

Feasibility of hysteroscopic endometrial polypectomy using a new dual wavelengths laser system (DWLS): preliminary results of a pilot study

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Abstract

Purpose Currently, endometrial polyps may be successfully treated in an outpatient setting with 5 Fr mechanical and bipolar instruments. Our aim is to evaluate the benefits of minimally invasive techniques in hysteroscopy, focusing on the use of a new dual wavelengths laser system in the treatment of endometrial polyps in an outpatient setting.

Methods Between September 2012 and December 2014, all consecutive patients of reproductive and menopausal age with ultrasound diagnosis of endometrial polyp with maximum diameter ≤ 2.5 cm were eligible to participate in a prospective study. They underwent a hysteroscopic procedure with excision of the polyp using a new dual wavelengths laser system. All procedures were performed on an outpatient basis without anesthesia.

Results Laser polypectomy was successfully performed in 219 out of 225 (97.3%). Success of surgery was not influenced by the initial location of polyp. No main complications were reported during or immediately after the

procedure. 6 and 12 months follow-up with ultrasound scan did not show any persistence or recurrence of the pathology.

Conclusions Our preliminary findings seem to support the safety and the effectiveness of the laser hysteroscopic endometrial polypectomy. However, further studies are mandatory to validate its use in daily hysteroscopic practice.

Keywords Endometrial polyp · Office hysteroscopy · Diode · Dual wavelengths laser system (DWLS)

Introduction

Endometrial polyps are a common gynecological disorder, clinically characterized by abnormal uterine bleeding, infertility and related to pre-malignant and malignant lesions [1–3]. The incidence reported in the literature is estimated to be 24% [4]. Despite their frequency in clinical practice, many aspects about their origin (inflammatory, disendocrine, genetic, iatrogenic), the prognostic significance and the opportunity to remove it are not well known [5, 6]. The risk of malignancy of polyps in asymptomatic patients can vary from 0.1 to 3% [7, 8]. Hysteroscopy is the gold standard technique for diagnosis and treatment of endometrial polyps in an office-based setting, without patient discomfort [9, 10]. In recent years, we have largely used the bipolar energy for resection of polyps. These procedures are associated with a lower surgical risk due to their realization without anesthesia [11, 12]. Moreover, advances made by gynaecologists in the field of operative hysteroscopy have developed a great interest in the use of surgical lasers. Many lasers have been used over time (Argon, CO₂, Yag, KTP and others) [13, 14]. Recently, the

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diode lasers have been widely used in medicine and a great variety of the semiconductors propelled the invention of different diode lasers. The currently available 980 + 1470 nm diode laser has been used recently in laparoscopic surgery with many advantages as previously described [15–17]. A diode is an electronic laser incorporating an optical gain medium in a resonant optical cavity [18]. A system controlled by a microprocessor regulates the electrical current flow through the diode generating the laser beam. This beam is then passed through an optical system to an optical fiber, which is the medium through which light reaches the surgical site. The aim of the study was to evaluate the feasibility and effectiveness of hysteroscopic endometrial polypectomy using a new dual wavelengths laser system (DWLS).

Materials and methods

In this prospective study we enrolled 300 women, aged 26–85 years, with ultrasound diagnosis of endometrial polyp with maximum diameter ≤ 2.5 , in two University Hospitals (Cagliari and Foggia) from September 2012 to December 2014. Demographic characteristics of patients are shown in Table 1. The patients came to our centers for abnormal uterine bleeding, evaluation for hormone replacement therapy (HRT), ultrasound suspicion of endometrial pathology and infertility. Women with other uterine or adnexal diseases, as well as those with any important systemic diseases were excluded. Based on our routine practice patients with endometrial polyp size > 2.5 cm, multiple polypoid formations were scheduled for hysteroscopy at the day surgery Unit with conscious sedation. All centers received research ethics approval for the study, and all subjects signed a written informed consent. We collected data of the operative time (from the introduction to the extraction of the hysteroscope) and pain assessment was analyzed according to patient responses to a Visual Analogue Scale (VAS) which consisted of a printed 10 cm horizontal line anchored by the descriptors “no pain” (minimum, on the left end of the scale) and “worst pain imaginable” (maximum, on the right end). Statistical analyses were performed with SPSS version 21.0 (IBM Corp., Armonk, NY, USA).

Table 1 Demographic characteristics of women enrolled

Number of patients (<i>n</i>)	300
Age (years)	54 (± 12.6)
Parity	2.11 (± 1.71)
Nullipar women (<i>n</i> , %)	56 (18.6%)
BMI (kg/m^2)	26.55 (± 4.23)

Values are given as mean ($\pm$ SD) or *n*, %

Quantitative variables are expressed as mean and standard deviation (SD).

