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Review Article

The treatment for closure of the bladder neck via transvaginal approach

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ABSTRACT

Urinary incontinence is described as the involuntary loss of urine due to an increase in intra-abdominal pressure combined with a lack of contraction of the detrusor muscle. The most common being stress incontinence, as it occurs in 30% of women between 30 and 60 years old. There is another condition called hidden stress incontinence as a result of a coiling of the urethra that causes obstruction in its lumen. This can manifest itself when performing any activity that involves effort, such as coughing or sneezing. Nowadays there are numerous surgical interventions for the treatment of these pathologies, so there is a discrepancy in the choice of the appropriate surgical technique to correct these conditions in isolation.

Keywords: Transvaginal, procedure, Plication, Comparison

INTRODUCTION

The anatomy of the pelvic floor in women has been divided into three large groups: the anterior part, which consists of the bladder and urethra, approximately 4 cm long; the middle part, which consists of the vagina (which in turn has multiple layers of muscle as well as various fascia) and uterus; the posterior part that includes the rectum, sphincter apparatus, and anus. It has a set of striated muscles of voluntary control with a support function for the organs during standing or during the variation of intra-abdominal pressure in the cephalocaudal direction, weakening the muscles and fascia of the pelvic floor resulting in the protrusion of structures of the anterior vaginal wall.[1]

The main anatomical structures of the pelvic floor are: the pelvic diaphragm constituted by the levator ani muscle in conjunction with the coccygeus that receives innervation given by the sacral plexus, branches of the perineal, inferior rectal, and coccygeal nerves, respectively.[2]

In 15-80% of women with alterations in pelvic floor function, urinary incontinence (UI) and pelvic organ prolapse (POP) can be found simultaneously.[3] POP is an anatomical alteration that is reflected in the symptoms that women present, such as the sensation of a lump in the vagina, which is generated by a cystocele, the most common condition in pelvic organ prolapse.[4]

There are various factors that cause this pathology, such as advanced age, increased body mass index, previous hysterectomy, and multiparity.[5] During childbirth, an injury can occur to the pudendal nerve, resulting in its denervation and atrophy, as well as the descent of the pelvic floor mainly in the anterior and middle part.[2]

Urinary incontinence is described as the involuntary loss of urine due to an increase in intra-abdominal pressure combined with a lack of contraction of the detrusor muscle. The most common being stress incontinence, as it occurs in 30% of women between 30 and 60 years old.[6] There is another condition called hidden stress

incontinence as a result of a coiling of the urethra that causes obstruction in its lumen.[6] This can manifest itself when performing any activity that involves effort, such as coughing or sneezing.[7]

Currently, the incidence of uterine prolapse and urinary incontinence in the female population grows as life expectancy increases. Although this issue is not life-threatening, it does have considerable repercussions on the quality of life of women who suffer from it.[3]

Nowadays there are numerous surgical interventions for the treatment of these pathologies, so there is a discrepancy in the choice of the appropriate surgical technique to correct these conditions in isolation.

As mentioned above, POP and urinary incontinence are frequently related, so it would be essential to find a surgical method capable of correcting both; however, at present, this has not been achieved.[3] Anterior colporrhaphy with Kelly plication has been one of the methods most used by surgeons to treat them.

The objective of this study was to review the Kelly-Kennedy surgical technique, and its subsequent comparison with the methods of Burch, Raz, Bologna, TOT, modified MMK, TVT-O for the treatment of urinary incontinence related to the pelvic organ prolapse.

BACKGROUND

Description of the surgical technique for transvaginal bladder neck closure

In 1914, Howard Kelly, a gynecologist at John Hopkins Medical School, used the incandescent light cystoscope to describe characteristics of female urinary incontinence, which led to the proposal of his plication techniques. Kelly obtained a hypothesis that incontinence is caused by the loss of elasticity of the urethra and the bladder sphincter, leading to incontinence.[8] In 1914, Kelly's plication plasty debuted, which was based on his theories of incontinence. Kelly plication consists of imbricating the ureteropelvic fascia and the anterior vaginal wall to restore support to the floor of the urethra and bladder neck. Then, in 1941, Kennedy, another gynecologist, modified the plication consisting of the pubocervical fascia to restore the position of the bladder by assuming that the fibers of the levator ani coalesce behind the urethra. Both procedures were known as (Kelly-Kennedy).[8]

