Review Article

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Goel's technique of laparoscopic hysterectomy for endometrium carcinoma

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ABSTRACT

The laparoscopic hysterectomy is the preferred choice in performing a hysterectomy in endometrial carcinoma. It is a great alternative to abdominal hysterectomy. The need for proper training, availability of adequate tools and infrastructure are some problems which have affected its wider reach in practice. The operating time required is more compared to abdominal hysterectomy but the merits of laparoscopic hysterectomy outweigh these problems. This technique has shown promising results due to a reduction in postoperative complications, hospital stay and a quick return to normalcy. This article described the technique of performing laparoscopic hysterectomy which the surgeon has introduced and has been practicing for the last few years. It is known as Goel's technique after the name of the surgeon who had first described and successfully executed. This technique encompasses 10 operative steps which are fixed in a way to carry out laparoscopic hysterectomy in safe manner. It emphasizes the identification of anatomical structure before cutting down. The main attribute of this technique is that this procedure operates without the use of vaginal manipulators or Myoma screws which carries the risk of spreading malignancy in the systemic circulation. This technique has highlighted the safety factor during the operation. The technique is easy to understand for surgeons and has been well received in the patients.

Keywords: Endometrium carcinoma, Goel's technique, Harmonic energy, Laparoscopic hysterectomy, Vaginal manipulators

INTRODUCTION

Hysterectomy, minimally invasive surgery to remove the uterus, can be carried out in 3 major ways. 1-3 Conservatively, abdominal hysterectomy has been the most widely used technique for gynaecological malignancies such as endometriosis or adhesions and in cases where the uterus is enlarged. Vaginal hysterectomy, a less invasive technique than abdominal hysterectomy was used only at times of prolapse, but nowadays it has been used for normal size uterus in treating menstrual abnormalities. Laparoscopic hysterectomy, the laparoscopic ligation of the major vessels providing the uterus, is a substitute to the abdominal hysterectomy technique with more focus on accurate dissection,

identification of the ureters (provides an unprecedented view of the anatomy) and meticulous hemostasis. This plays a crucial role in conditions such as endometriosis, fibroids, or adhesions where distortion of the normal anatomy has taken place.^{3,4} The first vaginal hysterectomy method with the aid of laparoscopy was described in 1984 and the first laparoscopically assisted vaginal hysterectomy was published in 1989.⁴ It entails greater surgical expertise than the vaginal and abdominal methods. It is the major reason for the slow acceptance of this procedure in gynaecology compared with other surgical disciplines. Other reasons include lack of training, operation time, funding and lack of enthusiasm of gynecologists to receive new innovations.^{2,4-6} Although the operation time is longer, several benefits are

highlighted in this procedure such as it is a preferred technique in treating pelvic diseases (such as endometriosis) and in performing adnexal surgery involving the amputation of the ovaries, it has the ability to secure difficult intraperitoneal haemostasis at the end of the operation and also it has a rapid recovery. Laparoscopic hysterectomy reduces wound complications, blood loss and hospital stay, returning to normal activities is faster when compared with open abdominal hysterectomies.²⁻⁸ Over the period there has been a gradual increment in the proportion of hysterectomies performed laparoscopically especially for the treatment of endometrial and cervical cancer.⁴

Evidence claims the use of several different techniques for performing laparoscopic hysterectomies.^{2,4,6,8} Though most of these procedures are similar to each other, the difference lies in a sequence of operative steps performed, initiations of dissection to completion of surgery. Every surgeon performs the operation according to the surgeon's comfort. These variations can have their merits and demerits. The technique described in this paper is not completely novel but it has fixed operative steps and their sequence makes it unique. This procedure especially emphasizes the identification of the anatomical parts before the amputation of that part. The previous surgical step needs to be completed before proceeding to the next step. The surgery is carried out without the use of vaginal manipulators or Myoma screws, which makes this method stands out among other hysterectomy approaches. In laparoscopic surgery, the use of various vaginal manipulators to manipulate the uterus for traction is common. However, if they are entered into cancer cells present in the endometrial cavity, it can lead to tissue breakup and bleeding. This can lead to cancer cells entering into the systemic circulation and may spread the malignancy.3 In this review, we described the details of the technique (Goel's technique) of laparoscopic hysterectomy in a stepwise manner. Additionally, the complete representation of the technique was illustrated in a video.9

OPERATIVE STEPS

The technique is named after the surgeon, Dr. Vipin Goel who had first described and practiced this technique which consists of 10 operative steps. These steps are fixed which means surgery has to carry out in this particular sequence.

