Chapter 1

New Hysterectomy Techniques via NOTES

Jan Baekelandt* and Jan JA Bosteels¹²

¹Department of Gynecology, Imelda Hospital, Belgium
²CEBAM, Centre for Evidence-based Medicine, Cochrane Belgium, Academic Centre for General Practice, Belgium

*Corresponding Author: Jan Baekelandt, Department of Gynecology, AZ Imelda Hospital, Imeldalaan 9, 2820 Bonheiden, Belgium, Tel: +3215/50 61 89; Fax: +3215/50 59 29; Email: jan.baekelandt@imelda.be

First Published April 02, 2016

Copyright: © 2016 Jan Baekelandt and Jan JA Bosteels.

This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source.

This book chapter discusses four new hysterectomy techniques by pure transvaginal Natural Orifice Transluminal Endoscopic Surgery (vNOTES).

Introduction

Hysterectomy is the surgical removal of the uterus. Is it the most commonly performed major gynecologic surgical procedure in the United States of America, where more than 400,000 hysterectomies are performed annually [1]. The most common benign indications for a hysterectomy are: fibroids 30%, dysfunctional uterine bleeding (20%), endometriosis and/or adenomyosis (20%), genital prolapse (15%), chronic pelvic pain (10%) and endometrial hyperplasia (6%) [2].

Conrad Langenbeck performed the first reported elective hysterectomy in 1813 (Table 1) using a vaginal approach [3] and in 1863 the first elective abdominal (subtotal) hysterectomy was performed by Charles Clay [3]. Harry Reich performed the first laparoscopic-assisted vaginal hysterectomy in 1989 and the first total laparoscopic hysterectomy in 1993 [3].

Table 2 presents the different hysterectomy techniques. Traditionally a hysterectomy could be performed via these 3 approaches: abdominal hysterectomy (AH), vaginal hysterectomy (VH) and laparoscopic hysterectomy. The laparoscopic hysterectomy can be divided into 3 categories: Laparoscopic Assisted Vaginal Hysterectomy (LAVH), Laparoscopic Hysterectomy (LH) and Total Laparoscopic Hysterectomy (TLH). With the introduction of
surgical robots, hysterectomies can now also be performed robotically (RH). The technique of a RH is similar to that of a TLH, but robotic arms hold the surgical instruments and the surgeon manipulates them remotely from behind a console. Laparoscopic and robotic hysterectomies can both be performed through multiple small abdominal incisions or through one larger umbilical incision. More recently a new approach to hysterectomy via Natural Orifice Transluminal Endoscopic Surgery (NOTES) has been introduced (Table 2).

This book chapter will focus on the different hysterectomy techniques by NOTES, where the uterus is removed endoscopically leaving no visible scars.

Natural Orifice Transluminal Endoscopic Surgery

The advantages of laparoscopy over traditional laparotomy have been accepted worldwide for many years [4]. To further reduce surgical morbidity, the evolutionary trend has been towards even less invasive techniques, such as single-incision laparoscopic surgery (SILS) and natural orifice transluminal endoscopic surgery (NOTES). Minimally invasive surgery improves cosmetic outcome, and also reduces surgical injury, which in turn decreases the inflammatory and neuroendocrine responses, and leads to less postoperative pain and quicker recovery [5].

NOTES reaches the abdominal cavity by scar-free means. To this end, numerous surgical procedures are performed via a natural body orifice. In recent years this technique has gained popularity among general surgeons, gynecologists, urologists and gastroenterologists, and its feasibility and safety have been approved [6].

NOTES can be performed via a variety of approaches, including the stomach, esophagus, bladder and rectum, but the majority of NOTES procedures have been performed transvaginally, as the vagina provides direct access to the peritoneal cavity [7]. Culdotomy has been widely used for several surgical procedures, not only by gynecologists but also by general surgeons for extraction of large specimens, and has been approved as safe and easy to close [8].