In 1923, a theory was described in which an English gynecologist, Dr. Victor Bonney, contradicted Kelly's work by reporting that incontinence occurs when the patient generates some effort, which leads to an increase in pressure. In 1940, Barnes' theory was introduced, which guided the use of manometry to study urethral function. He suggested that incontinence is the result of an increase in urinary expulsive forces of intravesical pressure, which contains a decrease in the power of resistance at the level of the urethral sphincter. Furthermore, Barnes postulated a diagnostic modality that includes manometry and chain cystography.[9]

Surgical treatment is indicated when the severity of the symptoms presented, as well as the age of the patient, the general and current condition of the patient, the type of prolapse, time of evolution, and even the experience of the surgeon require it. It is estimated that 30% of all women who have had surgery for prolapse, incontinence, or both, have the surgery repeated more than once. Several surgical techniques have been discovered to try to correct urinary incontinence, whether stress or stress in women[9]. The surgical process that proceeds to failed surgery must have a greater degree of preoperative diagnostic precision in terms of the choice of the surgical technique to be used.[10]

Among the various techniques used to correct stress urinary incontinence, the Kelly-Kennedy begins with the anterior vaginal repair with plication below the urethrovesical angle, which passes through the periurethral fascia and is finally inserted on the posterior surface of the pubic symphysis, authorizing the formation of scar tissue that supports the angle, returning it to its place, and correcting stress urinary incontinence. As time went by, the technique was modified, and the point was inserted in the subperiosteal area of the lower pubic rami. This type of surgery is indicated when there is a central aponeurotic defect and has a secondary effect in the prevention of stress urinary incontinence in patients who underwent surgery for pelvic organ prolapse.[10]

Correction of the existing prolapse was performed by either anterior-posterior colporrhaphy or vaginal hysterectomy. If a cystocele is found, a clamped Foley catheter is placed, and a longitudinal dissection of the anterior vaginal mucosa is performed, which is done with scissors and in a blunt manner. This cut is made 1 cm from the external urethral meatus and cervicovaginal fold, with the purpose of separating the vaginal mucosa from Halban's fascia, freeing the mucosa of the bladder floor and urethra. The dissection is performed when the bladder is full, causing a separation of the pubovesicocervical fascia on both sides of the midline until the lower branches of the pubis appear free of areolar tissue. This surgery is similar to the technique of Kelly-Kennedy but has a higher dissection, in which a 1-silk suture is placed. The suture is passed from the right side to the left side, raising the urethrovesical angle to a high retropubic hold. The knot is tied differently to ensure that the urethra is not occluded.[10]

The Bologna intervention or the Raz technique is used more frequently by surgeons in surgical processes to correct urinary incontinence associated with cystocele. The choice of the surgical technique between these two interventions is based on the main factor, which is the degree of anterior colpocele and the available amount of vaginal tissue, which allows or does not allow vaginal girths or tapes to be made, as in the Bologna technique. This factor is not necessary for the choice of the Raz

technique since this technique is used more frequently in women without cystocele.[10]

In the Bologna technique, there is a suspension of the bladder neck in the aponeurosis using pedicled vaginal tapes. The patient is asked to assume a gynecological position, with the thighs hyperflexed and open enough to offer good exposure to the perineum. It consists of individualizing 2 vaginal bands and directing them to the Retzius space, securing them to the anterior wall of the abdomen. The cervix is pulled using Pozzi forceps, achieving tension in the vagina that covers the cervix, located on its anterior surface. An anterior semicircular incision is made in the neck with a scalpel.[9]

The resulting anterior wall of the vagina is then made into a vertical incision along its entire length. This incision stops at the transverse vaginal stria, located in the bladder neck. The Raz technique is performed in a mixed surgical position, the same as used in Bologna surgery. In this technique, the procedure involves a double anterior colpotomy, located 2 cm below the urethral meatus. This perforation allows entry into the retropubic space and also isolates the different parts of the bladder neck. To begin the procedure, a braided thread is used, which is not absorbable, with a needle to grasp the pubourethral ligaments, pericervical fascia, and deep fascia of the vaginal wall. To finish the procedure, the two vaginal incisions are sutured with absorbable thread. In addition to the retropubic abdominal incision, to allow the threads from the vaginal space to emerge through the abdominal aponeurosis.[10]

