes can be attributed to early diagnosis, the timely necessity for surgery, developments in anaesthetic, surgical methods, treatment of general peritonitis, and the widespread availability of novel antibiotics. Mortality rates are significantly reduced in instances surgically addressed within 48 hours of symptom onset. Peltokallio and Tykka (1981)[45] documented fatality rates of 0.12% for non-perforated cases and 0.18% for perforated cases. The morbidity and mortality rates for masses are minimized with conservative treatment, however they increase with early surgical intervention (McPherson & Kinmonth).[46]

## METHODOLOGY & COLLECTION OF DATA

This is a Comparative study between patients undergoing Trans umbilical Laparoscopic assisted Single Port Appendicectomy v/s Conventional 3 Port Laparoscopic Appendicectomy surgeries in B.L.D.E. (D.U)'S Shri B.M. Patil Medical College Hospital and Research Centre.

The period of study is from March 2023 to March 2025

Patients with Appendicitis are allocated into two separate groups.

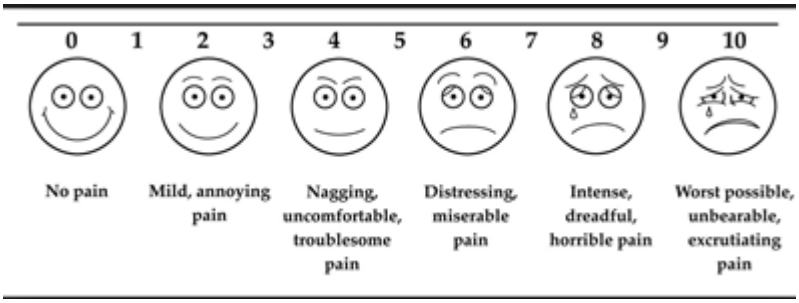
**Group 1** subjects will undergo Single Port Trans-Umbilical Laparoscopic Appendicectomy

**Group 2** subjects will undergo Conventional 3 Port Laparoscopic Appendicectomy after their informed consent is taken.

The parameters which were being considered to compare these two surgical procedures were assessed on the following

Operative Time: From the time of incision to completion of the procedure

Post operative pain: Assessed using visual analogue scale




Duration of hospital stay: From day of surgery till day of discharge

Cosmetic acceptance: Patient/Attenders were asked to rate the cosmetic acceptance of the scar post operatively as- Below Average, Average, Good & Excellent.

**PRO-FORMA**: Pro-forma will be used to fill up general information about the study subjects with their details.

**CONSENT:** Informed consent will be taken from the research subjects through a consent form

**METHOD:**

**TRADITIONAL THREE-PORT LAPAROSCOPIC APPENDECTOMY**

A 10mm curved skin incision is made at the umbilicus under general anaesthesia and stringent aseptic conditions, followed by the establishment of pneumoperitoneum using a Veress needle and carbon dioxide. A 10mm port is introduced, or the incision is extended to access the peritoneum, followed by the placement of the 10mm port. Pneumoperitoneum is reestablished, and the scope is introduced. Two 5mm ports are subsequently positioned under visual guidance—one in the left iliac fossa and the other in the suprapubic area. The patient is placed in a 30-degree left lateral posture, and the mesoappendix is dissected using electrocautery. The appendix base is ligated using a No. 1 catgut extracorporeal knot and subsequently removed with scissors. The region is irrigated with normal saline, suctioned, and complete haemostasis is verified. The specimen is extracted under direct visualization, and the incisions are sutured with 2-0 polyglactin sutures.

**TRANSUMBILICAL LAPAROSCOPIC ASSISTED APPENDICECTOMY:**

Under general anaesthesia and stringent aseptic circumstances, a 10mm curved incision is created at the umbilicus, followed by the establishment of pneumoperitoneum utilizing a Veress needle and carbon dioxide. A 10mm port is either inserted or the incision is extended to access the peritoneum, followed by the placement of the 10mm port. Pneumoperitoneum is re-established, and the 10mm, 0-degree scope with a single functional channel is introduced. The patient is lying at a 30-degree left lateral inclination. The appendix is seized by its tip with a grasper and is extracted through the umbilical incision. Extracorporeal dissection of the mesoappendix is performed with polyglactin 2-0, and the base of the appendix is secured with polyglactin 2-0, followed by extracorporeal appendicectomy. The appendicular stump is reinserted into the peritoneal cavity, and the port site is sutured with polyglactin No. 1, while the skin is closed with Nylon 2-0.

**STUDY DESIGN:**

- Design - Prospective Comparative interventional Study Design

- Proposed study period - March 2023 – March 2025

- Place of study - BLDE (DU)'s
  Shri.B.M. Patil medical college hospital and
  research centre, Vijayapura.

**SOURCE OF DATA:**

All patients admitted in the Department of surgery at B.L.D.E.(D.U)'S Shri B.M.Patil Medical College Hospital and Research Centre, Vijayapura between March 2023 to March 2025.

**INCLUSION CRITERIA:** All the patients of age group < 18 years of age who present to

SHRI B M PATIL MEDICAL COLLEGE AND RESEARCH CENTRE, BLDE(DU), VIJAYAPURA, At the Department of General Surgery OPD or Casualty/Emergency with Appendicitis.

**EXCLUSION CRITERIA:**

1) Patients with Appendicular phlegmon
2) Patients with Appendicular Abscess
3) Patients with Appendicular Mass
4) Patients converted to Open Appendicectomy from Laparoscopic Appendicectomy

**RESEARCH HYPOTHESIS**: Single-port laparoscopic appendectomy is a safe, minimally invasive procedure that offers excellent cosmetic outcomes (with less visible scars), reduced pain, shorter hospital stays, quicker return to work, and fewer post-operative complications compared to the traditional three-port laparoscopic appendectomy.