In hybrid NOTES the surgical procedure is performed through a natural body orifice with transabdominal assistance. The term pure NOTES refers to procedures that involve only transluminal access.

Table 1: History of Hysterectomy Techniques.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Abbreviation</th>
<th>Year</th>
<th>Surgeon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaginal Hysterectomy</td>
<td>VH</td>
<td>1813</td>
<td>Conrad Langenbeck</td>
</tr>
<tr>
<td>Abdominal Hysterectomy (Subtotal)</td>
<td>AH</td>
<td>1963</td>
<td>Charles Clay</td>
</tr>
<tr>
<td>Laparoscopic-Assisted Vaginal Hysterectomy</td>
<td>LAH</td>
<td>1989</td>
<td>Harry Reich</td>
</tr>
<tr>
<td>Total Laparoscopic Hysterectomy</td>
<td>TLH</td>
<td>1992</td>
<td>Harry Reich</td>
</tr>
<tr>
<td>Robotic Hysterectomy</td>
<td>RH</td>
<td>2002</td>
<td>Concepcion Diaz-Arrastia</td>
</tr>
<tr>
<td>Vaginally Assisted NOTES Hysterectomy</td>
<td>V ANH</td>
<td>2012</td>
<td>Chyi-Long Lee</td>
</tr>
<tr>
<td>Total Vaginal NOTES Hysterectomy</td>
<td>TVNH</td>
<td>2014</td>
<td>Jan Baekelandt</td>
</tr>
<tr>
<td>Robotic Vaginally Assisted NOTES Hysterectomy</td>
<td>RVANH</td>
<td>2015</td>
<td>Jan Baekelandt</td>
</tr>
<tr>
<td>Robotic Total Vaginal NOTES Hysterectomy</td>
<td>RTVNH</td>
<td>2015</td>
<td>Jan Baekelandt</td>
</tr>
</tbody>
</table>
### Table 2: Types of Hysterectomy.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAH</td>
<td>Total Abdominal Hysterectomy</td>
<td>Total hysterectomy performed through a laparotomy under direct vision using conventional surgical instruments.</td>
</tr>
<tr>
<td>VH</td>
<td>Vaginal Hysterectomy</td>
<td>Total hysterectomy performed entirely through vaginal access under direct vision using conventional surgical instruments.</td>
</tr>
<tr>
<td>LASH</td>
<td>Laparoscopic Supracervical Hysterectomy</td>
<td>Subtotal Hysterectomy performed by transabdominal laparoscopy.</td>
</tr>
<tr>
<td>LAVH</td>
<td>Laparoscopic Assisted Vaginal Hysterectomy</td>
<td>Total hysterectomy where first the cranial part of the uterus is dissected via transabdominal laparoscopy and afterwards the caudal part of the uterus (including ligating the uterine vessels) is dissected under direct vision using conventional instruments.</td>
</tr>
<tr>
<td>LH</td>
<td>Laparoscopic Hysterectomy</td>
<td>Total hysterectomy where first the cranial part of the uterus is dissected via transabdominal laparoscopy (including ligating the uterine vessels) and afterwards part of the operation is performed vaginally under direct vision using conventional instruments.</td>
</tr>
<tr>
<td>TLH</td>
<td>Total Laparoscopic Hysterectomy</td>
<td>Total hysterectomy where the entire uterus is dissected via transabdominal laparoscopy.</td>
</tr>
<tr>
<td>RH</td>
<td>Robotic Hysterectomy</td>
<td>Total hysterectomy where the entire uterus is dissected transabdominally using a surgical robot.</td>
</tr>
<tr>
<td>VANH</td>
<td>Vaginally Assisted NOTES Hysterectomy</td>
<td>Total hysterectomy where first the caudal part of the uterus is dissected vaginally under direct vision and afterwards the rest of the hysterectomy is performed via transvaginal NOTES using an endoscopic camera and endoscopic instruments.</td>
</tr>
<tr>
<td>RVANH</td>
<td>Robotic Vaginally Assisted NOTES Hysterectomy</td>
<td>Total hysterectomy where first the caudal part of the uterus is dissected vaginally under direct vision and afterwards the rest of the hysterectomy is performed via transvaginal NOTES using a surgical robot.</td>
</tr>
<tr>
<td>TVNH</td>
<td>Total Vaginal NOTES Hysterectomy</td>
<td>Total hysterectomy where the entire uterus is dissected via transvaginal NOTES using an endoscopic camera and endoscopic instruments.</td>
</tr>
<tr>
<td>RTVNH</td>
<td>Robotic Total Vaginal NOTES Hysterectomy</td>
<td>Total hysterectomy where the entire uterus is dissected via transvaginal NOTES using a surgical robot.</td>
</tr>
</tbody>
</table>