Comparison and follow-up studies

In a randomized clinical trial conducted by Samira Sohbati and collaborators in 2015, the results (at one, six, and twelve months) were compared between anterior colporrhaphy with Kelly plication and the transobturator tape (TOT) procedure. 60 patients with UI (refractory to conventional treatment) were included and randomly divided into two homogeneous groups of 30 patients. The first group underwent surgery with anterior colporrhaphy (using Kelly plication) and the second group with TOT. The analysis of the results reported that one month after surgery there were no differences between the two groups. However, after six months, relapses were reported despite the intervention in one patient in each group. Subsequently, the cases of failure increased to 5 patients in each group, so there were no disparities between both groups. After one year, no statistically relevant differences were reported between the two groups, and therefore it is considered that both surgical methods have the same therapeutic results. However, it was found that the time of surgery and the use of Foley catheter after this were minor in the TOT group. The rate of success, although not significant, was greater in patients treated with TOT than in those treated by anterior colporrhaphy with Kelly plication.[7]

In a comparative study carried out by Azab and collaborators in 2009, the Kelly Kennedy plication and the vaginal tension-free tape on the obturator (TVT-O) were compared. This study was carried out through a randomized trial in a university hospital. 110 patients, of whom only 91 were candidates for surgery, were counseled before and after the operation at intervals of 6 weeks, 6 months, and 12 months. The objective points to perform this procedure were through the cough test, while to assess the subjective data, two questionnaires were carried out, urogenital distress inventory (UDI6) and incontinence impact questionnaire (IIQ7), pre and post-surgery. There was no significant difference in the results of this study regarding the type of anesthesia and complications within the surgery. Kelly Kennedy plication had a significantly shorter time compared to TVT-O. It was concluded that both procedures have the same healing efficacy.[11]

Similarly, in a comparison between MMK surgery versus Kelly surgery at 5 years, 93 cases of patients who were operated on for incontinence were obtained. All patients were carefully chosen so that surgery could be performed. They were divided into three groups. The first was related to patients with a pelvic floor prolapse, the second group was related to patients who did not have a genital prolapse or a recent pelvic surgery, and the third group was analyzed for patients who had previously had a hysterectomy or benign pelvic pathology. Of the 19 patients who underwent MMK, 17 were cured, and 2 patients failed surgery. Of those who underwent the Kelly operation, there were 42 patients, of which 29 were cured, and 13 failed the surgery. Of the 13 patients whose Kelly surgery was not successful, 8 of them underwent MMK, with which 6 were cured, and surgery failed again in 2 patients.[12]

In another prospective study conducted by Tepe et al, the aim was to compare the effect of anterior hysterectomy associated with posterior colporrhaphy with Kelly plication (VH/KP) against anterior hysterectomy associated with posterior colporrhaphy with transobturator tape (VH/TOT). This analysis mainly focused on evaluating quality of life, incontinence symptoms, and sexual functions during the 6 months post-surgery in patients with POP and concomitant UTI. 50 patients who were previously treated using the aforementioned surgical techniques were selected and divided into two homogeneous groups of 25 patients each. The effectiveness of both surgeries was compared using the diaper test and various questionnaires related to UI symptoms and sexual function. The results in the 6 months after surgery did not indicate statistically significant dissimilarities in both groups in terms of UI symptoms or in the diaper test. However, the results obtained through the UI tests showed a greater degree of cure in favor of the group (VH/TOT). As far as sexual function is concerned, better postoperative results were found with posterior colporrhaphy with Kelly plication.[13]

According to research carried out by Sun and collaborators, published in 2015, with the purpose of comparing the treatment of prolapse of the anterior vaginal wall by mesh repair versus colporrhaphy. This study was carried out taking as a reference point 11 articles obtained from various databases (PubMed, Embase, and Cochrane Library), which included 1,455 patients. The points to be compared were: anatomical result, patient satisfaction, sexual function, manifestations presented during surgery, as well as complications (urinary incontinence, urinary retention, and difficulty emptying). The follow-up given to the patients in the analyzed articles was diverse (6, 12, 24, and 36 months), and the results showed that there was no significant difference between the complications that occurred in both groups of patients. On the other hand, it was shown that mesh correction surgery obtained better results in terms of anatomical results, lower possibility of failure, and relapses. It has been shown that despite being the best treatment method, there is a risk of mesh exposure. It is worth mentioning that among the patients in the study, the majority of them were asymptomatic before said event; however, the remaining minority presented a series of complications and a significant deterioration in the patient's life. It was concluded that mesh repair is a surgical procedure with greater benefits and fewer complications.[1]