**SAMPLE SIZE**: The anticipated Mean ± SD of Operative time (min) in LA group 47.83±16.59 and in TULAA 30.39±13.12 resp. **The required minimum sample size is 18 per group** (i.e. a total sample size of 36, assuming equal group sizes) to achieve a power of 90% and a level of significance of 5% (two sided), for detecting a true difference in means between two groups.

$$N = 2\left[\frac{(Z_{\propto} + z_{\beta}) * S}{d}\right]^2$$

$Z_{\propto}$ Level of significance=95%

$Z_{\beta}$--power of the study=80%

d=clinically significant difference between two parameters

SD= Common standard deviation

**Statistical Analysis:** The data obtained will be entered in a Microsoft Excel sheet, and statistical analysis will be performed using statistical package for the social sciences (Version 20).

- Results will be presented as Mean ± SD, counts and percentages and diagrams.
- For normally distributed continuous variables between two groups will be compared using independent t test for not normally distributed variables Mann Whitney U test will be used. Categorical variables between two groups will be compared using Chi square test.
- $p<0.05$ will be considered statistically significant. All statistical tests will be performed two tailed.

# RESULTS & ANALYSIS

The results and analysis of the outcome of the study are as follows

Table: General Characteristics

| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***AGE*** | | | **0.037** |
| 11 to 14 years | 10 (56%) | 8 (44%) | |
| 15 to 18 Years | 4 (29%) | 10 (71%) | |
| 6 to 10 Years | 4 (100%) | 0 (0%) | |
| ***SEX*** | | | 0.2 |
| FEMALE | 9 (64%) | 5 (36%) | |
| MALE | 9 (41%) | 13 (59%) | |
| [1] n (%) | | | |
| [2] Fisher's exact test; Pearson's Chi-squared test | | | |

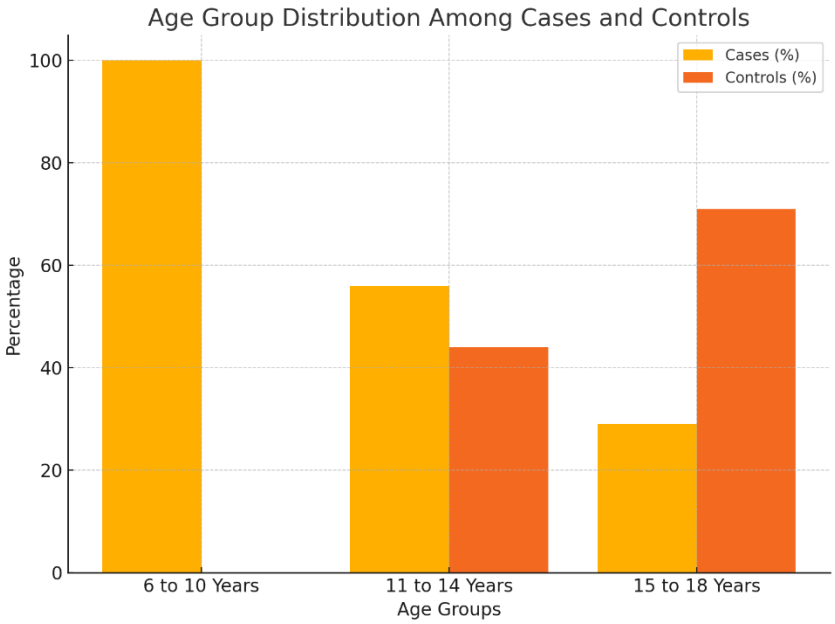
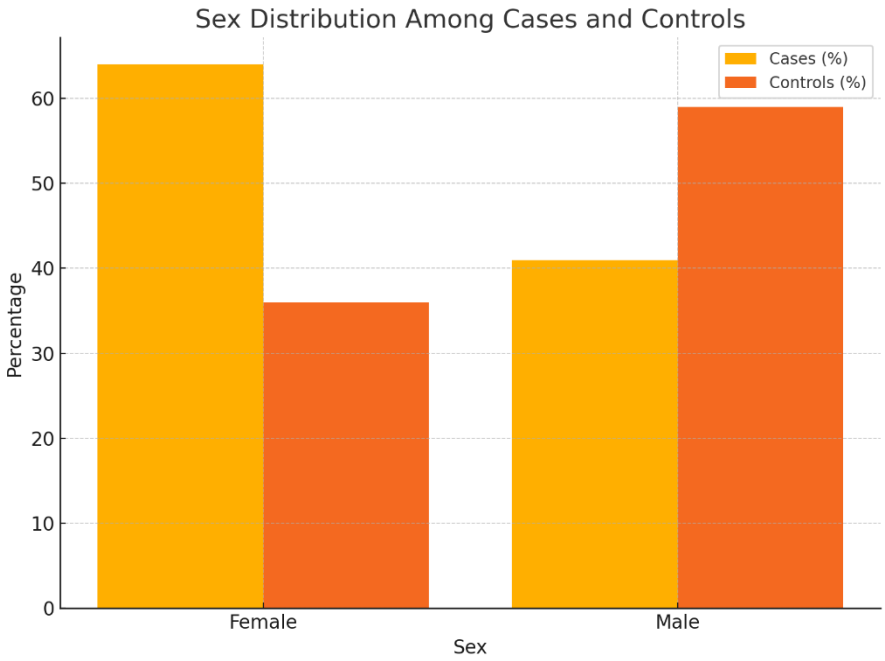



Table 2:

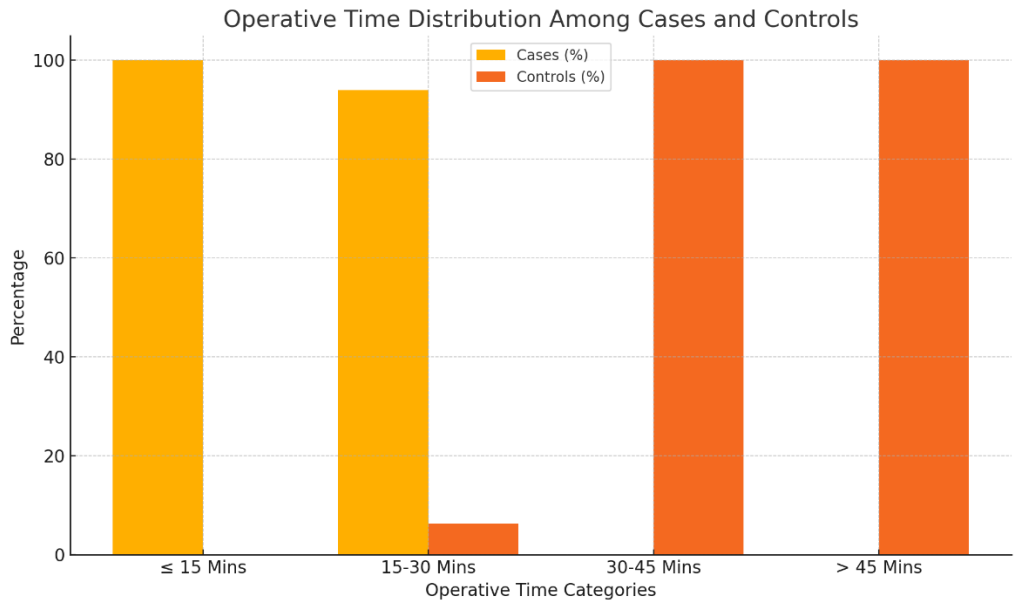
| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***DIAGNOSIS*** | | | >0.9 |
| ACUTE APPENDICITIS | 6 (46%) | 7 (54%) | |
| RECURRENT APPENDICITIS | 6 (55%) | 5 (45%) | |
| SUBACUTE APPENDICITIS | 6 (50%) | 6 (50%) | |
| [1] n (%) | | | |
| [2] Pearson's Chi-squared test | | | |




| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***OPERATIVE TIME ( MINS )*** | | | **<0.001** |
| Less than or equal to 15 Mins | 3 (100%) | 0 (0%) | |
| More than 15 and less than 30 Mins | 15 (94%) | 1 (6.3%) | |
| More than 30 and less than 45 Mins | 0 (0%) | 6 (100%) | |
| More than 45 Mins | 0 (0%) | 11 (100%) | |

[1] n (%)

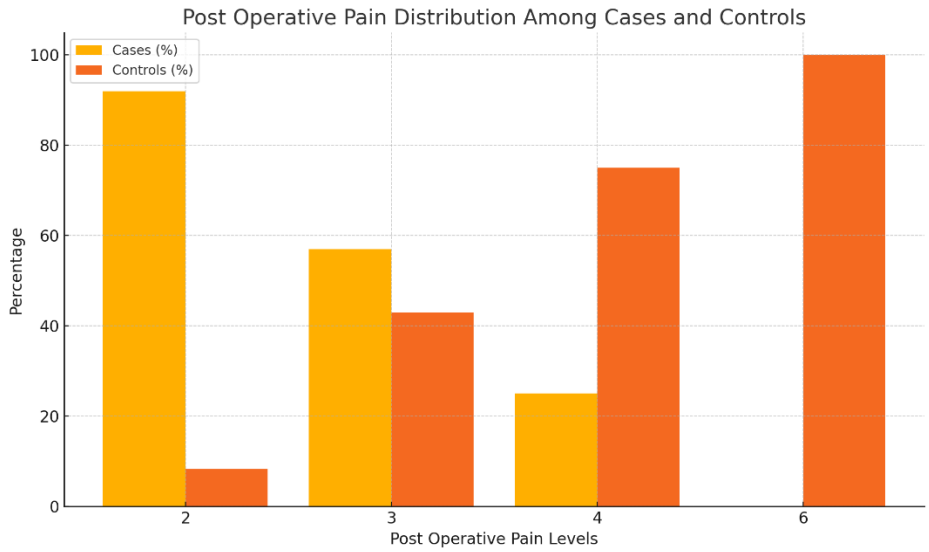
[2] Fisher's exact test




| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***POST OPERATIVE PAIN*** | | | **<0.001** |
| 2 | 11 (92%) | 1 (8.3%) | |
| 3 | 4 (57%) | 3 (43%) | |
| 4 | 3 (25%) | 9 (75%) | |
| 6 | 0 (0%) | 5 (100%) | |

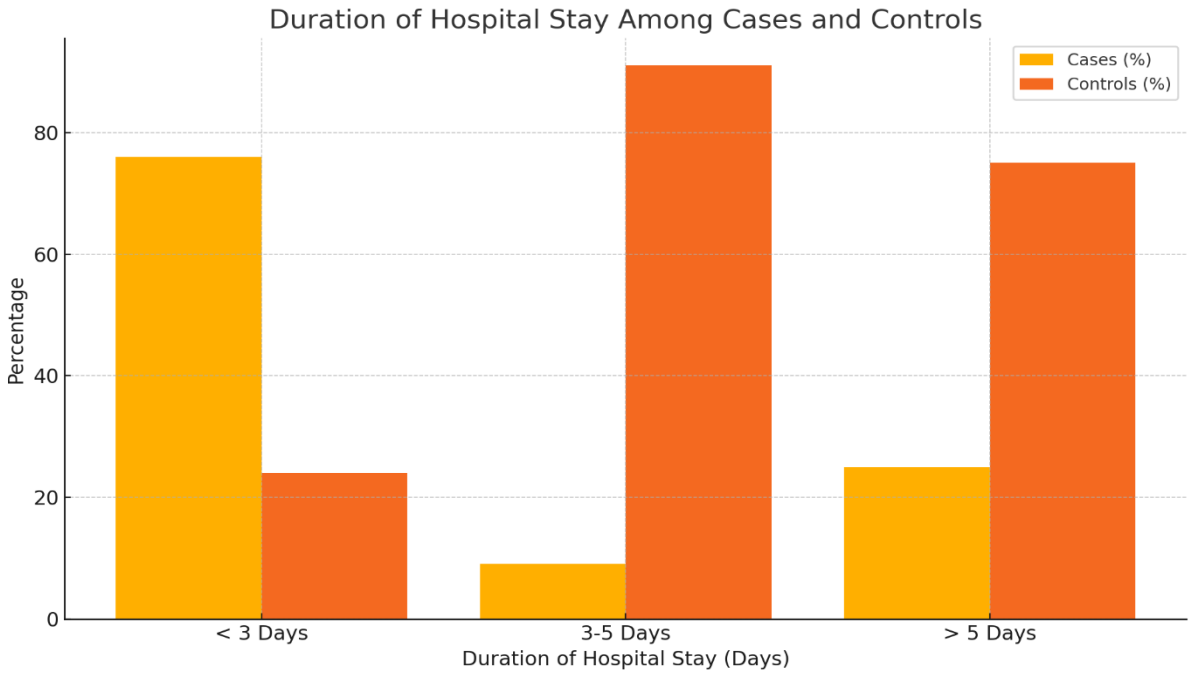
[1] n (%)