Step 1: Ports placement (no vaginal manipulators or Myoma screws)

The patient is placed in a dorsal lithotomy position with no flexion at the hips. The legs abducted at the hip joint and knees flexed to 90 degrees. The arms of the patient are tucked to the sides to make them ease. The patient is secured to an operating table to prevent sliding during the steep Trendelenburg (a supine position with their feet positioned above their head at an angle of inclination of

25 to 30 degrees) position used during surgery. This enables the surgeon the best ergonomic position allowing the free movement of the surgeon's arm and adequate access to the vagina for specimen removal without changing drapes. In this technique, five ports are used for performing surgery. This technique involves a primary port at the umbilicus with two accessory ports in the bilateral lower quadrants. First, a 10 mm port is placed in the supraumbilical region by open technique followed by two ports on right and two ports on the left side under laparoscopic camera guidance. A 10 mm right lower port is placed next. It is placed 2 cm medial and 2 cm cranial to the anterior superior iliac spine. This is the main working port. A 5 mm trocar is placed equidistance from these two ports, at least 8 cm distance from already placed ports, forming a near equilateral triangle. On the left side, two 5 mm ports are used; these ports are a mirror image of right-side ports.

Uterine manipulation is crucial for laparoscopic procedures involving dissection of the female pelvis. Several uterine manipulations, tenaculum or Myoma screw for traction on the uterus are available to help manoeuvre the uterus to facilitate the proper dissection in the pelvis. However, their use is not ideal in endometrial carcinoma as they can rupture the cancer cells and the peritoneal spread of tumor cells cannot be denied. This technique doesn't use vaginal manipulators or Myoma screws throughout the surgery. The laparoscopic nontraumatic grasper is inserted through the abdominal ports for retraction of the uterus.

Step 2: Cutting the round ligament, opening an anterior leaf of the broad ligament and identifying the ureter

The patient is placed in a steep Trendelenburg position to help the bowel fall out of the pelvis. The other hysterectomy procedures initiate the dissection either at utero-ovarian ligament or the infundibulopelvic ligament depending on whether the ovary is preserved or not. However, this technique starts the dissection at the round ligament on the left side of the patient. The assistant grasps at the isthmus of the uterus on the same side of the dissection and gives traction by pulling the uterus towards the right shoulder. The round ligament is cut with the help of the harmonic energy device, followed by spotting the anterior leaf of the broad ligament and cutting it down (Figure 1). A harmonic device is a preferred choice for cutting of the peritoneum. The next step is to identify the ureter. The most simple way to identify and spot the ureter is to look for the place where it crosses the common iliac artery dividing into the external and internal iliac artery. Once the ureter is spotted, dissection stops at the left side of the patient.

Step 3: Repeating steps on the opposite side

The above-mentioned step 2 is repeated on the right side. Holding at the isthmus of the uterus on the right side, traction is given towards the left shoulder in a similar manner. The round ligament is cut with the help of the harmonic energy device. Later, the anterior leaf of the broad ligament is cut. After identification of ureter on the right side, it is lateralized. The dissection stops on the right side of the patient with the identification of the ureter.

Step 4: Opening the vesicouterine fold and entering into retrovesical space

Traction is given on the uterus cranially by holding the uterus at the isthmus by both sides of the uterus (Figure 2). After visualization and lifting of the vesicouterine peritoneal fold, it is cut with the harmonic scalpel. The important step is to create a plane between the bladder anteriorly and the cervix/vagina posteriorly with the help of monopolar cautery. There is loose areolar tissue present between the bladder anteriorly and cervix/vagina posteriorly. Staying in this plane is very crucial in order to avoid injury to the bladder. Further, this position doesn't facilitate bleeding to occur. Another point to remember is that any fat reposition present belongs to the bladder and it must always be kept with the bladder. If one is dissecting between the fat, he/she is in the wrong plane. One needs to move one plane posteriorly and always keep fat with the bladder. Distal dissection is performed at a minimum of 2 cm distal to the cervix.

Step 5: Opening the posterior leaf of broad ligament on both sides

Dissection is started on the left side of the patient. Retracting the uterus anteriorly and rectum on the right side, the posterior leaf of the broad ligament on the left side is made taut to see the uterosacral ligament. The uterosacral ligament is lifted and cut down after visualizing it close to the rectum (Figure 3). Continuing in the same plane, the posterior leaf of the broad ligament is spotted and cut down. At this junction, it's very important to visualize the ureter from behind. The important dictum to be followed at this step is not to cut the posterior leaf of the peritoneum without seeing the ureter. Once the ureter is seen, it is lateralized before cutting the posterior leaf of the broad ligament. These steps of lateralization of the ureter should be repeated again and again before cutting the posterior leaf of the broad ligament. The ureter should be identified and kept in view throughout this step of the hysterectomy procedure. The dissection must be stopped when one reached the pouch of Douglas.

The same steps mentioned above are repeated on the right side. Retracting uterus anteriorly and rectum on the left side, a posterior leaf of broad ligament on the right side is cut down and ureter is spotted. As mentioned above, the steps such as the lateralizing right ureter and cutting the posterior leaf of the broad ligament should be kept on repeating until the pouch of Douglas appears.