On the other hand, work was carried out by Mathias and collaborators between 2015 and 2016 in the department of gynecology and obstetrics of the Lokmanya Tilak general hospital, Mumbai, India. The effectiveness of trans obturator tape versus Kelly repair in the treatment of female stress urinary incontinence was comparatively evaluated through a retrospective experimental study. A cohort of 60 patients in total was carried out, which was divided into two groups of 30 patients each, group one being the patients who received treatment with trans obturator tape and group two the Kelly repair. The following parameters were assessed: symptom correction, duration of surgery, blood loss, hospitalization time, sexual dysfunction, and complications during urination.

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There were no significant surgical complications, so both were considered to have a successful outcome; however, Kelly surgery showed a greater number of patients with persistence of symptoms and prolonged hospitalizations that were related to a significant number of comorbidities. Finally, it was noted that patients with TOT generally showed better postoperative results during the following 3 to 6 months during which they were followed up.[6]

According to the comparison by Curtis et al, pelvic organ prolapses after surgical treatment using mesh and anterior colporrhaphy. Using a database, the total number of women who experienced a recurrent cystocele after using either of the two repair methods was obtained. The result was established in the presence of prolapse symptoms, active sexual life pre and post-surgery, erosion, and whether they had undergone surgery to repair said erosion. Follow-up was over 6.5 years for 88 patients, 50 underwent mesh repair and 38 underwent colporrhaphy. It is worth mentioning that there were no complications during the procedure. 48 mesh patients were interviewed, 1 died of external causes, and 1 was lost to follow-up. Mesh erosion occurred in 5 patients (11.6%), 2 were treated with estrogen, one was cut, and 2 required surgical excision. 2 patients presented symptoms of prolapse recurrence, and 1 presented overactive bladder. Of the group of patients who experienced colporrhaphy, 25 were interviewed, 1 died from external causes. The recovery rate was 33% in mesh and 32% in colporrhaphy, mesh erosion was 11.6%, and 4% required surgery. 46% of women with mesh and 40% of women with colporrhaphy became sexually inactive. There is a lower recurrence of mesh repair, its benefits are underestimated.[14]

A review carried out by Stavros et al with the aim of presenting the advantages and disadvantages of the efficacy and safety of colporrhaphy for POP with non-absorbable synthetic mesh. Based on a study carried out by Cochrane in 2013. The study obtained data from 5 trials, of which 4 compared mesh and colporrhaphy. A multicenter randomized controlled double-blind study was found, in which mesh and colporrhaphy were compared, presenting 65 surgeries, 33 mesh and 32 colporrhaphy. The group of women who experienced the mesh obtained a percentage of 15.6 related to the exposure of the mesh; this percentage did not coincide with the expected safety. In a 12-month follow-up, more cases of recovery were reported with the use of mesh. However, 3 years later, a cure was again reported in patients, of which 85% corresponded to women under the mesh procedure and 71% colporrhaphy. Another multicenter randomized controlled study showed that complications and recurrence had a higher incidence in the colporrhaphy group in 83 of 168 patients evaluated, mesh recurrence was 16.9%. Through a randomized study of 70 patients with prolapse, mesh was used for 36 patients and colporrhaphy for 34. The follow-up was for 1 year, and the recurrence of prolapse was 3% (1 case) in the group of patients with mesh versus 65% (22 cases) in patients with colporrhaphy. A multicenter trial that included 184 patients with stage 3-4 prolapse, 94 of which underwent mesh surgical treatment and 90 of which underwent colporrhaphy, both of which were followed up for 1 year. The cure figures were subsequently shown: 86.4% in the mesh versus 79.4% in colporrhaphy.[15]