[2] Fisher's exact test




| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***POST OPERATIVE COMPLICATIONS*** | 2 (100%) | 0 (0%) | 0.5 |
| [1] n (%) | | | |
| [2] Fisher's exact test | | | |

| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***DURATION OF HOSPITAL STAY (DAYS)*** | | | **<0.001** |
| Less Than 3 days | 16 (76%) | 5 (24%) | |
| More than 3 and less than 5 days | 1 (9.1%) | 10 (91%) | |
| More than 5 Days | 1 (25%) | 3 (75%) | |
| [1] n (%) | | | |
| [2] Fisher's exact test | | | |




| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***COSMETIC ACCEPTANCE*** | | | **<0.001** |
| AVERAGE | 0 (0%) | 18 (100%) | |
| GOOD | 13 (100%) | 0 (0%) | |
| EXCELLENT | 5 (100%) | 0 (0%) | |

[1] n (%)

| **Characteristic** | **Cases**, N = 18[1] | **Control**, N = 18[1] | **p-value**[2] |
|---|---|---|---|
| ***CONVERSION*** | | | 0.5 |
| CONVERTED | 0 (0%) | 2 (100%) | |
| No | 18 (53%) | 16 (47%) | |

[1] n (%)

[2] Fisher's exact test

[2] Fisher's exact test

# DISCUSSION

The present study consisted of 18 cases and 18 controls, with a higher proportion of younger participants (6–10 years) in the case group (100%) compared to the control group (11.11%). In contrast, Bindi E et al. (2023) reported a mean age distribution across different paediatric age groups, with a total sample of 181 patients,[70] whereas Go DY et al. (2016) examined patients aged under 15.[68] Similarly, Noviello C et al. (2015) reported a mean age of 9.2 years (range: 2 to 14 years), which aligns more closely with the current study.[71] Regarding sex distribution, females constituted 64% of cases in the present study, while males accounted for 41% of cases, though the difference was not statistically significant ($p = 0.1714$). Similar trends have been reported in paediatric appendectomy studies, with Bindi E et al. (2023)[70] and Noviello C et al. (2015)[71] showing a slight male predominance in their cohorts.

One of the significant findings of the present study is that the operative time was significantly shorter in the case group ($p < 0.001$), with all cases completing surgery within 30 minutes. This is in stark contrast to previous studies. Bindi E et al. (2023) found that Trans-Umbilical Laparoscopic-Assisted Appendectomy (TULAA) had a significantly shorter operative time than Conventional Laparoscopic Appendectomy (CLA), with mean times of 56.4 minutes vs. 70.9 minutes, respectively ($p < 0.0001$).[70] Similarly, Cheema AH et al. (2024) reported that TULAA reduced operative time compared to CLA by approximately 11.16 minutes ($p < 0.00001$).[72] On the other hand, Wu S et al. (2022) reported that Single-Incision Laparoscopic Assisted Appendectomy (SILAA) required more operative time than conventional methods, with an average operative duration of 65.3 minutes for SILAA compared to 56.5 minutes for CLA ($p = 0.039$).[64]

According to Giordano Perin , Maria Grazia Scarpa the overall operating time reported in their literature ranges from 10 to 196 minutes. The use of descriptive statistic methods varies across the analysed literature; some authors prefer to report their outcome as mean operating time, and some authors prefer to use a median value. Overall, the mean/median operating time reported ranges from 15 to 58.6 minutes.

This suggests that while some minimally invasive techniques, like TULAA, may be advantageous in reducing operative time, others like SILAA may require more time due to technical challenges.

Postoperative pain was significantly lower in the case group of the present study ($p = 0.0009$), with 92% of patients reporting a pain score of 2 compared to 8.3% in controls. This aligns with findings from Boo YJ et al. (2015), who reported that TULAA had significantly lower postoperative pain compared to SILA ($p < 0.001$).[72] Similarly, Go DY et al. (2016) found that TULAA led to significantly lower postoperative pain scores and reduced use of rescue analgesics compared to CLA.[68] Wu S et al. (2022) also confirmed that SILA patients experienced less postoperative pain than those undergoing CLA.[64]

The present study found that hospital stay was significantly shorter in the case group ($p = 0.0008$), with 76% of patients discharged within three days, compared to 24% in controls. This is consistent with Cheema AH et al. (2024), who reported that TULAA resulted in a shorter hospital stay than CLA (mean difference: -0.44 days, $p = 0.002$).[72] Similarly, Cirocchi R et al. (2024) concluded that Single-Port Laparoscopic Assisted Appendectomy (SILA) resulted in a shorter hospital stay compared to CLA, although the difference was not statistically significant.[74] However, Bindi E et al. (2023)[70] and Noviello C et al. (2015)[71] did not find a statistically significant difference in hospital stay between different laparoscopic techniques. This suggests that while some studies demonstrate a benefit of newer techniques in reducing hospital stays, the evidence remains mixed.