Four new hysterectomy techniques by pure transvaginal NOTES (vNOTES) will now be discussed:

- **VANH**: Vaginally Assisted NOTES Hysterectomy
- **TVNH**: Total Vaginal NOTES Hysterectomy
- **RVANH**: Robotic Vaginal NOTES Hysterectomy
- **RTVNH**: Robotic Total Vaginal NOTES Hysterectomy

**Hysterectomy Techniques via vNOTES**

**VANH Technique**

A circular incision is made around the cervix using a cold knife. The Pouch of Douglas and then the vesicouterine peritoneum, are opened using cold scissors. Both uterosacral ligaments are transected using cold scissors and tied off using a Vicryl-1 suture. A NOTES port is inserted into the peritoneal cavity, and CO2 used to inflate it. An optic is inserted and the peritoneal cavity is inspected. The patient is now placed in the Trendelenburg position and the small intestine lifted out of the pelvis.

The ureter is identified, but not routinely dissected. The uterine artery is coagulated using a bipolar grasper.
and is transected. The ovarian artery and the meso of the Fallopian tube are coagulated using a bipolar grasper and transected. In patients requiring an adnexectomy, the infundibulopelvic ligament is coagulated using a bipolar grasper and is transected. Hemostasis is checked and the peritoneal cavity is rinsed. The NOTES port and the uterus are removed transvaginally and the pneumoperitoneum is deflated.

The colpotomy is closed using a resorbable suture.

Evidence

Seven studies, including 731 study participants, have been published on VANH (Table 3). These studies use different names to describe a similar procedure. None of the studies was a randomized controlled trial. One study was a preclinical study describing the technical feasibility of transvaginal NOTES hysterectomy on a female cadaver [9]. One study was a prospective cohort study [10], and two studies were retrospective comparative studies [11,12]. Three studies were case series [13-15].

The authors concluded that hysterectomy for the treatment of benign diseases can be feasibly carried out via transvaginal NOTES but prospective studies are needed to determine its full clinical application.

Table 3: Overview of vNOTES Hysterectomy Studies.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Study</th>
<th>N</th>
<th>Population</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>VANH</td>
<td>Chen 2012</td>
<td>8</td>
<td>female to male transsexuals</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Lee 2012</td>
<td>10</td>
<td>women with benign uterine disease</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Su 2012</td>
<td>16</td>
<td>women with benign uterine disease</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Lee 2014</td>
<td>137</td>
<td>women scheduled for laparoscopic hysterectomy</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Yang 2014</td>
<td>16</td>
<td>women with benign uterine disease</td>
<td>S2 LAHV</td>
</tr>
<tr>
<td></td>
<td>Wang 2015</td>
<td>147</td>
<td>women with benign uterine disease and no genital prolapse</td>
<td>365 LAHV</td>
</tr>
<tr>
<td>TVNH</td>
<td>Baekelandt 2015</td>
<td>10</td>
<td>5 nulliparous and 5 parous women</td>
<td>none</td>
</tr>
<tr>
<td></td>
<td>Atallah 2015</td>
<td>1</td>
<td>Female cadaver</td>
<td>none</td>
</tr>
<tr>
<td>RVANH</td>
<td>Baekelandt 2015</td>
<td>5</td>
<td>women with myomatous uterus</td>
<td>none</td>
</tr>
<tr>
<td>RTVNH</td>
<td>Baekelandt 2016</td>
<td>10</td>
<td>women with myomatous uterus or cervical dysplasia</td>
<td>10 RVANH</td>
</tr>
</tbody>
</table>

