Minimally Access Surgery (MIS) is intended to minimize the trauma of access without compromising the exposure of operative field. With the rapid invention the approaches used in MIS are laparoscopic, endoluminal pelvivisecral, with or without the help of robotic system. In this review we have given a critical brief overview of all these emerging techniques. For preparation of this article the literature was searched on internet using Pub Med, Medline, Med Scope, Google, Pakmedinet, different international website.


INTRODUCTION

Laparoscopic cholecystectomy is a standard treatment for gallstones diseases nowadays and one of the commonest surgical procedures performed all over the world. Historically, Dr. Bozzini, in eighteen century, developed the lichtleiter (a crude endoscope) for viewing the intracavity organ with the help of candle light. Than Kussmaul, in 1868 has performed the esophagoscopy on a professional sword swallowee, using an illuminated reflected light of Gasoline lamp. In 1901, the first examination by using cystoscopy over dag was performed successfully by kelling. The tremendous break through occurred when rod lens system was invented by John Hopkin in 1966 and around the same time the same has developed automate insufflator. He performed firts incidental appendicectomy in 1983 through laparoscopy. The first laparoscopic cholecystectomy on human was performed by Mouret a Gynecologist in 1985 who shifted laparoscope to the right sub hepatic area while performing a gynecological surgery and finds a gall bladder with stone and decided to remove it laparoscopically. Nowadays the laparoscopic cholecystectomy has become the most common surgical procedures in general surgery. Overall, the complication rate of this procedure is about 1.5%, and less than 0.1% mortality. The laparoscopic cholecystectomy has become the preferred surgical procedure for gall stone diseases because of less morbidity, mortality and early return to work. The future in laparoscopic cholecystectomy is promising due to more advanced gadgets and techniques which requires the cooperation of endoscopists and surgeons to do the procedure. Other than laparoscopic cholecystectomy the other surgical procedures like Endoluminal and Tans luminal cholecystectomy in which of gall bladder is extracted through transgastric, transvaginal, transanal or transcolonic routes, with flexible endoscopic instruments. Moreover, the Robotic surgery is an emerging technology in which a surgeon can perform different operations with minimally invasive techniques. In Robotic assisted laparoscopic cholecystectomy, a remote control robot which is attached with a computerized system is used to remove gall bladder. In specialized centers the Robotic surgery is being performed successfully over the experimental animals and the volunteers. The Robotic surgery has a good and progressive future but is very expensive as compared the conventional Laparoscopic Cholecystectomy.

Laparoscopic Cholecystectomy – The Procedure

After induction of general anesthesia, a Ryle's tube and Foley's catheter is placed just to decompress the stomach and urinary bladder respectively. The surgeon operates from the left side of the patient with the camera person by his side and the assistant and scrub nurse on the other side of the operating table. Some surgeons made a small incision in the supra / infra umbilical area and a needle (Veress) is inserted into the peritoneal cavity. Carbon dioxide is introduced through the Veress needle which is insufflatted up to 12 – 15mm Hg pressure. Others put the port by Hasan technique and insufflate peritoneum and later a laparoscope is introduced which allows to inspect the peritoneum from inside onto video screen. Three more ports are placed in the right upper quadrant under direct vision, two are 5mm in diameter and one is 10mm in diameter. These ports are used for graspers, dissectors, and scissors, to separate the gallbladder from the liver bed. The end of the gallbladder is grasped and pushed up toward the diaphragm. This places the cystic duct and cystic artery on stretch and permits the necessary separation of the structures prior to ligating them. To gain better exposure of the Calot's triangle (cystic duct, common duct, cystic artery area) a second grasping instrument is used to grasp the proximal portion of the gall bladder (Hartmann's pouch) and retract it inferiolaterally. This opens up the cystic duct-common duct junction and allows for safe identification and dissection of this area. Once the cystic duct, common bile duct and cystic artery have been clearly identified and dissected free of each other, it is now safe to ligate and divide the cystic duct and the cystic artery. This is done by inserting a clipping instrument through the 10mm port and placing two clips proximally and distally then cutting between the clips. With this accomplished the gall bladder is then

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trans Gastric Laparoscopic Cholecystectomy:
The procedure is performed successfully on animals experimentally. In this procedure an over tube is placed into the mouth and advanced to the stomach with a forward-viewing double-channel endoscope inside the overtube. An anterior gastric wall is punctured under the direct laparoscopic observation and gastric were punctured by using an endoscopic knife with a combination of coagulation and cut current. With the help of pull type sphincterotome, this opening is enlarged to 20-mm and the endoscope is brought into the peritoneal cavity. Than the endoscopy is rotated, retroflexed and advanced toward the gallbladder. The laparoscope is used to monitor the flexible endoscope position and to facilitate its orientation inside the peritoneal cavity. After gallbladder identification, a 10-mm laparoscopic port is inserted in the right upper quadrant and a grasper is introduced to provide traction to facilitate the exposure of the gallbladder. Use of a double-channel flexible endoscope facilitates the ligation of the cystic artery and cystic duct by using two instruments simultaneously i.e. a grasping forceps through one channel and clip applicator through another channel. This endoscopic multiple clip applicator is easy to use, which provides good hemostasis and it reliably clon the cystic duct. The cystic duct, and artery is identified, and ligated with endoclips by using a prototype endoscopic multiple clip applicator especially designed for use through the biopsy channel of the flexible endoscope. After transection the cystic artery and duct the gallbladder is dissected from the liver bed and retrieved by withdrawing the flexible endoscope into the stomach and through the mouth. The gastrostomy was closed with endoclip from inside the gastric lumen after approximating the incision edges together under direct visualization through the laparoscope from inside the peritoneal cavity.