Transvaginal ultrasound scanning

Transvaginal ultrasound scan was performed preoperatively in all patients to give accurate information on the characteristics of endometrial polyp to be operated on and to exclude other coexistent uterine or adnexal diseases. Ultrasonographic measurements were performed by an experienced physician with a transvaginal probe multifrequency from 5.0 to 9.0-MHz (Voluson S8, General Electric Medical Systems, and the ALOKA Alpha-10, depending on the institution). The size of the polyps, as well as the diameters of the entire uterus (length, thickness, and width) were measured.

Office hysteroscopic laser polypectomy

All office hysteroscopic procedure procedures were performed by two experienced hysteroscopists (one per each center) by means of a 4-mm continuous-flow office hysteroscope (Bettocchi Office Hysteroscope “size 4” Karl Storz, Tuttlingen, Germany) with a 2.9-mm rod lens optic. The vaginoscopic approach [19] was used; no analgesia or anesthesia was administered to the patient. For the distension of uterine cavity we used saline solution and the intrauterine pressure was automatically controlled by an irrigation-suction electronic device (Endomat; Karl Storz) set at 45 mm Hg. To perform polypectomy we used a new Dual wavelengths Laser System (D.w.L.S.; Leonardo®, Biolitec, Germany) to generate a 980 + 1470 nm laser through a diode semiconductor. The combination of two wavelengths, 980 and 1470 nm gives a contemporary absorption in H_2O and in hemoglobin (Hb) with excellent ability of hemostasis, cutting and vaporization, as was previously shown in laparoscopic surgery [15–17]. We used two different types of fiber: Bare Fiber 1000 μm with Ball Tip and Bare Fiber 715 μm with Conical Tip. The first one was mostly used for hemostasis and vaporization, the second one for cutting. The diode laser can be used in direct contact with tissue (contact mode) or at a distance from tissue (non-contact mode). The operating distance of the fiber, in terms of cutting, coagulation, or hemostasis, is directly related to power applied (Watts). This characteristic allowed us to modulate the type of surgical approach according to the characteristics of the polyp and its localization. A high power (50–60 W) gives a laser effect spray and it was used when operating far from the endometrial surface, to avoid activating the nociceptive endings. We used a lower power (35–45 W) when operating close to the

endometrial surface. Polyps larger than the internal cervical os were cut into smaller pieces and externalized from the uterine cavity by mechanical instruments from 5 Fr (an endoscopic grasper or endoscopic basket). In all cases, the pieces removed were sent to the pathologist for histological confirmation. Antibiotic prophylaxis was not administered [20].

Results

300 women, aged 26–85 years, with ultrasound diagnosis of endometrial polyp were enrolled. 70 patients were excluded from the study: 48 patients for endometrial polyp size >2.5 cm and 22 for the presence of multiple polypoid formations. All these patients were scheduled for hysteroscopy at the day surgery Unit. 230 patients showed polypoid formations with maximum diameter ≤ 2.5 cm and they were scheduled for an outpatient hysteroscopy (Office). Hysteroscopy was successfully performed in 230 patients; two were excluded from the study because there was any evidence of intracavitary disease (false positive results), one had a myoma and other two had thickened endometrium. The remaining 225 women with single polyp (≤ 2.5 cm) underwent operative hysteroscopy. Specifically 138 were menopausal women (mean parity 2.34, SD ± 1.117 , nullipars: $n = 12$, 8.7%) and 87 were of reproductive age (mean parity 1.25, SD ± 1.154 , nullipars: $n = 30$, 34.5%). 219 out of 225 (97.3%) undertook laser polypectomy according to the ‘See & Treat’ philosophy [21]. Six patients of reproductive age requested the suspension of the procedure for intolerance (severe pain) due to cervical stenosis, and therefore, they were scheduled for a second hysteroscopy with conscious sedation in our Day Surgery Unit. The diagrammatic flow of the participants is given in Fig. 1. The procedure was longer in women of reproductive age with polyp size between 1 and 2.5 cm (13 min. SD ± 0.90 range 7–27) and shorter in menopausal women with polyps between 0 and 1 cm (9 min. SD ± 0.45 range 6–21). VAS score was very low in patients treated; in particular, it was substantially lower in menopausal women undergoing laser endometrial polypectomy with polyp size 0–1 cm, compared to women of reproductive age with endometrial polyp 1–2.5 cm (complete results are shown in Tables 2 and 3). The parity and percentage of nullipars in the menopausal women (8.7 vs 34.5%) could explain the better tolerability of the procedure and the shorter operative time and VAS score compared to the women of reproductive age. All polyps were successfully removed in all the different uterine locations even in the positions hardly to reach such as uterine corners or fundus. Table 4 shows the number of uterine polyps removed with laser in different uterine