Conclusion

These preliminary studies demonstrate that VANH is feasible and that it can be used as an alternative for a total laparoscopic hysterectomy. There are no prospective randomized studies to further support the value of a VANH.

TVNH

Technique

A vNOTES port is inserted into the vagina, and CO2 is insufflated to create a pneumovagina. An optic is inserted into the pneumovagina. A circular incision is made around the cervix using a monopolar laparoscopic hook, and the Pouch of Douglas is opened using laparoscopic scissors. The vesico-uterine peritoneum is opened using laparoscopic scissors. Both uterosacral ligaments are coagulated using a laparoscopic bipolar grasper and transected. The patient is now placed in the Trendelenburg position and the small intestine is lifted out of the pelvis.
The ureter is identified, but not routinely dissected. It is only dissected if it cannot be identified transperitoneally. The uterine artery and the ovarian artery are coagulated using a bipolar grasper and transected. The meso of the Fallopian tube is coagulated using a bipolar grasper and is transected. In patients requiring an adnexectomy, the infundibulopelvic ligament is coagulated using a bipolar grasper and is transected. Hemostasis is checked and the peritoneal cavity is rinsed. The NOTES port and the uterus are removed trans-vaginally and the pneumoperitoneum is deflated.

The colpotomy is closed using a resorbable suture.

The major difference between TVNH and a VANH lies in the opening of the anterior and posterior peritoneum and the transection of the uterosacral ligaments. This is performed entirely endoscopically in the TVNH, whereas it is performed by classical vaginal surgery in a VANH (Table 3). The TVNH technique can therefore also be used in nulliparous patients, patients without uterine prolapse, and patients with a narrow vagina where classical vaginal surgery can be more challenging [10,16].

Evidence

One case series has been published describing that TVNH for benign uteri being successfully performed in ten patients, using only conventional, reusable laparoscopic instruments and a self-constructed NOTES port [17]. The procedures were completed within a reasonable operation time and without major complications, no conversion to laparotomy or standard laparoscopy was necessary. The study demonstrated that this technique can be used in parous and nulliparous women, provided that a different port is constructed to maintain a pneumovagina.

Conclusion

This case series demonstrates that TVNH is feasible and that it can be used as an alternative for a total laparoscopic hysterectomy, both in parous and nulliparous patients. There are currently no prospective randomized studies to further support the value of a TVNH.

RVANH

The first case report on transvaginal robotic surgery was presented by Dr Jan Baekelandt at the 7th Annual SERGS Meeting on Robotic Gynaecological Surgery in June 2015 [18]. From the first case series of 5 patients, a new technique of Robotic Vaginally Assisted NOTES hysterectomy (RVANH) was published [19].

Technique

A robotic VANH was performed. The patient was placed in the lithotomy position as for a classical vaginal hysterectomy. The circumcision of the cervix, the opening of the anterior and posterior peritoneum, and the tran-
section of both sacro-uterine ligaments was performed by classical vaginal surgery. A NOTES port was constructed by assembling a surgical glove, a wound protector, 4 Da Vinci 8mm trocars and 1 reusable 5mm trocar. The ring of the wound protector was then inserted transvaginally into the peritoneal cavity to create a pneumoperitoneum. A Da Vinci Xi surgical robot was side docked between the legs of the patient and three arms connected to the trocars in the gloveport. The fourth arm was not used. Using a 30° optic, a fenestrated bipolar grasper, and a vessel sealer, the hysterectomy was performed via transvaginal NOTES using the surgical robot. Subsequently a bilateral adnexectomy was performed using the same method. Once the hysterectomy and bilateral adnexectomy were completed, the robot and gloveport were removed. When the uterus was too large to extract in toto, it was manually morcelated so that it could be removed vaginally. The colpotomy was closed as in classical vaginal surgery. No abdominal incisions were made.