Step 6: Opening the rectouterine pouch and entering into rectovaginal space

This step needs the assistant to change the direction of traction on the uterus and rectum once the posterior leaf of the broad ligament was cut on both sides. The uterus is retracted anteriorly and the rectum is retracted cranially making the pouch of Douglas visible. The rectouterine folds of the peritoneum are cut down. Later, the entry into rectovaginal space is made (Figure 4). There is loose areolar tissue present between the cervix/vagina anteriorly and the rectum posteriorly. The fat here belongs to the rectum as seen previously in the case of fat that belonged to the bladder. The fat should be kept along with the rectum and should move one plane anteriorly, in case if fat is present. Distal dissection is performed for a minimum of 2 cm distal to the end of the cervix.

Step 7: Coagulation and cutting the uterine vessels

The specimen is completely held on only uterine and ovarian vessels. With all previous surgical steps, the uterine vessels are completely skeletonized, which is the main advantage of this technique. Now with the help of the vessel sealer, uterine vessels are coagulated and cut on the right side. Lateralizing the ureter before cutting uterine vessels helped in reducing the risk to the ureter. Thus, the lateralization of the ureter is always recommended before taking uterine vessels. Repeating the same on the left side, uterine vessels are coagulated and cut. When the bubbling stops, it indicates the complete coagulation of the vessels with the tissue sealer, following which the vessels need to be carved.

Step 8: Keeping gauze into the vagina to give vaginal cut

To maintain pneumoperitoneum and prevent gas leaking out of the abdomen, the gauze piece needs to be packed in the vagina from the perineum. The para-vaginal tissue should be cleared before giving the vaginal cut. Para-vaginal tissue is coagulated and cut with the help of energy devices. The point of the transection of the vagina is confirmed by palpating the vagina with one instrument anterior and one instrument posterior to the vagina (Figure 5). After confirming a minimum of 1 cm of vagina length is included in the specimen, a monopolar instrument can be used to facilitate the vaginal cut. Alternatively, the vagina can also be cut with the help of a harmonic energy device. Any bleeding from the cut end of the vagina can be controlled with the help of a bipolar instrument.

Step 9: Coagulation and cutting the ovarian vessels and delivering specimen through the vagina

Currently, the specimen is only hanging on the infundibulopelvic ligament. The reason this ligament isn't cut initially is to prevent rotation of the uterus. As

this technique is not using any manipulator or Myoma screws, it is important to maintain anatomical orientation intact.

Depending on whether ovaries are conserved or not, the utero-ovarian ligament or the infundibulopelvic ligament is divided. In this present case, the ovary is removed and with the help of vessel sealer, infundibulopelvic ligament containing ovarian vessel is coagulated and cut. It is crucial to make sure the removal of the complete fallopian tube is taken place along with the specimen. Incomplete elimination of fallopian tube residuals may increase the chances of relapse of malignancy. Once ovarian vessels of both sides are cut, the assistant sitting between the legs removes the specimen through the vagina. The position of the patient in this technique aids in retrieving the specimen without the need to change the position of the patient or drapes.

Step 10: The closing of the vagina, followed by hemostasis and closure of ports

Many surgeons favored a vaginal approach to suture the vaginal cuff due to their expertise and comfort in vaginal suturing or/and lack of training for intracorporeal suturing. However, this technique uses the intracorporeal technique to close the vagina. Closure of the vagina begins at the right angle of the vaginal cuff. 3-0 vicryl suture with a round body needle is used to close the vagina. Suturing is done in a continuing interlocking running fashion. In the end, the suture is secured by an intracorporeal square knot. The needle is removed through a 10 mm port. The pelvis is thoroughly irrigated with normal saline. Hemostasis is performed and rechecked as perfect hemostasis is a must before closing ports. Any bleeding points if found are controlled with the help of bipolar cautery. Ports are closed in the end. 10 mm port is closed with the help of a port closure instrument. The 5 mm port doesn't require rectus sheath closure; skin closure is enough. The skin is closed with the help of skin staplers.

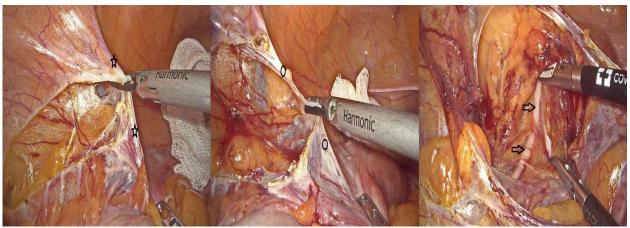


Figure 1: Cutting down the round ligament and broad ligament on the left side with harmonic energy device and identifying ureter (star point's round ligament, circle points anterior leaf of broad ligament, arrow points towards left ureter).