Trans Vaginal Laparoscopic Cholecystectomy:
Natural Orifice Transluminal Endoscopic Surgery is a newly developed technique with potential advantages for the patients. However, ethical and technical challenges are involved in opening and closing of a healthy organ, as encountered in transgastric access. Moreover, the lack of comprehension of physiopathology of these approaches haven’t yet allowed clinical application of these procedures in human. Present study, based on previous animal experiments, describes the first clinical application of transvaginal Natural Orifice Translumenal Endoscopic Surgery. The first Elective Natural Orifice Translumenal Endoscopic Surgery i.e. transvaginal cholecystectomy (NOS) was performed in 2007 over a 43-year-old female with symptomatic gall stone by using a colonoscope, endoscopic graspers, and vaginal platform instruments. The total operative time was 66 minutes, and the vaginal access and closure were done in another 15 minutes. The patient had smooth and rapid postoperative recovery and discharged within 48 hours without any complications. Recent literature search and experience of the present study group suggests the future possibilities of preliminary clinical applications by transvaginal natural orifice surgery. The vaginal access may offer earlier benefits of this procedure was compared to the transgastric route in literature, because lack of danger of fistula formation and peritonitis. Further studies regarding instrument development and physiology of natural orifice surgery are undergoing, possibly brings better solutions for more advanced procedures.

Robotic Laparoscopic Cholecystectomy:
A further step towards new potential developments in minimally invasive surgery is a robotic surgery. Surgeons must keep abreast of these newly developed technologies and should learn their limits actions and possibilities. Literature shows several reports documenting the safety and feasibility of robotic surgery in humans. So foe, the robotic laparoscopic cholecystectomy is safe but carries no obvious advantages for the patients and had recovery times similar to those of standard laparoscopic cholecystectomy. So fare, there are no reliable clinical trials available in literature even than it is considered that the verifying the potential advantages of robotic over conventional surgery, robots have the potential to revolutionize the way surgery is performed. Future applications of robotic surgery would allow integration of preoperative or intraoperative computer images and also leads to further technological advances, such as the computer assisted virtual reality imaging. The question is not that do we really need it robotic technology but it should be considered a developmental step in performing more complex surgical procedures and achieving further technological advances. Robotic surgery is an emerging technology which may comprises of the variety of procedure a surgeon can perform with minimally invasive techniques. Although the laparoscopic Cholecystectomy have minimal advantages by using robotic technology but it can serve as excellent learning tool for residents and surgery trainees to this type of minimally invasive surgical approach.
surgery (MIS). Technically, this technology is ideal for complex hepatobiliary surgery and thoracic surgery, especially in treating the solid chest masses. In addition, the micro-robot were also developed which provides a mobile robotic system to be used inside the body during minimally invasive surgery, procedure particularly the laparoscopy. According to the present invention the micro-robotic may comprise various sensors having in various embodiments and sensors to measure of the pH, blood pressure, humidity, temperature, blood or other fluids in tissue. Moreover, the micro-robot comprises one or more transceivers and imaging capability. In addition, in some embodiments, the micro-robot of the present generation may include one or more manipulators. Certain embodiments of the invention are adapted to be used with the standard laparoscopic gadgets for use during laparoscopic surgery. These inventions provides both teleoperated and non-teleoperated embodiments.

THE WAY FORWARD

Laparoscopic Cholecystectomy has replaces the conventional open surgery and progressing towards with new equipment's and more developed facilities. Laparoscopic Cholecystectomy has become the standard procedure now a days due to less morbidity early return to work, better cosmetic results, less mortality and is also an acceptable alternative for high risk patient. In spite some disadvantages or risk factors of Laparoscopic Cholecystectomy, the Laparoscopic Cholecystectomy is in continuous phase of progress for better out come and less complications even in high risk patients. Laparoscopic Cholecystectomy first started in 1985 in Germany till now shows more advances and progressions in operative techniques along with more advances equipment. The currently practical procedures like 4 , 3 or 2 ports Laparoscopic Cholecystectomy are much safe, having less operative complications, less in pain, better cosmoses, less conversion to open surgery, short hospital stay, more effective cost than and more acceptable by the patients. By considering these advantages the Laparoscopic Laparoscopic Cholecystectomy has followed the development of Robotic Laparoscopic Cholecystectomy and Transluminal Laparoscopic Cholecystectomy techniques. The transluminal approaches includes transgastric, transvaginal, transcolonic and transanal. The Incision less cholecystectomy are the new procedures which are under experimental phase and performed on animals and volunteers, promising us with new methods of highly advanced techniques with very low complaints and without incision operations.

Contribution of authors:

Amir Yousaf: wrote the introduction and standard laparoscopic cholecystectomy procedure
Rizwan aziz: wrote the latest trends in MIS
Ishtiaq Ahmed: wrote abstract, did literature search, final formatting and proof reading of the manuscript

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