Evidence

One case series has been published [19]. It describes five case reports demonstrating that vaginal robotic surgery is possible and that it can be used to perform a hysterectomy. RVANH makes use of the advantages of robotic surgery to broaden the indications for vaginal hysterectomy and can help overcome its limitations, while the NOTES approach avoids abdominal wall wounds and trocar related complications. Further developments in robotic technology will help overcome the problem of robotic arm collision. Robotic hysterectomy via vaginal access is a novel approach that requires further validation. The extra cost and set up time of RVANH will also need to be assessed in comparison to the advantages it provides over a VANH or total laparoscopic hysterectomy.

Conclusion

This first case series demonstrates that RVANH is feasible and that it can be used as an alternative for a total laparoscopic hysterectomy [19]. There are currently no prospective randomized studies to further support the value of a RVANH.

RTVNH

The first cases of Robotic Total Vaginal NOTES Hysterectomy were performed by Dr Jan Baekelandt in 2015.

Technique

A NOTES port was constructed by assembling a surgical glove, a wound protector, 3 Da Vinci 8mm trocars and 1 reusable 5mm trocar. The ring of the wound protector was then inserted into the vagina to create a pneumovagina. A Da Vinci Xi surgical robot was side docked between the legs of the patient and three arms were connected to the trocars in the gloveport. The fourth arm was not used. Using a 30° optic, a fenestrated bipolar grasper, and monopolar scissors, the hysterectomy was performed via transvaginal NOTES using the surgical robot.
via transvaginal NOTES using the surgical robot. The Fallopian tubes were removed with the uterus. When indicated, the ovaries were removed as well. Once the hysterectomy was completed, the robot and gloveport were removed. When the uterus was too large to extract in toto, it was manually morcellated so that it could be removed vaginally. The colpotomy was closed as in classical vaginal surgery. No abdominal incisions were made.

Evidence

The first case series comparing 10 RTVNH with 10 RVANH has been accepted for publication [20].

Conclusion

This first case series demonstrates that Robotic vNOTES Hysterectomy is feasible and that it can be used as an alternative for a total laparoscopic hysterectomy, both in parous and nulliparous patients [20]. There are no prospective randomized studies to further support the value of a RVANH or RTVNH.

Discussion

Current Evidence

According to the Cochrane Database the preferred technique to perform a hysterectomy is via conventional vaginal surgery. When a vaginal hysterectomy is not possible, a laparoscopic hysterectomy may avoid the need for an abdominal hysterectomy [3]. Vaginal hysterectomy can be safely performed for large uteri [21] and in nulliparous women [22]. The risk of complications however is higher in nulliparous women [22]. The accessibility of the vaginal passage, disease confined to the uterus, and the surgeons experience are the major determining factors for the choice of route for hysterectomies [23]. In recent years, the incidence of robotic hysterectomy and laparoscopic hysterectomy has increased, whilst the incidence of vaginal and abdominal hysterectomy has decreased [24]. Conventional vaginal hysterectomy can be challenging in cases of enlarged uterus, undescensus, or because of restricted vaginal space in women who have never delivered [10]. Making use of the advantages of endoscopic surgery vNOTES hysterectomy broadens the indications for vaginal hysterectomy and helps overcome its limitations, while the NOTES approach avoids abdominal wall wounds and trocar related complications.