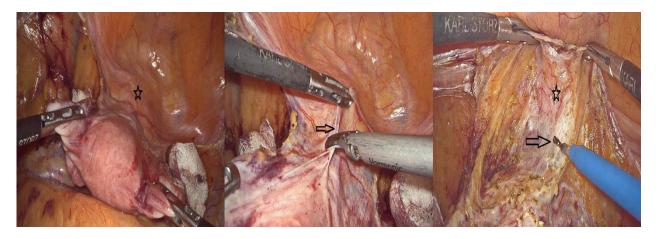


Figure 2: Giving the traction on the uterus cranially, cutting the vesicouterine fold and creating a plane between the bladder anteriorly and the cervix/vagina posteriorly (star points bladder, arrow points avascular plane between bladder and cervix/vagina).

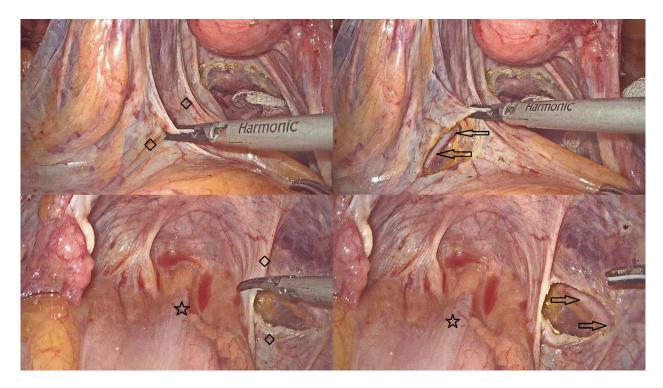


Figure 3: Cutting the uterosacral ligament and identifying the ureter (diamond points posterior leaf of broad ligament, star points rectum, arrow points towards ureter).

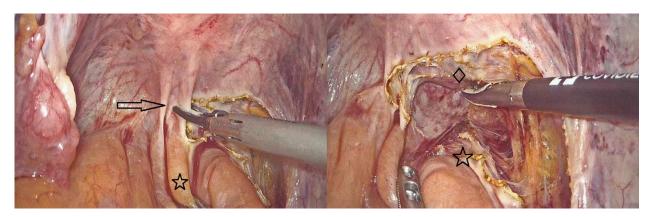


Figure 4: Entry into rectovaginal space by cutting the rectouterine folds and dissecting into between cervix and rectum for 2 cm distal to end of the cervix (arrow points at the rectouterine fold, star points rectum, diamond points cervix).



Figure 5: Paracolpos is coagulated, assessing the vaginal margin and cutting vagina after getting enough length of the vagina (star points vagina, diamond points bladder, arrow points Paracolpos).

Post-operative management

Return to normal activities

The systemic review and meta-analysis of different randomized trials performed in hysterectomy procedures claimed that patients in both vaginal and laparoscopic hysterectomy returned to normal activities sooner than abdominal hysterectomy.³

Operating time

This technique has been put forward in various seminars and surgeons have used this technique in their practice. They had given the feedback stating that the learning curve of Goel's technique is around 3 cases and the average operation time is two and a half hours. Johnson et al in their meta-analysis had reported that abdominal and vaginal hysterectomies had shorter operating time than laparoscopic hysterectomies.³

Hospital stay

The same meta-analysis claimed that the hospital stay was significantly shorter for women who have had vaginal and laparoscopic hysterectomy compared with abdominal hysterectomy.³

Post-operative complications

This technique is easy to learn and can reduce the complication rate to a minimum with proper care and expertise. The long term morbidity data of post-operative complications is in process and will be published once complete data is collected, treated and analyzed. However, the literature claimed that the overall complication rates for laparoscopic hysterectomy vary from 5 to 14 percent. Data from the large systematic review reported the incidence of the urinary tract, bowel and other complications after laparoscopic hysterectomy. Bowel injury incidence is quite low and found in the range of 0.34 to 0.45 percent.

Limitations

The limitation of this technique is that the uterus size required is less than or equal to 12 cm. Uterus more than 12 cm can't be operated on with this technique due to lack of use of vaginal manipulators or Myoma screws. This method of hysterectomy relies on the retraction of the uterus with an atraumatic grasper for hysterectomy, the large uterus makes it difficult to give traction.

CONCLUSION

This technique comprising of 10 steps is not the only technique of performing a laparoscopic hysterectomy. However, the sequence of the steps and the distinct way it is carried out without the use of vaginal manipulators or

Myoma screws make this technique unique. This technique has been standardized to decrease the complication rate to a minimum. The main quality of this technique is the emphasis given on the identification of the anatomical parts. No structures are amputated till proper identification of them. The technique dwells on the separation of the ureter, bladder, rectum in the safe plane before performing a hysterectomy. The safety perspective is very well taken care off in this technique.

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