Regarding Rudnicki and collaborators, in 2015, they carried out a comparative study in which the cure rates and possible complications in anterior colporrhaphy were observed in relation to transvaginal mesh for prolapse of the anterior vaginal wall, in follow-up of 1 and 3 years through pre- and post-surgical questionnaires and verbal information. This study was carried out through a randomized controlled trial on 138 women over 55 years of age, of which 70 underwent mesh procedures and the remaining 68 underwent colporrhaphy. According to the

objective results in the mesh procedure, a cure rate was obtained in the first year of 88.1% and for the third year 91.4%, while in the colporrhaphy groups the first year was 39.9% and the third year 41.2% it was observed that the cervix continued to improve over time in both groups. The subjective results that were carried out through the use of questionnaires pelvic floor impact questionnaire (PFIQ-7) and pelvic floor distress inventory (PFDI-20) did not show any additional improvement in either group; however, the symptoms were observed more intense in the mesh procedure. Regarding the complications of the aforementioned procedure, 10 patients in the first year and 10 more for the third year suffered exposure of the vaginal mesh compared to colporrhaphy; only two people presented with uterine prolapse.[16]

According to the long-term follow-up, Montera and colleagues carried out a 10-year follow-up of 50 patients with stress urinary incontinence combined with cystocele who underwent surgery using anterior colporrhaphy in conjunction with tension-free vaginal tape. At 10 years, 43 patients returned to be evaluated using stress tests, diaper examinations, and questionnaires to assess symptoms. In the results obtained from the 10-year follow-up, 41 patients were reported cured of cystocele, and regarding urinary incontinence, different results were obtained, since only 39 patients were cured. On the other hand, 38 patients (89%) were cured of both pathologies. Regarding complications, 16 (37%) of the patients failed with the surgical treatment, due to the recurrence of incontinence symptoms, as well as bladder overactivity and dyspareunia in 3 (7%) patients. The percentage of patients who required surgical reintervention at 10 years was 12%.[3]

During 2016, Fairchild and collaborators conducted a study where they compared the rates for colpopexy and colporrhaphy at the time of hysterectomy for the treatment of pelvic organ prolapse. They indicate that pelvic organ prolapse is an indication for performing hysterectomy, and in the vast majority, this is done through a vaginal approach or assisted by laparoscopy. But it was observed that when the procedure was laparoscopic, there was an increase in the complication rate. Women over 75 years of age are more likely to have a colpopexy. Adding apical support points at the time of surgery has been shown to reduce the recurrence and recovery rate. However, colporrhaphy, whether anterior or posterior, is performed without prior colpopexy, and hysterectomy is often used in the treatment of organ prolapse. The sole treatment of hysterectomy for pelvic organ prolapse is contraindicated.[17]

Table 1: Comparison of different techniques for urinary incontinence.

Study	Comparative techniques	No. of patients	Time	Recurrence/ failure (%)	Healing (%)	Complications
Sohbati et al (JP2)[7]	Anterior colporrhaphy with Kelly plication	30	12 months	5 patients (16.5)	66.7	3 (10%) dyspareunia
	Transobturator tape (TOT)	30	12 months	5 patients (16.5)	80	3 (10%) vaginal perforation, 1 patient with dyspareunia
Azab et al (CA1)[3]	Kelly plicature	43	12 months	6 patients (14)	86	Hematoma in the wound
	TVT-O	48	12 months	4 patients (8.3)	91.7	Groin pain
Chawla et al[12]	MMK	19	--	2 patients (10.5)	90.1	-
	Kelly	42	--	13 patients (30.9)	69	-
Tepe et al[13]	Anterior hysterectomy associated with posterior colporrhaphy with Kelly plication (VH/KP)	25	6 months	4 patients (16)	64	
	Anterior hysterectomy annexed to posterior colporrhaphy with transobturator tape (VH/TOT)	25	6 months	2 patients (8)	68	Detrimental effects on sexual function, vaginal extrusion
Sun et al[1]	Repair with mesh	722	16.9 months	--	95	Mesh exposure, increased blood loss, and increased duration of surgery

Continued.