When compared to classical vaginal hysterectomy, vNOTES hysterectomy offers good endoscopic visibility to operate, and perform haemostasis. Using the enlarged endoscopic view, the surgeon can operate accurately using endoscopic instruments, whereas in some conditions in conventional vaginal hysterectomy, certain steps can only be achieved by palpation [10]. In addition, adnexal procedures in conventional vaginal surgery can be difficult due to limited accessibility in the restricted space [10]. Salpingectomy, oophorectomy, ovarian cystectomy,
or adhesiolysis can be performed via the same NOTES approach during a vNOTES Hysterectomy [25,26]. Due to the pneumovagina, TVNH and RTVNH can be performed in nulliparous women, whereas a narrow vaginal access can make a classical vaginal hysterectomy more challenging [10,22,23].

It has been demonstrated that very large uteri can be removed via VANH, and that ligating the uterine vessels transvaginally before dissecting the rest of the uterus, results in less blood loss compared to a transabdominal laparoscopic approach, where there is more manipulation before occlusion of the feeding vessels [10,15].

When compared to laparoscopic hysterectomy, vNOTES hysterectomies offer the advantage of no visible scarring. In addition, in patients with previous abdominal surgery, there is no need to perform adhesiolysis to gain access to the pelvis in order to perform the hysterectomy via vNOTES approach, contrary to a laparoscopic approach.

vNOTES hysterectomy (TVNH and VANH) can provide surgeons with the comfort of operating under good endoscopic vision but via vaginal access without increasing the invasiveness of the procedure by making abdominal incisions. In addition, RTVNH and RVANH offer the extra advantages of robotic surgery including better ergonomics, better camera control and articulated wrist motion. However, these advantages need to be weighed against the longer operating time and higher cost. Further technical innovations in surgical robots will help overcome the problem of robotic arm collision and will therefore reduce the time of surgery.

Failure of VANH is almost always due to impedance of the transvaginal colpotomy [10]. When compared to VANH, TVNH enables the surgeon to perform the colpotomy endoscopically instead of via classical vaginal surgery. This provides better visualization and, as in laparoscopic surgery, the CO2 pressure helps identify and dissect the surgical planes. This enables easy performance of the anterior and posterior colpotomy in patients who had not delivered vaginally and in patients with previous cesarean sections.

Less post-operative pain and a quicker recovery are also potential advantages of vNOTES. The inability, during vNOTES, to overview the pelvic area, in particular the vesico-uterine pouch, is a major limitation that could lead to lesions, such as bladder endometriosis, being missed. Innovation of endoscopes is desirable to overcome this limitation and to have the ability with NOTES to explore the entire abdominal cavity [26].

One could argue the possibility of pelvic infection after vaginal surgery, however none of the patients presented with this complication after TVNH, RVANH or RTVNH procedure. Previous studies have also shown that post-operative pelvic infection is unlikely to happen par-
particularly when prophylactic antibiotics are administered [10,27]. As the vaginal vault is closed in the same way as in a classical vaginal hysterectomy, no differences in incidence of dyspareunia are to be expected. As was the case for our study protocol, sexual abstinence should be recommended for six to eight weeks, as is the recommendation for conventional transvaginal surgery [10].

A surgeon who wants to perform vNOTES hysterectomy should be confident in both classical vaginal hysterectomy and total laparoscopic hysterectomy (TLH). Being experienced in single incision laparoscopic surgery TLH and vNOTES for adnexal surgery certainly helps to keep the learning curve short. In addition, to perform RVANH and RTVNH, the surgeon also needs to be experienced in robotic surgery as the robotic setup for RVANH and RTVNH is complex. In our experience introduction of NOTES into the hysterectomy armamentarium did not influence the percentage of hysterectomies performed by classical vaginal hysterectomy, but reduced the percentage of TLH in favor of the less invasive NOTES approach.

VANH, TVNH, RVANH and RTVNH are novel approaches that require further validation. Their safety and complication risk have not been compared with laparoscopic hysterectomies in randomized controlled trials. The small case series that have been published indicate that the techniques are safe in the hands of the few experts that perform these procedures and that they may have the abovementioned advantages over laparoscopic hysterectomies.