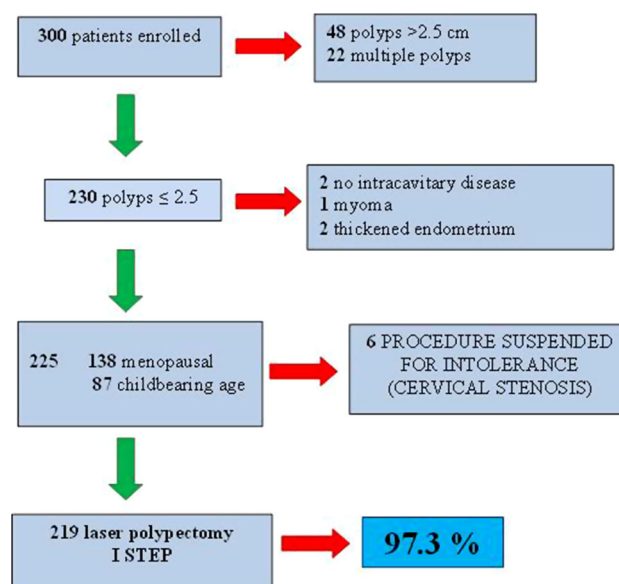


Fig. 1 Diagrammatic flow of the participants

Table 2 VAS score in women of reproductive age with polyps ≤ 1 cm and polyps ≤ 2.5 cm

Size	Total patients (87)	VAS*
0–1 cm	38	1.773 $\pm$ 2.39
1–2.5 cm	49	2.054 $\pm$ 1.494

* Values are given as mean ($\pm$ SD)

Table 3 VAS score in menopausal women with polyps ≤ 1 cm and polyps ≤ 2.5 cm

Size	Patients (138)	VAS*
0–1 cm	56	1.622 $\pm$ 1.803
1–2.5 cm	82	1.703 $\pm$ 2.271

* Values are given as mean ($\pm$ SD)

locations. No main complications (i.e., uterine perforation, hemorrhage, distention fluid overloading syndromes, severe vasovagal syndrome or postoperative infections) were reported during or after the procedure. All patients were discharged in the same day and there were no readmissions for any problems in the next days. In all cases there was correspondence between the histological examination of the removed tissue and the hysteroscopic diagnosis. All the patients treated underwent routine postoperative clinical visit after one month and follow-up visit (after 6 and 12 months) with ultrasound scan. The ultrasound scan (performed by the same physician who did it preoperatively) did not show any persistence or recurrence of the pathology.

Table 4 Characteristics of endometrial polyps in menopausal and reproductive age patients

Location	Menopausal age (138)	Reproductive age (87)
PUW	35	28
AUW	16	11
LUW	57	30
F	18	10
C	10	7
I	2	1
Basis of implantation		
Large	73	36
Small	65	51
SIZE		
0–1 cm	56	38
1–2.5 cm	82	49

PUW posterior uterine wall, AUW anterior uterine wall, LUW lateral uterine wall, F fundus, C corners, I isthmus

Discussion

In hysteroscopic gynecological surgery, we have made great progress through the use of smaller endoscopes and bipolar electrosurgical system that perform hysteroscopy, without any type of anesthesia. In this study, we present our first experience in endometrial polypectomy using a new dual wavelengths laser system (DWLS) instead of the standard bipolar energy. Patients with more than one endometrial polyp were excluded from the study to have greater objectivity in the evaluation of operative times and results. The advent of laser technology has allowed to obtain further advantages for the surgeon and the patient in the treatment of endometrial pathology. Moreover, this new laser enables to respect surgical planes and it is able to tackle diseases in locations not easily accessible (e.g., tubal corners of the uterus). The success rate of the technique (97.3% in our study), in association with the high compliance of the patients and the short operative time may suggest the validity and feasibility of the procedure. These very interesting results were also obtained with the dual function of the laser able to cut and vaporize with an excellent hemostatic power. This makes it an excellent hemostatic tool in hysteroscopic procedures, thus reducing both the risks and the operative times. In addition, the heat developed by the laser fiber causes dehydration of endometrial lesions allowing not only easy removal, but also the passage through the internal uterine orifice, which is particularly painful (60% of the sensitive fibers is located here). The advantages of this technology are drying effect on the lesion with the immediate reduction of its volume, extreme precision of cutting, a controlled power of penetration/deepening, a

high capacity of hemostasis, the absence of electrical interferences, high safety and a good compliance by the patients. The main disadvantages for the clinical application of this technology might be the cost because laser equipment currently tend to be expensive [22, 23] and an adequate learning curve to better understand the instrumentation technical characteristics.

Conclusions

To our knowledge, this is the larger descriptive analysis on hysteroscopic laser polypectomy with a new dual wavelengths laser system carried out as an outpatient procedure and without anesthesia, with promising results based on the success rate and the patients' satisfaction level. Further well-designed studies are necessary, however, to explore the feasibility and reproducibility of the technique by other authors, as well as to compare these promising results with the usual monopolar and bipolar techniques.

Compliance with ethical standards

Conflict of interest We declare that we have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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