Study	Comparative techniques	No. of patients	Time	Recurrence/ failure (%)	Healing (%)	Complications
	Colporrhaphy	733	16.9 months	--	--	POP recurrence
Mathias et al[6]	Transshutter tape	30	12 months	1 patients (3.3)	29 patients (96.6)	Urinary retention and dyspareunia
	Kelly Repair	30	12 months	3 patients (10)	27 patients (90)	Urinary retention, dyspareunia and overactive bladder symptoms
Curtis et al[14]	Previous colporrhaphy	38	6.5 years	32	--	Sexual inactivity due to dyspareunia 40%
	Repair with mesh	50	6.5 years	33	--	Mesh erosion 11.6% (5), 4% required surgery for erosion, sexual inactivity 46%
Stavros et al[15]	Previous colporrhaphy	32	3 years	---	71 at 3 years	
	Previous colporrhaphy	33	3 years	15.6	85 at 3 years	Higher reoperation rate at 12 months
	Previous colporrhaphy	83	12 months	16.9		
	Previous colporrhaphy	85	12 months	39.4		
	Previous colporrhaphy	34	12 months	65		
	Mesh repair with sacrospinal fixation	36	12 months	3		Mesh exposure 8% (3 cases)
	Previous colporrhaphy	90	12 months	-	70.4	
	Repair with polypropylene mesh	94	12 months	Mesh exposure 20 (18 cases)	86.4	Mesh exposure 20% (18 cases)
Rudnicki et al[16]	Previous colporrhaphy	68	1 y 3 years	2 patients (2.9) at 3 years	39.9 in the first year. 41.2 in the third year	
	Mesh	70	1 y 3 years	10 (7) with mesh exposure in the first year, 10 (7) patients with mesh exposure in the third year	81.1 first year, third year 91.4	Incontinence in 3 patients
Total						
9	Kelly-Kennedy plicature/colporrhaphy	1248	20.4 months	22.68	69.78	Dyspareunia, wound hematoma, urinary retention, overactive bladder

DISCUSSION

Over time, the effectiveness of anterior colporrhaphy has been evaluated, based on the surgeon's perspective, and the point of view expressed by the patient has been downplayed. This was revealed in a study conducted by Kousgaard et al, with the purpose of emphasizing the expectations that patients have after a colporrhaphy operation for prolapse of the anterior vaginal wall. Currently, work has been done to find a specific method through which the patient can express his opinion about the treatment and specifically identify the results obtained. It is of great importance not to forget the personal objectives that the patient expects; These data are usually interesting since the person may sometimes have unrealistic expectations. The patients expressed some concern when carrying out physical activities, and trying to have intercourse for fear that the vaginal protrusion would occur again.[18]

In the article, Mercado, Medina, and Pacheco focus on a detailed description of the modified Kelly technique. It was found that the vaginal technique with the modified Kelly point was effective in correcting stress urinary incontinence, and although present postoperative complications, it was an effective long-term surgery.[10]

In this study, a comparison was made between the different surgical techniques for transvaginal bladder neck closure. The results obtained in 9 investigations indicated that in 1,248 patients who underwent Kelly reconstructive surgery, they had an average follow-up of 20.4 months in which the percentage of recurrence or failure was 22.68% and a cure percentage of 69.78%. During follow-up, the most common postsurgical disadvantages were dyspareunia, wound hematoma, urinary retention, and overactive bladder symptoms.

New technique for robot-assisted implantation of the AMS-800 artificial urinary sphincter (AUS) in women. The research reviewed the medical records of eight female patients who underwent robot-assisted AUS implantation through a posterior approach to the bladder neck. This approach aimed to prevent blind dissection and the risk of vaginal or bladder injury. After a median operating time of 244 minutes, no peri-operative vaginal or bladder injuries were observed. The AUSs were functional in all patients at a median follow-up of 12 months. The results indicated that 62.5% of patients required no protection, while 37.5% needed day protection. All patients reported satisfaction with the procedure, except for one who requested treatment for persistent urge incontinence. The study suggests that robot-assisted AUS implantation via the posterior approach is a simple, reproducible, and safe procedure with satisfactory short-term functional outcomes. These outcomes are comparable to those of an open approach. However, a more extended study is needed to confirm the long-term benefits compared to the anterior robot-assisted approach and classic open techniques. The authors disclosed potential conflicts of interest related to personal fees from various medical companies.[19]

CONCLUSION

In general terms, the transvaginal bladder neck surgery technique shows inferior postoperative results compared to other long-term techniques. However, its complication rate, when compared to other modalities, makes it a treatment that can yield positive outcomes in well-selected patients. We believe that future comparisons should be made with laparoscopic or robotic surgery.

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