Future Evidence
HALON Trial

The HALON (Hysterectomy by transabdominal Laparoscopy Or NOTES) is the first prospective randomized controlled trial to compare vNOTES hysterectomy with Total Laparoscopic Hysterectomy. The trial is currently underway and the results are expected to be published in 2017.

The study protocol has been registered with the National Institutes of Health and can be found at ClinicalTrials.gov ID:NCT02631837

Brief Summary of the Study Protocol
Objective

To compare vNOTES (vaginal Natural Orifice Transluminal Endoscopic Surgery) and established total laparoscopic hysterectomy for successful removal of the uterus for benign gynecological pathology.

Study design

Randomized controlled/single center/single-blinded/parallel-group/noninferiority/efficacy trial.

Study population

All women aged 18 to 70 years regardless of parity with a benign indication for hysterectomy.
Randomization

Women will be randomly allocated, immediately before surgery, to undergo one of two techniques for removal of the uterus by using a computer generated randomization list. Stratified randomization will be used according to the estimated uterine size on clinical examination.

Intervention

Women will be treated by a surgeon who is not blinded to the treatment allocation and who is equally skilled in performing both techniques. In the intervention group a vNOTES technique will be used.

Control

In the control group surgery will be done by a classical laparoscopic technique.

Main study parameters/endpoints

Primary study outcome parameters

successful removal of the womb with the intended approach without conversion to an alternative approach.

Secondary outcomes

The proportion of women discharged the same day, based on their own preference; postoperative pain scores using a VAS (Visual Analogue Scale) measured between days 1-7 by the participating women following surgery and the total amount of analgesics used as described in the standardized pain treatment protocol from days 1-7; postoperative infection defined by lower abdominal pain with fever > 38°C and positive clinical signs or laboratory findings; pre- or postoperative complications according to the Clavien-Dindo classification detected during the first six weeks of surgery; hospital readmission within 6 weeks following surgery; duration of the surgical procedure; incidence and intensity of dyspareunia recorded by the participants at 3 and 6 months by self-reporting using a simple questionnaire and VAS (Visual Analogue Scale); sexual wellbeing recorded by the participants at 3 and 6 months by SSFS (Short Sexual Functioning Scale); direct costs up to 6 weeks after the hysterectomy associated with both procedures.

Conclusion

Hysterectomy has traditionally been performed by laparotomy or by conventional vaginal surgery. At the end of the 1980's and during the 1990's the first major paradigm shift occurred with the introduction of the laparoscopic hysterectomy. Hysterectomies could be performed through several small incisions, instead of through one large incision, using a camera that offered superior visualization, and long fine instruments. This less invasive approach allowed quicker recovery and a cosmetically more appealing result. After a period of skepticism, it has now become commonplace in most gynaecology departments.

According to the pioneers and early adopters, vNOTES hysterectomy is now the next paradigm shift.
After a period of research, it has become a realistic alternative for an abdominal and laparoscopic hysterectomy. Besides the obvious aesthetic advantage of not creating any visible scars while maintaining superior endoscopic visualization, other potential advantages include less surgical wound infection, fewer abdominal wall hernias and less abdominal wall pain, all leading to a quicker recovery and shorter hospitalization.

At the moment only case series have been published on vNOTES hysterectomy, demonstrating its feasibility and safety in the hands of expert surgeons. There are no results of randomized controlled trials to support the advantages of vNOTES hysterectomy. The results of the HALON trial and other randomized controlled trials need to be awaited to validate the value of vNOTES hysterectomy compared to laparoscopic hysterectomy.

References


scopically assisted vaginal and abdominal hysterectomy for uterine myoma larger than 6cm in diameter or uterus weighing at least 450g. Acta-ObstetGynecol Scand. 2002; 81: 1132-1138.