Postoperative complications were noted in two cases in the present study, but the difference was not statistically significant ($p = 0.1456$). Previous studies have shown varied results regarding complication rates. Koizumi[77] and colleagues in 2015 retrospectively compared 64 patients undergoing open appendicectomy with 62 patients undergoing a single port Trans umbilical Laparoscopic Assisted Extracorporeal Appendicectomy. 8/64 patients developed a complication in the first group (5 surgical wound infections, 1 intra-abdominal abscess, and 2 cases of ileus); 12/62 patients developed a complication in the second group (9 surgical wound infections, 1 abscess, and 2 cases of ileus).

Cheema AH et al. (2024) found that TULAA was associated with a lower risk of intraabdominal infections (RR = 0.64, $p = 0.03$).[72] However, Wu S et al. (2022) found no significant difference in wound infections between CLA and TULAA (trans umbilical LAA).[64]

Boo YJ et al. (2015) found that TULAA had a significantly lower complication rate (1.5%) compared to SILA (9.8%) ($p = 0.0035$). [12] In contrast, Karam PA et al. (2016) reported a slightly higher surgical site infection rate for TULAA (6%) compared to conventional 3-port laparoscopic appendectomy (TPLA) (4%), though the difference was not statistically significant.[69]

Cosmetic acceptance was significantly better in the case group of the present study ($p < 0.001$). This aligns with findings from multiple studies, including Rometra S et al. (2018)[75] and Cirocchi R et al. (2024),[74] which emphasized that TULAA resulted in superior cosmetic outcomes compared to CLA. Wu S et al. (2022) also found that patients who underwent TULAA techniques had significantly higher cosmetic satisfaction scores than those who had CLA ($p < 0.05$).[64]

Gupta R. K., Gupta A., Kothari P., Kesan K. K,[79] in their highlighted how single port surgery has the potential of leaving a "scarless" abdomen. However, some concerns remain regarding the risk of umbilical deformity and incisional hernias in trans umbilical SILA (TSILA), as highlighted by Wu et al. (2022).[64]

Visnjic[78] compared their outcomes with three different appendicectomy techniques: laparoscopic appendicectomy with staplers (34), laparoscopic appendicectomy with loops (9), and Trans umbilical Laparoscopic Assisted Appendicectomy (29). Considering only the cost of consumables used in the three techniques, they highlight how Trans umbilical Laparoscopic Assisted Appendicectomy is cheaper as it involves the use of single multifilament absorbable suture instead of staples or endo-loops.

# SUMMARY

This study was conducted to compare the safety and efficacy of Trans umbilical laparoscopic assisted appendicectomy with conventional 3 Ports Laparoscopic appendicectomy in patients undergoing surgery for appendicitis.

This study was conducted on 36 patients admitted in BLDEU's Shri B M Patil Medical College Hospital and Research Centre, Vijayapura from March 2023 to March 2025 who were diagnosed to have acute/chronic/recurrent appendicitis. The patients were divided into two groups of 18 each. Group A underwent Trans Umbilical Laparoscopic assisted appendicectomy (TULAA) while Group B underwent conventional three ports laparoscopic appendectomy (CTPLA). Both the group were compared for duration of surgery, duration of hospital stays, postoperative pain, post-operative complications, cosmetic results in terms of satisfaction rate.

All data were collected and analyzed statistically. There was no age difference between both the groups. However higher proportion of younger population (6-10 years) in case group (100%) compared to control group (11.11%) were present. Mean duration of surgery in TULAA group was 56.4 mins and for CTPLA was 70.9 mins suggesting TULAA had significantly shorter operative time compared to CTPLA. Duration of hospital stay in TULAA group was significantly shorter than CLA ($p = 0.0008$), with 76% of patients being discharged within 3 days, compared to 24% in control. In TULAA group postoperative pain was less ($p = 0.0009$), with 92% of patients reporting a pain score of 2 on VAS compared to 8.3% in control group. There was no difference between both the groups in terms of parenteral analgesics received and resuming work after surgery. TULAA group were more completely satisfied in terms of surgical scar ($p < 0.001$) in comparison to CTPLA group ($p < 0.05$). In our study 2 out of 18 cases were converted to CTPLA due to dense intra-abdominal adhesions ( $p= 0.5$ ).

Post operative complications were noted in two cases in the present study, but the results were not statistically significant ($p = 0.1456$).

**TULAA can be considered as an alternative to CTPLA with shorter duration of surgery, shorter duration of stay in hospital, better cosmetic outcome, less postoperative pain & early resume to work with no increase in complication rates.**

# CONCLUSION

Laparoscopic surgery is increasingly regarded as the "gold standard" for numerous procedures conducted by general surgeons, including appendectomy. Laparoscopic surgery has considerably enhanced the principles of minimally invasive surgery. With heightened awareness and safety about laparoscopic surgeries, along with technological advancements, novel concepts have evolved to further augment the minimally invasive character of surgeries, exemplified by trans umbilical laparoscopic-assisted appendectomy.

The present study demonstrates that Trans-Umbilical Laparoscopic-Assisted Appendectomy (TULAA) offers significant advantages over Conventional Laparoscopic Appendectomy (CLA) in paediatric patients. TULAA resulted in a shorter operative time, reduced postoperative pain, faster recovery, and superior cosmetic outcomes, with no significant difference in complication rates. Given its minimally invasive nature and favourable surgical outcomes, TULAA should be considered a preferred approach for managing uncomplicated appendicitis, particularly in younger patients.

**This study shows that TULAA is a safe and effective technique for appendicectomy and is superior to CTPLA in terms of postoperative scar, early resume to work & less postoperative pain & shorter duration of surgery.**

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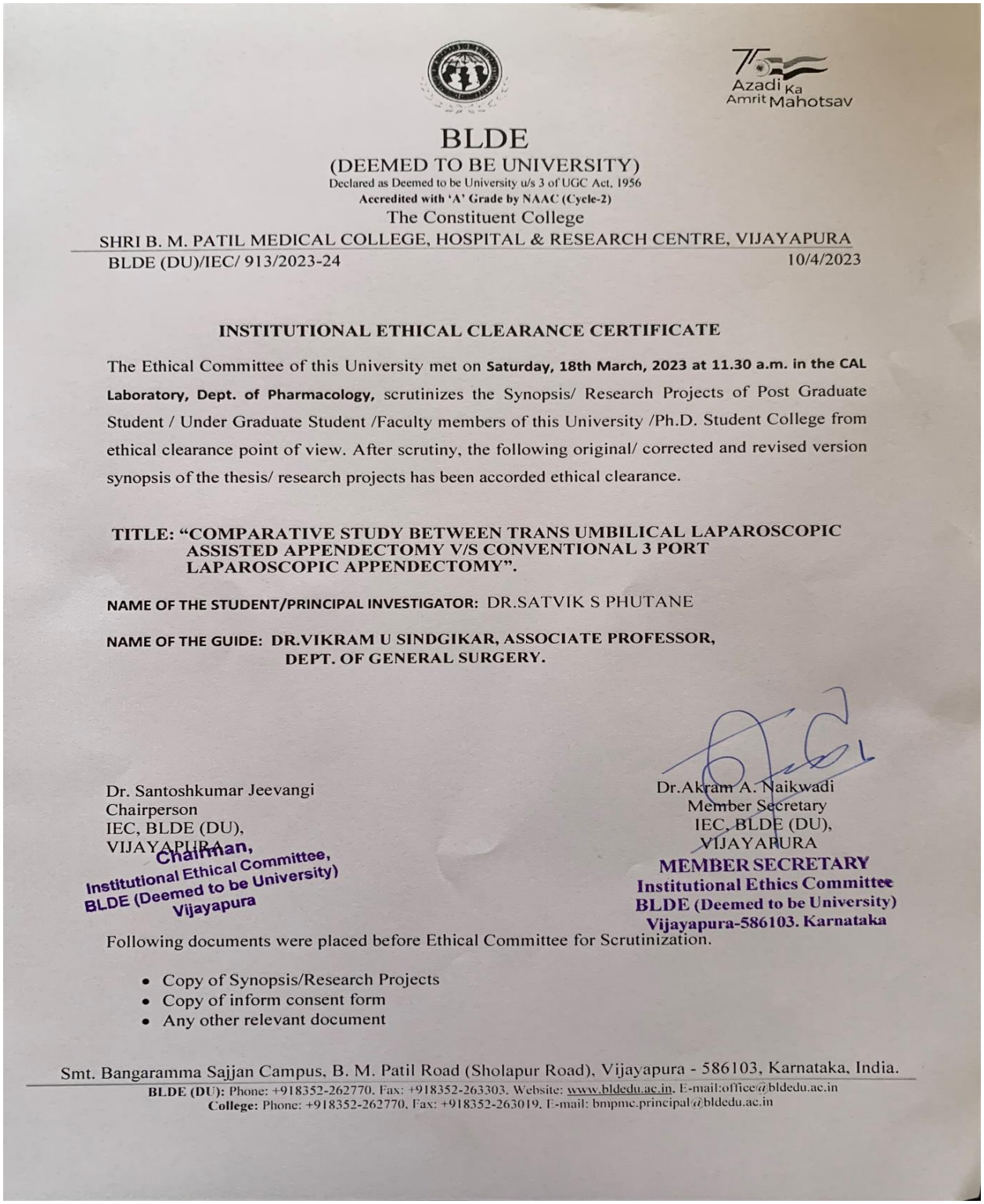

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SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 913/2023-24 10/4/2023

**INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE**

The Ethical Committee of this University met on **Saturday, 18th March, 2023 at 11.30 a.m. in the CAL Laboratory, Dept. of Pharmacology,** scrutinizes the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

**TITLE: "COMPARATIVE STUDY BETWEEN TRANS UMBILICAL LAPAROSCOPIC ASSISTED APPENDECTOMY V/S CONVENTIONAL 3 PORT LAPAROSCOPIC APPENDECTOMY".**

**NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR:** DR.SATVIK S PHUTANE

**NAME OF THE GUIDE: DR.VIKRAM U SINDGIKAR, ASSOCIATE PROFESSOR, DEPT. OF GENERAL SURGERY.**

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA

Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA

MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103. Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.

**BLDE (DU):** Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in

**College:** Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

**PROFORMA**

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AGE IP NO

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RELIGION DOA

OCCUPATION WARD

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SOCIO-ECONOMIC STATUS:

**COMPLAINTS;**

**HISTORY OF PRESENT ILLNESS;**

**PAST HISTORY:**

**PERSONAL HISTORY:**

**GENERAL PHYSICAL EXAMINATION**

**BUILT**: WELL/MODERATE/POOR

**BODY MASS INDEX**:

**NOURISHMENT**: WELL, /MODERATE/POOR BMI= ]

PALLOR

ICTERUS

CYANOSIS

CLUBBING

PEDAL EDEMA

GENERAL LYMPHADENOPATHY

**VITAL DATA**:

TEMPERATURE:

PULSE:

RESPIRATORY RATE:

BLOOD PRESSURE:

**SYSTEMIC EXAMINATION**

**RESPIRATORY SYSTEM**

**CARDIOVASCULAR SYSTEM**

**CENTRAL NERVOUS SYSTEM**

**PER ABDOMEN:**

**PER RECTAL EXAMINATION**

**CLINICAL DIAGNOSIS:**

**INDICATION FOR EMERGENCY SURGERY:**

**PLAN OF TREATMENT:**

**LABORATORY TESTS**

HB%

TOTAL COUNT

DIFFERENTIAL COUNT

N/L/E/B/M

RENAL FUNCTION TEST

LIVER FUNCTION TEST

OTHER INVESTIGATIONS

OPERATIVE PROCEDURE:

DATE:

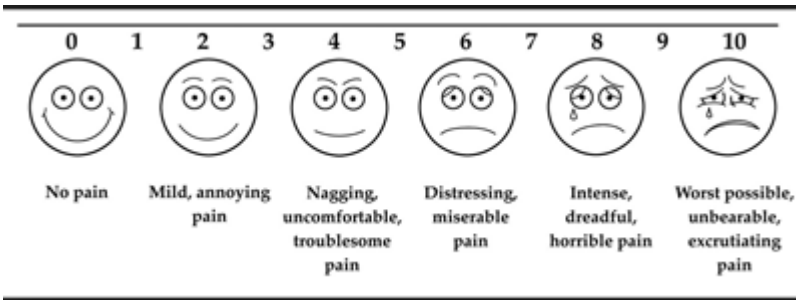
PROCEDURE DONE: TULAA OR CLA

POSTOPERATIVE COMPLICATIONS:

1) OPERATIVE TIME:

2) POSTOPERATIVE PAIN:

VISUAL ANALOG SCALE:




DURATION OF THE HOSPITAL STAY FROM THE DAY OF SURGERY TO THE DATE OF DISCHARGE: _____Days.

**PATIENT'S ASSESSMENT OF THE TREATMENT AND SYMPTOM RELIEF:**

RECOVERED

IMPROVED

UNCHANGED

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**VIJAYAPURA- KARNATAKA**

**INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH**

I, the undersigned, _____, S/O D/O _____, aged ____years, resident of _____ do hereby state/declare that Dr **Satvik S Phutane** of Shri. B. M. Patil Medical College Hospital and Research Centre have examined me thoroughly on _____ at _____ (place) and it has been explained to me in my language about the study. Further Dr. Satvik S Phutane informed me that he is conducting dissertation/research titled "Comparative study between Trans-umbilicus Laparoscopic Assisted Appendicectomy with Conventional 3 Port Laparoscopic Appendicectomy" under the guidance of Dr. VIKRAM U SINDAGIKAR requesting my participation in the study. I will also be contacted on phone at times necessary to ask regarding my condition. Further Doctor has informed me that my participation in this study will help in the evaluation of the results of the study which is a useful reference to the treatment of other similar cases in the future.

The Doctor has also informed me that information given by me, observations made/ photographs/ video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes.

The Doctor did inform me that though my participation is purely voluntary, based on the information given by me, I can ask any clarification during the treatment/study related to diagnosis, the procedure of treatment, the result of treatment, or prognosis. At the same time, I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time but not the procedure of treatment and follow-up unless I request to be discharged.

After understanding the nature of dissertation or research, diagnosis made, mode of treatment. I am giving consent for the blood and other essential investigations and also for the follow-up.

I the undersigned Shri/Smt _____ under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of the Patient :

Signature of Doctor :

**CONFIDENTIALITY:**

I understand that medical information produced by this study will become a part of this hospital record and will be subjected to the confidentiality and privacy regulation of this hospital. Information of a sensitive, personal nature will not be a part of the medical records but will be stored in the investigator's research file and identified only by a code number. The code key connecting name to the numbers will be kept in a separate secure location.

If the data are used for publication in the medical literature or teaching purposes, no names will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission

**REQUEST FOR MORE INFORMATION:**

I understand that I may ask more questions about the study at any time.

Dr. Satvik S Phutane is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during this study, which might influence my continued participation. If during this study, or later, I wish to discuss my participation in or concerns regarding this study

with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. And that a copy of this consent form will be given to me for careful reading.

**REFUSAL OR WITHDRAWAL OF PARTICIPATION:**

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that Dr. Satvik S Phutane will terminate my participation in this study at any time after he has explained the reasons for doing so and has helped arrange for my continued care by my physician or therapist if this is appropriate

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**INJURY STATEMENT:**

I understand that in the unlikely event of injury to me/my ward, resulting directly to my participation in this study, if such injury were reported promptly, then medical treatment would be available to me, but no further compensation will be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained_____the purpose of this research, the procedures required, and the possible risks and benefits, to the best of my ability and the patient's language.

DATE:

DR. VIKRAM U SINDGIKAR
(GUIDE)

DR. SATVIK S PHUTANE
(INVESTIGATOR)

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**STUDY SUBJECT CONSENT STATEMENT:**

I confirm that Dr. Satvik S Phutane has explained to me the purpose of this research, the study procedure that I will undergo, and the possible discomforts and benefits that I may experience, in my language.

I have been explained all the above in detail in my language and I understand the same. Therefore, I agree to give my consent to participate as a subject in this research project.

_____ _____

(PARTICIPANT) DATE

_____ _____

(WITNESS) DATE

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**MASTER CHART**

| SL.NO | NAME | AGE | SEX | IP NUMBER | DIAGNOSIS | OPERATIVE TIME ( MINS ) | POST OPERATIVE PAIN | POST OPERATIVE COMPLICATIONS | DURATION OF HOSPITAL STAY (DAY | COSMETIC ACCEPTANCE | CONVERSION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MAHIRA | 6 | FEMALE | 95623 | SUBACUTE APPENDICITIS | 20 | 4 | 1 | 5 | GOOD | 0 |
| 2 | NANDINI JAVATHI | 10 | FEMALE | 101867 | RECURRENT APPENDICIT | 25 | 2 | 0 | 2 | EXCELLENT | 0 |
| 3 | SAGAR SIDDAGON | 11 | MALE | 1064 | SUBACUTE APPENDICITIS | 15 | 2 | 0 | 2 | GOOD | 0 |
| 4 | SRUJAN BIRADAR | 13 | FEMALE | 131747 | RECURRENT APPENDICIT | 30 | 3 | 0 | 3 | GOOD | 0 |
| 5 | ALIYA NASIR | 12 | FEMALE | 197278 | ACUTE APPENDICITIS | 30 | 2 | 1 | 7 | GOOD | 0 |
| 6 | MUTHURAJ DOLLIE | 10 | MALE | 216336 | RECURRENT APPENDICIT | 18 | 3 | 0 | 2 | GOOD | 0 |
| 7 | NIRMALA ANAND | 12 | FEMALE | 219036 | ACUTE APPENDICITIS | 30 | 2 | 0 | 2 | EXCELLENT | 0 |
| 8 | AJAY KUMAR | 13 | MALE | 111424 | ACUTE APPENDICITIS | 25 | 2 | 0 | 2 | GOOD | 0 |
| 9 | RAMESH DUNDAPP | 11 | MALE | 362100 | SUBACUTE APPENDICITIS | 30 | 2 | 0 | 2 | EXCELLENT | 0 |
| 10 | ANANYA BIRADAR | 12 | FEMALE | 380105 | SUBACUTE APPENDICITIS | 30 | 4 | 0 | 2 | GOOD | 0 |
| 11 | KANDU VITTAL | 15 | MALE | 27311 | RECURRENT APPENDICIT | 15 | 2 | 0 | 2 | EXCELLENT | 0 |
| 12 | AKSHAY | 12 | MALE | 120375 | ACUTE APPENDICITIS | 25 | 2 | 0 | 3 | GOOD | 0 |
| 13 | SNEHA BIRAPPA | 16 | FEMALE | 21032 | SUBACUTE APPENDICITIS | 20 | 2 | 0 | 3 | GOOD | 0 |
| 14 | ARSHA ABDUL | 10 | FEMALE | 81079 | SUBACUTE APPENDICITIS | 18 | 4 | 0 | 2 | GOOD | 0 |
| 15 | ANKITHA CHAVAN | 11 | FEMALE | 216470 | RECURRENT APPENDICIT | 25 | 3 | 0 | 2 | EXCELLENT | 0 |
| 16 | ANIRUDH | 17 | MALE | 346588 | ACUTE APPENDICITIS | 20 | 2 | 0 | 2 | GOOD | 0 |
| 17 | SRIHARI | 18 | MALE | 212565 | RECURRENT APPENDICIT | 30 | 2 | 0 | 3 | GOOD | 0 |
| 18 | JNANESH | 12 | MALE | 112321 | ACUTE APPENDICITIS | 15 | 3 | 0 | 2 | GOOD | 0 |
| | | | | | | | | | | | |
| CONTROL GROUP | | | | | | | | | | | |
| 1 | RANGASWAMY | 16 | MALE | 110287 | ACUTE APPENDICITIS | 45 | 4 | 0 | 3 | AVERAGE | 0 |
| 2 | ANMYA | 13 | FEMALE | 16625 | SUBACUTE APPENDICITIS | 45 | 4 | 0 | 4 | AVERAGE | 0 |
| 3 | PRAVEEN KUMAR | 17 | MALE | 197806 | RECURRENT APPENDICIT | 40 | 4 | 0 | 4 | AVERAGE | 0 |
| 4 | KARTHIK RATHOD | 14 | MALE | 203178 | RECURRENT APPENDICIT | 40 | 3 | 0 | 4 | AVERAGE | 0 |
| 5 | ARPITHA | 18 | FEMALE | 315528 | SUBACUTE APPENDICITIS | 50 | 6 | 0 | 4 | AVERAGE | 0 |
| 6 | CHANDA LINGGA | 17 | MALE | 364170 | SUBACUTE APPENDICITIS | 50 | 6 | 0 | 6 | AVERAGE | 0 |
| 7 | ASHWINI PAVAR | 12 | FEMALE | 381525 | RECURRENT APPENDICIT | 45 | 6 | 0 | 7 | AVERAGE | 0 |
| 8 | PREETHI | 18 | FEMALE | 7317 | SUBACUTE APPENDICITIS | 45 | 6 | 0 | 6 | AVERAGE | 0 |
| 9 | GURURAJ | 17 | MALE | 31441 | RECURRENT APPENDICIT | 40 | 3 | 0 | 4 | AVERAGE | 0 |
| 10 | SAHANA PATIL | 12 | FEMALE | 218001 | ACUTE APPENDICITIS | 40 | 6 | 0 | 3 | AVERAGE | 0 |
| 11 | RAMESH B | 18 | MALE | 88644 | SUBACUTE APPENDICITIS | 45 | 4 | 0 | 4 | AVERAGE | 0 |
| 12 | SHANKAR RATHOD | 17 | MALE | 175799 | ACUTE APPENDICITIS | 45 | 4 | 0 | 5 | AVERAGE | 0 |
| 13 | DAYANAND G | 18 | MALE | 189791 | ACUTE APPENDICITIS | 50 | 3 | 0 | 4 | AVERAGE | 0 |
| 14 | ANAND TIPANNA | 13 | MALE | 214385 | ACUTE APPENDICITIS | 30 | 2 | 0 | 3 | AVERAGE | CONVERTED |
| 15 | KESHAWAR | 13 | MALE | 21686 | RECURRENT APPENDICIT | 50 | 4 | 0 | 3 | AVERAGE | CONVERTED |
| 16 | ATISH | 12 | MALE | 34656 | ACUTE APPENDICITIS | 35 | 4 | 0 | 4 | AVERAGE | 0 |
| 17 | SRINIVAS YADAV | 14 | MALE | 21343 | ACUTE APPENDICITIS | 40 | 4 | 0 | 4 | AVERAGE | 0 |
| 18 | CHIRAG JOSHI | 16 | MALE | 112321 | SUBACUTE APPENDICITIS | 45 | 4 | 0 | 3 | AVERAGE | 0 |
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# Satvik S Phutane

## A Comparative Study Between Trans-Umbilical Laparoscopic Assisted Appendicectomy vs Conventional 3 Port Appendicectomy

BLDE University

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